

# Daffin

#### **Chester Road Hostel**

Appendix D – SAP & SBEM Outputs Energy Statement

13 May 2020

Address:

Located in: **England** Region: Thames valley

UPRN:

07 November 2019 Date of assessment: 12 May 2020 Date of certificate:

New dwelling design stage Assessment type:

New dwelling Transaction type: Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

PCDF Version: 460

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

55.3 m<sup>2</sup> 3.09 m Floor 0

Location:

8\_01

8\_07

8 07

8\_07 8\_01

28.01 m<sup>2</sup> (fraction 0.507) Living area:

North East Front of dwelling faces:

$\sim$				
	nan.	ına	TVI	oes:
$\circ$	pen	шч	ιу	ucs.

Name: D8\_01

Vent\_08\_03

Vent\_08\_02

Vent\_08\_06

V\_01

Name: D8_01 Vent_08_03 Vent_08_02 Vent_08_06	Source: Manufacturer Manufacturer Manufacturer Manufacturer	Type: Solid Solid Solid Solid	Glazing:		Argon:	Frame: Metal
V_01	Manufacturer	Solid				Metal
Window_08_07	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_01	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_04	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_05	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
<b>Name:</b> D8_01	<b>Gap:</b> mm	Frame Fa	ctor: g-value:	<b>U-value:</b> 1	<b>Area:</b> 2.13	No. of Openings:
			ctor: g-value: 0 0	<b>U-value:</b> 1 1		No. of Openings: 1 1
D8_01	mm	0	0	<b>U-value:</b> 1 1 1	2.13	No. of Openings: 1 1 1
D8_01 Vent_08_03	mm mm	0 0	0	<b>U-value:</b> 1 1 1 1	2.13 0.96	No. of Openings: 1 1 1 1
D8_01 Vent_08_03 Vent_08_02	mm mm mm	0 0 0	0 0 0	<b>U-value:</b> 1 1 1 1 1	2.13 0.96 0.96	No. of Openings:  1  1  1  1  1
D8_01 Vent_08_03 Vent_08_02 Vent_08_06	mm mm mm mm	0 0 0 0	0 0 0 0	U-value:  1  1  1  1  1  1  1  1	2.13 0.96 0.96 0.7	No. of Openings: 1 1 1 1 1 1
D8_01 Vent_08_03 Vent_08_02 Vent_08_06 V_01	mm mm mm mm mm	0 0 0 0	0 0 0 0 0	1 1 1 1	2.13 0.96 0.96 0.7 0.2	No. of Openings:  1  1  1  1  1  1  1
D8_01 Vent_08_03 Vent_08_02 Vent_08_06 V_01 Window_08_07	mm mm mm mm mm 6mm	0 0 0 0 0 0	0 0 0 0 0 0	1 1 1 1 1 1.2	2.13 0.96 0.96 0.7 0.2 0.86	No. of Openings:  1  1  1  1  1  1  1  1
D8_01 Vent_08_03 Vent_08_02 Vent_08_06 V_01 Window_08_07 Window_08_01	mm mm mm mm mm 6mm	0 0 0 0 0 0.7	0 0 0 0 0 0 0.4 0.4	1 1 1 1 1 1.2 1.2	2.13 0.96 0.96 0.7 0.2 0.86 2.01	No. of Openings:  1  1  1  1  1  1  1  1  1  1  1  1  1

Orient:

North East

South West

South West

South West

North East

Type-Name:

Height:

0

0

0

0

0.2

Width:

0

0

0

0

1.01

Window_08_07	8_05	North East	0.6	1.44
Window_08_01	8_07	South West	1.22	1.65
Window_08_04	8_07	South West	1.22	1.65
Window_08_05	8_07	South West	1.22	1.2
Fanlight	8 01	North East	1.01	0.315

Overshading: Average or unknown

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>s</u>						
8_01	15.172	2.65	12.52	0.13	0	False	N/A
8_02	1.854	0	1.85	0.13	0	False	N/A
8_03	6.727	0	6.73	0.13	0	False	N/A
8_04	1.823	0	1.82	0.13	0	False	N/A
8_05	6.365	0.86	5.5	0.13	0	False	N/A
8_07	28.737	8.1	20.64	0.13	0	False	N/A
8_08	19.467	0	19.47	0.13	0.82	False	N/A
Ground	55.3			0.11			N/A
Internal Elements	<u>S</u>						

Party Elements

Thermal bridges:	No information on thermal bridging $(y=0.15)$ $(y=0.15)$
3	

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Manufacturer Declaration

Manufacturer's data

Efficiency: 89.5% (SEDBUK2009)

Condensing combi with automatic ignition

Fuel Burning Type: Unknown Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901 Fuel :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:

Terrain type:

EPC language:

Wind turbine:

Photovoltaics:

Assess Zero Carbon Home:

100%

Dense urban

English

No

No

No

		l lear I	Details:						
Assessor Name:	Adam Ritchie	— <u> </u>	Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	: Flat Ty	pe A En	ergy Eff	only		
Address :									
Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				(1a) x		3.09	(2a) =	170.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)			_		
Dwelling volume		´ <u></u>		J	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:								17 0.00	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	<b> </b> =	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>   +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x ·	10 =	0	(7a)
Number of passive vents					0	x ·	10 =	0	(7b)
Number of flueless gas fi	res				0	x 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
'	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in the		50 to (11),	ouror wide (	oonanao n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
it both types of wall are pl deducting areas of openii	resent, use the value corresponding angs); if equal user 0.35	to the grea	ter wall are	ea (arter					
•	floor, enter 0.2 (unsealed) or (	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Percentage of windows Window infiltration	s and doors draught stripped		0.25 - [0.2	) v (14) · 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es ner hø					area	0	(16)
•	lity value, then $(18) = [(17) \div 20] +$			•	ictic oi c	листорс	arca	2.5 0.12	(17)
•	es if a pressurisation test has been do				is being u	sed			` ′
Number of sides sheltered	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.12	(21)
Infiltration rate modified f	<del>- 1                                   </del>	11		0	0-4	Nan	Data	1	
Jan Feb	Mar   Apr   May   Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	peed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0   4.4   4.3   3.6	3.0	3.1	<u> </u>	4.3	1 4.0	4.7	J	
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4			,				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		

Adjusted infilt	ration rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se					•		¬
If mechanic			andiv N. (C	2h) _ (22d	) Em. (c	auation (I	VEVV otho	muiaa (22h	) - (22a)			0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
If balanced wit		-	-	_					2h\ //	20h) [/	1 (00.5)	75.65	(23c)
a) If balanc (24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	23D) <b>×</b> [ 0.26	0.27	÷ 100]	(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat rec	covery (N	иV) (24b	p)m = (22)	2b)m + (2	23b)	!		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I				•	•				(00h	\			
(24c)m = 0	m < 0.5 >	(230),	nen (240	(230) = (230)	o); other	wise (24	$\frac{C}{C} = (220)$	0 m + 0.	.5 × (230	0	0		(24c)
d) If natural		<u> </u>				<u> </u>		ļ	0	0	0		(240)
	m = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - e	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/k	۲)	k-value kJ/m²-l		
Doors Type 1													
					2.13	×	1	=	2.13				(26)
Doors Type 2					2.13 0.96	=	1	= =	2.13 0.96				(26) (26)
Doors Type 2 Doors Type 3						x		=					, ,
• •					0.96	x	1	=	0.96				(26)
Doors Type 3					0.96	x x	1	=	0.96				(26) (26)
Doors Type 3 Doors Type 4					0.96 0.96 0.7	x x x	1 1	= = = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7				(26) (26) (26)
Doors Type 3 Doors Type 4 Doors Type 5	e 1				0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1 1	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2				(26) (26) (26) (26)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2				0.96 0.96 0.7 0.2	x x x x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98				(26) (26) (26) (26) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ	e 1 e 2 e 3				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x 1 x 1 x 1 x 1	1 1 1 1 /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4	7	2.65	;	0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor	e 1 e 2 e 3 e 4 e 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2 e 3 e 4 e 5	5			0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2 e 3 e 4 e 5	3	0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Win	e 1 e 2 e 3 e 4 e 5	5 3 2	0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Floor Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 1 e 2 e 3 e 4 e 5	5 3 2 6	0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	e 1 e 2 e 3 e 4 e 5  15.1 1.8 6.7 1.8 6.3	5 3 2 6	0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

				· · · · · · · · · · · · · · · · · · ·	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
					lls and part	titions								
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat ca	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therma	al mass	parame	ter (TMF	c = Cm ÷	: TFA) ir	n kJ/m²K			Indicat	Indicative Value: Low 100				
•	•	sments wh ad of a dea			constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						20.32	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								(33) +				47.64	(37)
Ventila	tion hea			d monthly	i						25)m x (5)	<u> </u>	1	
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
		( /)	II D) \A/	/ 21.C						_	Sum(39) <sub>1</sub>	12 /12=	62.22	(39)
г		meter (F		r	4.40			44		= (39)m ÷			1	
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14	1.13	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	average =	Sum(40) <sub>1</sub> .	12 / 12=	1.13	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(41)m=			31	30	31	30	-	Ť		31	30	-		(41)
	31			l		30	-	Ť		31	30	-	ear:	(41)
4. Wa	31 ter heat	28 ting ener	gy requi	l		30	-	Ť		31		31 kWh/ye	ear:	
4. Wa Assum if TF	ter heat ed occu A > 13.9	ze ting ener upancy, I 9, N = 1	rgy requi	irement:			31	31	30		1.	31	ear:	(41)
4. Wa Assum if TF if TF Annual	ter heat ed occu A > 13.9 A £ 13.9 averag	ing energipancy, I 9, N = 1 9, N = 1 e hot wa	rgy requi N + 1.76 x	irement:  [1 - exp	o(-0.0003	349 x (TF	31 FA -13.9 erage =	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/ye	ear:	
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annua	ing energipancy, I	rgy requi N + 1.76 x ater usag hot water	irement:  [1 - exp ge in litre usage by	o(-0.0003 es per da 5% if the a	349 x (TF ay Vd,av welling is	31 FA -13.9 erage = designed to	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	əar:	(42)
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annual	ing energipancy, I pancy, I pancy, I pancy, I pancy, I pancy I	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the a	349 x (TF ay Vd,av lwelling is hot and co	31  FA -13.9 erage = designed id	31 (25 x N) o achieve	30 0013 x (7 + 36 a water us	ΓFA -13. se target o	9) 78	31 kWh/yu 85	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occur A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assume if TF, if TF, Annual Reduce in not more	ter heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy in N = 1 p	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr  ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from T	31  FA -13.9 erage = designed to ld)  Jul Table 1c x	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us	ΓFA -13. se target o Oct	1. 9) 78	31 kWh/yu 85 0.05	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occur A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36 a water us Sep	ΓFA -13. se target o  Oct  79.61	9) 78 Nov 82.73	85 .05 Dec		(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirements of the second reports of the second reports of the second requirements of the second requirem	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec	936.55	(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirements of the second reports of the second reports of the second requirements of the second requirem	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec		(42)
4. Wa  Assume if TF, if TF, Annual Reduce in not more  Hot wate (44)m= [  Energy contact   15   15   15   15   15   15   15   1	ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in 85.85	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy energe litres per pancy feb panc	rgy requive the second of the	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24	FA -13.9 erage = designed in the signed in t	31 (25 x N) to achieve Aug (43) 73.36	30  0013 x (7  + 36     a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1. 9) 78 Nov 82.73 m(44)12 = ables 1b, 1	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3		(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy co (45)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan er usage in 85.85 content of	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pan	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy c (45)m= [ If instanta (46)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
4. Wa  Assume if TF if T	ed occur A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage ir 85.85 content of 127.31 aneous w 19.1 storage	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiverse requirements of the second period pe	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month  76.49  culated me 100.17	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = fai  73.36  onthly = 4.  96.12 o hot water  14.42	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage),	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  76.86  enter 0 in  11.53	31 (25 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  0 to (61)  13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy co (45)m= [ If instanta (46)m= [ Water s Storage	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1 storage e volum	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  m x nm x E  76.86  enter 0 in  11.53  storage	31 (25 x N) (25 x N) (25 x N) (26 achieve  Aug (43) (73.36 (77.3600  88.2 (46) (13.23) within sa	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  0 to (61)  13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31 kWh/ys 85 3.05 Dec 85.85 c, 1d) 123.3	936.55	(42) (43) (44) (45)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the content of t	ed occur A > 13.9 A £ 13.9 average the annual of that 125 Jan er usage in 85.85 content of 127.31 storage e volum munity herise if no	ing energy, I pancy, I pancy I p	rgy requive the second of the	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49  culated me 100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = fai  73.36  onthly = 4.  96.12 o hot water  14.42	349 x (TF ay Vd,av lwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS	and	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [  Energy of (45)m= [  Water storage If commotherw Water storage III commother III commother III commother II commother	ed occu A > 13.9 A £ 13.9 A £ 13.9 averag the annua that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated mo  100.17  for use (no  15.03  and any so ank in dw er (this in	es per da 5% if the avater use, I  May  Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  - c, 1d)  123.3  - 18.49	936.55	(42) (43) (44) (45) (46) (47)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the common of the c	der heat ed occur A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no storage anufact	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely requirements of the sector	irement:  [1 - exp  ge in litre usage by and (all we  Apr ach month  76.49  culated mo 100.17  for use (no 15.03  and any so ank in dw er (this in	of (-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fact  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	1.9) 78 Nov 82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54 m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) =		)	(50)
b) If manufacturer's declared cylinder loss factor is not know	n:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		(	)	(51)
If community heating see section 4.3  Volume factor from Table 2a				(52)
Temperature factor from Table 2b				(52)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53)	= (		(54)
Enter (50) or (54) in (55)		(		(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$			
(56)m= 0 0 0 0 0 0	0 0	0 0	0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m w	where (H11) is froi	m Appendix H	
(57)m= 0 0 0 0 0 0	0 0	0 0	0	(57)
Primary circuit loss (annual) from Table 3		(	)	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	365 × (41)m			
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder th	nermostat)		
(59)m= 0 0 0 0 0 0	0 0	0 0	0	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	-1)m			
(61)m= 43.75 38.08 40.57 37.72 37.39 34.64 35.79	37.39 37.72 4	40.57 40.8	43.75	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)$	5)m + (46)m +	 (57)m + (59)m + (6	61)m
(62)m= 171.06 149.43 155.47 137.89 133.51 117.58 112.6	5 125.58 126.97 14	44.58 154.34	167.05	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar co	ontribution to wate	r heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)			
(63)m= 0 0 0 0 0 0	0 0	0 0	0	(63)
Output from water heater		-		
(64)m= 171.06 149.43 155.47 137.89 133.51 117.58 112.6	5 125.58 126.97 14	44.58 154.34	167.05	
(64)m= 171.06 149.43 155.47 137.89 133.51 117.58 112.6	Output from water			1 (64)
(64)m= 171.06 149.43 155.47 137.89 133.51 117.58 112.6  Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]	Output from water	r heater (annual) <sub>1.</sub>	12 1696.1	1 (64)
	Output from water m + (61)m] + 0.8 x [(4	r heater (annual) <sub>1.</sub>	12 1696.1	1 (64) (65)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4	r heater (annual) <sub>1</sub> . (46)m + (57)m (44.73 47.95	+ (59)m ] 51.93	
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 53.27 46.54 48.35 42.74 41.31 36.24 34.5	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4	r heater (annual) <sub>1</sub> . (46)m + (57)m (44.73 47.95	+ (59)m ] 51.93	
Heat gains from water heating, kWh/month $0.25$ ′ $[0.85 \times (45)]$ (65)m= $\begin{bmatrix} 53.27 & 46.54 & 48.35 & 42.74 & 41.31 & 36.24 & 34.5 \end{bmatrix}$ include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4	r heater (annual) <sub>1</sub> . (46)m + (57)m (44.73 47.95	+ (59)m ] 51.93	
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 53.27   46.54   48.35   42.74   41.31   36.24   34.5 include (57)m in calculation of (65)m only if cylinder is in the	Output from water m + (61)m] + 0.8 x [(4 38.67   39.11   4 e dwelling or hot water	r heater (annual) <sub>1</sub> . (46)m + (57)m (44.73 47.95	+ (59)m ] 51.93	
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45) (65)m= 53.27 46.54 48.35 42.74 41.31 36.24 34.5 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4 e dwelling or hot water  Aug Sep	r heater (annual) <sub>1</sub> . (46)m + (57)m (44.73   47.95 er is from com	+ (59)m ] 51.93 munity heating	
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 53.27 46.54 48.35 42.74 41.31 36.24 34.5 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Output from water m + (61)m] + 0.8 x [(4) 38.67   39.11   4 e dwelling or hot water  Aug   Sep   7   110.77   11	r heater (annual) 1. (46)m + (57)m (44.73	1696.1 + (59)m ] 51.93 munity heating	(65)
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4 e dwelling or hot water  Aug Sep 7 110.77 110.77 11 also see Table 5	r heater (annual) 1. (46)m + (57)m (44.73	1696.1 + (59)m ] 51.93 munity heating	(65)
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 53.27 46.54 48.35 42.74 41.31 36.24 34.5 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 110.77 110.7	Output from water m + (61)m] + 0.8 x [(4) 38.67   39.11   4 e dwelling or hot water  Aug   Sep   7   110.77   110.77   11 also see Table 5   19.28   25.88   3	r heater (annual) 1.  (46)m + (57)m  (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77	(65)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4   38.67   39.11   4   e dwelling or hot water  Aug Sep   7   110.77   110.77   110.77   110.77   also see Table 5   19.28   25.88   3 13a), also see Table	r heater (annual) 1.  (46)m + (57)m  (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77	(65)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4 38.67 39.11 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	r heater (annual) 1. (46)m + (57)m (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77	(65) (66) (67)
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)]  (65)m= 53.27  46.54  48.35  42.74  41.31  36.24  34.5  include (57)m in calculation of (65)m only if cylinder is in the final state of the f	Output from water m + (61)m] + 0.8 x [(4) 38.67   39.11   4 e dwelling or hot water  Aug   Sep   7   110.77   110.77   17 also see Table 5	r heater (annual) 1. (46)m + (57)m (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77	(65) (66) (67)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4) 38.67   39.11   4 e dwelling or hot water  Aug   Sep   7   110.77   110.77   17 also see Table 5	r heater (annual) 1.  (46)m + (57)m  (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77  40.89	(65) (66) (67) (68)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4) 38.67   39.11   4 e dwelling or hot water  Aug   Sep   7   110.77   110.77   17 also see Table 5	r heater (annual) 1.  (46)m + (57)m  (44.73	1696.1 + (59)m] 51.93 munity heating  Dec 110.77  40.89	(65) (66) (67) (68)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4   38.67   39.11   4   2 dwelling or hot water  Aug Sep 7 110.77 110.77 11 also see Table 5 19.28 25.88 3 .13a), also see Table 3 177.23 183.51 19 a), also see Table 5 47.92 47.92 4	r heater (annual)         (46)m + (57)m         (44.73       47.95         er is from common         Oct       Nov         10.77       110.77         32.87       38.36         e 5       96.89       213.77         47.92       47.92	1696.1 + (59)m] 51.93 munity heating  Dec 110.77  40.89  229.64	(65) (66) (67) (68) (69)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)]  (65)m= 53.27	Output from water m + (61)m] + 0.8 x [(4   38.67   39.11   4   e dwelling or hot water  Aug Sep 7	r heater (annual)         (46)m + (57)m         (44.73       47.95         er is from common         Oct       Nov         10.77       110.77         32.87       38.36         e 5       96.89       213.77         47.92       47.92	1696.1 + (59)m] 51.93 munity heating  Dec 110.77  40.89  229.64	(65) (66) (67) (68) (69)

Water heating	g gains (T	able 5)												
(72)m= 71.6	69.26	64.98	59.36	55.52	50	0.33	46.38	51.9	98 54.31	60.12	2 66.6	69.8	1	(72)
Total interna	⊥ I gains =					(66)n	n + (67)m	+ (68	s)m + (69)m +	(70)m +	(71)m + (72)	)m	J	
(73)m= 439.47	<del></del>	418.01	392.03	365.82	34	2.23	328.78	336.	34 351.56	377.7	2 406.57	428.18	]	(73)
6. Solar gair	ns:													
Solar gains are		using sola	r flux from	Table 6a	and a	associa	ated equa	tions t	o convert to th	ne appli	cable orientat	tion.		
Orientation:		actor	Area			Flux			9_		FF		Gains	
	Table 6d		m²			Tab	le 6a		Table 6b		Table 6c		(W)	
Northeast 0.9x	0.77	X	3.0	36	x	11	1.28	x	0.4	X	0.7	=	1.88	(75)
Northeast 0.9x	0.77	X	0.3	32	x	11	1.28	x	0.4	X	0.7	=	0.7	(75)
Northeast 0.9x	0.77	X	3.0	36	x	22	2.97	X	0.4	x	0.7	=	3.83	(75)
Northeast 0.9x	0.77	х	0.3	32	x	22	2.97	X	0.4	x	0.7	=	1.43	(75)
Northeast 0.9x	0.77	X	3.0	36	X	41	1.38	X	0.4	X	0.7	=	6.91	(75)
Northeast 0.9x	0.77	х	0.3	32	x	41	1.38	X	0.4	x	0.7	=	2.57	(75)
Northeast 0.9x	0.77	X	3.0	36	X	67	7.96	X	0.4	X	0.7	=	11.34	(75)
Northeast 0.9x	0.77	X	0.3	32	X	67	7.96	X	0.4	X	0.7	=	4.22	(75)
Northeast 0.9x	0.77	X	3.0	36	x	91	1.35	x	0.4	X	0.7	=	15.24	(75)
Northeast 0.9x	0.77	X	0.3	32	x	91	1.35	X	0.4	X	0.7	=	5.67	(75)
Northeast 0.9x	0.77	X	3.0	36	x	97	7.38	X	0.4	X	0.7	=	16.25	(75)
Northeast 0.9x	0.77	X	0.3	32	x	97	7.38	x	0.4	X	0.7	=	6.05	(75)
Northeast 0.9x	0.77	X	3.0	36	x	9	1.1	X	0.4	X	0.7	=	15.2	(75)
Northeast 0.9x	0.77	X	0.3	32	x	9	1.1	x	0.4	X	0.7	=	5.66	(75)
Northeast 0.9x	0.77	X	3.0	36	X	72	2.63	X	0.4	X	0.7	=	12.12	(75)
Northeast 0.9x	0.77	X	0.3	32	X	72	2.63	X	0.4	X	0.7	=	4.51	(75)
Northeast 0.9x	0.77	Х	3.0	36	x	50	).42	X	0.4	X	0.7	=	8.41	(75)
Northeast 0.9x	0.77	X	0.3	32	X	50	).42	X	0.4	X	0.7	=	3.13	(75)
Northeast 0.9x	0.77	X	3.0	36	X	28	3.07	X	0.4	X	0.7	=	4.68	(75)
Northeast 0.9x	0.77	Х	0.3	32	x	28	3.07	x	0.4	X	0.7	=	1.74	(75)
Northeast 0.9x	0.77	X	3.0	36	X	1	4.2	X	0.4	X	0.7	=	2.37	(75)
Northeast 0.9x	0.77	X	0.3	32	x	1	4.2	x	0.4	x	0.7	=	0.88	(75)
Northeast 0.9x	0.77	Х	3.0	36	x	9	.21	X	0.4	X	0.7	=	1.54	(75)
Northeast 0.9x	0.77	X	0.3	32	x	9	.21	x	0.4	x	0.7	=	0.57	(75)
Southwest <sub>0.9x</sub>	0.77	X	2.0	)1	x	36	6.79		0.4	X	0.7	=	14.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	)1	x	36	6.79		0.4	X	0.7	=	14.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	16	x	36	5.79		0.4	X	0.7	=	10.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	)1	x	62	2.67		0.4	X	0.7	=	24.44	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)1	x	62	2.67		0.4	x	0.7	=	24.44	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	16	x	62	2.67		0.4	x	0.7	=	17.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)1	x	85	5.75		0.4	x	0.7	=	33.45	(79)
Southwest <sub>0.9x</sub>	0.77	х	2.0	)1	x	85	5.75		0.4	х	0.7	=	33.45	(79)

Southweste on F		<b>—</b>			, <del></del>	05.75	1 1		<b>–</b>				(70)
Southwest <sub>0.9x</sub>	0.77	x	1.46	=		85.75	] 1	0.4	×	0.7	=	24.29	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01	=	<b>—</b>	106.25	] 1	0.4	= X	0.7	_ =	41.44	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.01	=		106.25	] 1	0.4	x	0.7	=	41.44	(79)
<u>L</u>	0.77	×	1.46	_		106.25	]	0.4	_ x	0.7	_ =	30.1	(79)
Southwesto.ex	0.77	X	2.01	_		119.01	]	0.4	×	0.7	_ =	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01	_		119.01	]	0.4	×	0.7	=	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46	_	X	119.01	]	0.4	×	0.7	=	33.72	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01	_	X	118.15	]	0.4	X	0.7	_ =	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01	_	Χ	118.15	]	0.4	X	0.7	=	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46		X	118.15	_	0.4	X	0.7	=	33.47	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		X ·	113.91	_	0.4	X	0.7	=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	113.91	]	0.4	X	0.7	=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46		χ	113.91	_	0.4	X	0.7	=	32.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		X ·	104.39		0.4	X	0.7	=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		X ·	104.39		0.4	X	0.7	=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46		χ	104.39	]	0.4	X	0.7	=	29.57	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.01		x	92.85	]	0.4	X	0.7	=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	92.85		0.4	X	0.7	=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46		X	92.85	]	0.4	X	0.7	=	26.3	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	69.27	]	0.4	X	0.7	=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	69.27		0.4	X	0.7	=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.46		x	69.27		0.4	х	0.7	=	19.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	44.07		0.4	х	0.7	=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.01		x	44.07		0.4	x	0.7	=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.46		x	44.07	]	0.4	x	0.7		12.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.01		x	31.49		0.4	x	0.7		12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.01		x	31.49	į	0.4	х	0.7	=	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.46		x	31.49	<u>ו</u>	0.4	×	0.7		8.92	(79)
_							_						
Solar gains in	watts, cal	culated	for each n	nonth			(83)m	i = Sum(74)m	(82)m			_	
(83)m= 41.71	71.9	100.66	128.54	47.46	147.93	141.98	127	.63 110.28	80.08	50.11	35.59		(83)
Total gains – ii	nternal an	d solar	(84)m = $(7$	73)m -	+ (83)m	, watts						-	
(84)m= 481.18	507.08	518.67	520.58 5	13.28	490.16	470.77	463	.97 461.84	457.8	456.69	463.77		(84)
7. Mean inter	nal tempe	rature (	heating se	eason	)								
Temperature	during he	ating pe	eriods in th	ne livir	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gai	ns for li	ving area,	h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aı	ug Sep	Oct	Nov	Dec		
(86)m= 0.93	0.91	0.89	0.84 (	0.77	0.64	0.51	0.5	3 0.7	0.84	0.9	0.93	]	(86)
Mean interna	l temperat	ture in I	iving area	T1 (fc	ollow ste	eps 3 to 7	7 in T	able 9c)				=	
(87)m= 19.01	19.2	19.53		20.4	20.75	20.9	20.	<del>- i - '</del>	20.14	19.52	18.98	]	(87)
Temperature	during be	ating n	erinds in re	ast of	dwellin	r from Ta	ahle (	Th2 (°C)		1		4	
(88)m= 19.96	19.96	19.97		9.98	20	20	20		19.98	19.98	19.97	1	(88)
(32)			'	<b>-</b>		1	<u> </u>	1 .0.00	1	1	1	1	` '

Litilication	n factor for	gaine for	rest of d	welling l	h2 m (se	oo Tablo	02)						
	.92 0.9	0.87	0.82	0.73	0.57	0.41	0.44	0.63	0.81	0.89	0.92		(89)
` ′	ļ		Į	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	0.00	0.52		(00)
	ernal temp		19.12	19.52	19.83	19.95	19.94	19.76	19.29	18.68	18.15		(90)
(00)	1 10.00	1 .0.00	1	10.02	.0.00	10.00		<u> </u>	<u> </u>	g area ÷ (4	<u> </u>	0.51	(91)
								۸\ =0				0.0.	
	ernal temp	<del>`</del>	î .				<del>_`</del>	<del></del>	40.70	10.44	40.57		(02)
` ′	8.6 18.78		19.55	19.97	20.3	20.43	20.42	20.22	19.72	19.11	18.57		(92)
· · · · · · <del>- · · ·</del>	justment to 8.6 18.78		19.55	19.97	20.3	20.43	20.42	20.22	19.72	19.11	18.57		(93)
	heating re			19.97	20.3	20.43	20.42	20.22	19.72	19.11	10.57		(50)
	the mean			re obtain	and at et	on 11 of	Table O	h eo tha	t Ti m-/	76\m an	d ro-calc	ulato	
	ation factor		•		icu ai sii	ер п ог	Table 3	0, 50 ii la	ıt 11,111—(	<i>i</i> ojili ali	u ie-caic	uiate	
J	an Fel	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	n factor for	gains, hn	า:								-		
(94)m = 0	0.88	0.86	0.81	0.73	0.6	0.46	0.48	0.65	0.8	0.87	0.91		(94)
Useful ga	ains, hmGr	n , W = (9	4)m x (8	4)m									
(95)m= 43	3.29 448.1	8 444.08	419.95	372.63	291.95	214.76	222.18	299.93	365.3	398.95	420.8		(95)
Monthly	average ex	ternal ten	perature	e from Ta	able 8	,					1		
` '	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	rate for m		<del></del>			<del>- `                                   </del>	<del>-``</del>	<u> </u>	<del></del>				
` ′	7.86 878.9		663.28	513.26	348.68	234.57	245.42	376.6	566.24	749.59	902.13		(97)
	eating requ	1	T			1			<del></del>	ri e	1		
(98)m= 35	3.08 289.4	8 261.85	175.2	104.63	0	0	0	0	149.49	252.46	358.11		<b>¬</b>
							Tota	ıl per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	1944.31	(98)
Space he	eating requ	irement in	kWh/m²	²/year								35.16	(99)
9a. Energ	y requirem	ents – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space h	_										,		_
Fraction	of space h	eat from s	econdar	y/supple	mentary	system						0	(201)
Fraction	of space h	eat from n	nain syst	tem(s)			(202) = 1	- (201) =				1	(202)
Fraction	of total hea	ating from	main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficienc	y of main s	pace heat	ing syste	em 1								90.3	(206)
Efficiency	y of secon	dary/suppl	ementar	y heating	g systen	າ, %						0	(208)
П	an Fel	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space he	eating requ	irement (d	<u> </u>		)				ļ.			,	
35	3.08 289.4	8 261.85	175.2	104.63	0	0	0	0	149.49	252.46	358.11		
(211)m = ·		204)] } x ′	100 ÷ (20	)6)		•							(211)
` ′ —	1.01 320.5		194.02	115.87	0	0	0	0	165.55	279.58	396.58		` ,
		·					Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	2153.17	(211)
Space he	eating fuel	(secondai	v). kWh	month									
•	x (201)] } x	•	• •										
	0 0	0	0	0	0	0	0	0	0	0	0		
<u></u>			•				Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
													_

11a. SAP rating - individual heating systems  Energy cost deflator (Table 12)	247) + (250) (256)] ÷ [(4)	)(254) + 45.0] ling mi	=		Emiss			0.42 1.43 80.12	(255) (256) (257) (258)
Total energy cost (245)(  11a. SAP rating - individual heating systems  Energy cost deflator (Table 12)  Energy cost factor (ECF) [(255) x  SAP rating (Section 12)	247) + (250) (256)] ÷ [(4)	)(254) + 45.0]	=					0.42	](256) ](257)
Total energy cost (245)(  11a. SAP rating - individual heating systems  Energy cost deflator (Table 12)  Energy cost factor (ECF) [(255) x	247) + (250)	)(254)						0.42	](256) ](257)
Total energy cost (245)(  11a. SAP rating - individual heating systems  Energy cost deflator (Table 12)	247) + (250)	)(254)						0.42	(256)
Total energy cost (245)( 11a. SAP rating - individual heating systems			=						
Total energy cost (245)(			=					340.41	(255)
Appendix Q items: repeat lines (253) and (254)	as necae	ea							
	as neede	. ما						120	J (=~ '/
Additional standing charges (Table 12)	. ,							120	](251)
(if off-peak tariff, list each of (230a) to (230g) se Energy for lighting	eparately a	as app	licable a	nd apply	fuel prid		rding to x 0.01 =	Table 12a	(250)
Pumps, fans and electric keep-hot	(231)				13.	19	x 0.01 =	38.76	(249)
Water heating cost (other fuel)	(219)				3.4	8	x 0.01 =	69.64	(247)
Space heating - secondary	(215)	X			13.	19	x 0.01 =	0	(242)
Space heating - main system 2	(213)	X			0		x 0.01 =	0	(241)
Space heating - main system 1	(211)	X			3.4	8	x 0.01 =	74.93	(240)
	<b>Fue</b> kWh	l /year			Fuel P (Table			Fuel Cost £/year	
10a. Fuel costs - individual heating systems:									
Electricity for lighting								281.06	](232)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			293.89	(231)
boiler with a fan-assisted flue							45	] ]	(230e)
central heating pump:							30	] ]	(230c)
mechanical ventilation - balanced, extract or p		out fron	n outside	Э			218.89	1	(230a)
Electricity for pumps, fans and electric keep-ho	t							2001.1	J
Space heating fuel used, main system 1 Water heating fuel used								2153.17	
Annual totals					k\	Wh/yea	r	kWh/year	- 7
			Tota	I = Sum(2	19a) <sub>112</sub> =			2001.1	(219)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$ $(219)m = 196.54   171.95   179.53   160.43   157.36$	145.17	139.08	155.04	156.75	169.15	178.36	191.75	]	
(217)m= 87.04 86.9 86.6 85.95 84.84	81	81	81	81	85.48	86.53	87.12		(217)
Efficiency of water heater								81	(216)
111110   110110   100101   100101	117.58	112.65	125.58	126.97	144.58	154.34	167.05	]	
171.06 149.43 155.47 137.89 133.51									
Water heating Output from water heater (calculated above)									

Space heating (main system 1)	(211) x	0.216	=	465.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	432.24	(264)
Space and water heating	(261) + (262) + (263) + (264) =			897.32	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	152.53	(267)
Electricity for lighting	(232) x	0.519	=	145.87	(268)
Total CO2, kg/year	sum	of (265)(271) =		1195.72	(272)
CO2 emissions per m <sup>2</sup>	(272	2) ÷ (4) =		21.62	(273)
El rating (section 14)				84	(274)

#### 13a. Primary Energy

	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2626.87 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	2441.35 (264)
Space and water heating	(261) + (262) + (263) + (264) =		5068.21 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	902.25 (267)
Electricity for lighting	(232) x	0 =	862.85 (268)
'Total Primary Energy	sum	n of (265)(271) =	6833.32 (272)
Primary energy kWh/m²/year	(272	2) ÷ (4) =	123.57 (273)

User Details: Adam Ritchie **Assessor Name:** Stroma Number: STRO019516 Stroma FSAP 2012 **Software Version:** Version: 1.0.4.25 **Software Name:** Property Address: Flat Type A Energy Eff only Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) Ground floor 55.3 (1a) x (2a) = 170.88 (3a) 3.09 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)55.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =170.88 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a) 0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div$  (5) = (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) O Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)2.5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.12 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)0  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)1  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr Mav Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effect		_	rate for t	he appli	cable ca	se	•	•	•	•			(00-)
If exhaust air he			andiv N (2	3h) - (23s	a) × Fmv (e	aguation (	N5N othe	rwisa (23h	) <i>- (</i> 23a)			0.5	(23a)
If balanced with									) = (25a)			0.5	(23b)
a) If balanced		-	-	_					2h)m + (	23h) <b>v</b> [1	 1 <i>– (23c</i> )	75.65 ± 1001	(23c)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(24a)
b) If balanced	d mecha	nical ve	ntilation	without	heat rec	coverv (ľ	л ИV) (24b	)m = (22	2b)m + (2	1 23b)		l	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	ouse extr	ract ven	tilation o	or positiv	re input v	ventilatio	on from o	outside				ı	
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	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change r	ate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)				•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losses	s and hea	at loss p	paramete	er:									
ELEMENT	Gross area (		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Boole Type T					2.13	X	1	= [	2.13				(26)
Doors Type 2					2.13 0.96	=	1	= [	2.13 0.96				(26) (26)
						x		=					, ,
Doors Type 2					0.96	x	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x	1 1	= [ = [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2				0.96 0.96 0.7 0.2	x x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.2 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3			7 [	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4	7	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5	_	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Floor Walls Type1	2 3 4 5				0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Floor Walls Type1 Walls Type2	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ (0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ (0.11 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

* for windov ** include th							ated using	formula 1	/[(1/U-valu	e)+0.04] á	as given in	paragraph	1 3.2	
Fabric he	eat loss	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat capa	acity C	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Thermal	mass p	parame	ter (TMF	c = Cm -	- TFA) ir	n kJ/m²K			Indicat	tive Value	: Low		100	(35)
For design a					constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal I	bridge	s : S (L	x Y) cal	culated	using Ap	pendix I	<						20.32	(36)
if details of	thermal	l bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabr	ric hea	at loss							(33) +	(36) =			47.64	(37)
Ventilatio	n heat	t loss ca	alculated	monthl	у	•			(38)m	= 0.33 × (	25)m x (5)	•	•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 1	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tran	nsfer co	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 6	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
	<u> </u>					•			,	Average =	Sum(39) <sub>1</sub> .	12 /12=	62.22	(39)
Heat loss	<del></del>	<u> </u>		m²K					(40)m	= (39)m ÷	(4)		Ī	
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14		_
Number o	of days	c in mor	oth (Tab	lo 1a)					A	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.13	(40)
			· ·	<del>-                                    </del>	Mov	lun	lul	۸۰۰۵	Con	Oct	Nov	Doo	]	
(41)m=	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov	Dec 31		(41)
	ા ા													(41)
(41)111-		20	01	30	01		<u> </u>	31	30	31	30	31		
4. Water	r heati	ng ener	gy requi	irement:							1.	kWh/ye	ear:	(42)
4. Water	r heati	ng ener	gy requi	irement:				)2)] + 0.0			1.	kWh/ye	ear:	
4. Water Assumed if TFA: if TFA: Annual av Reduce the	r heating of the second of the	pancy, N , N = 1 , N = 1 e hot wa	gy requi N + 1.76 x ater usag hot water	irement:  [1 - exp ge in litre usage by	(-0.0003 es per da 5% if the a	349 x (TF ay Vd,av lwelling is	FA -13.9 erage = designed t	)2)] + 0.0 (25 x N)	0013 x (1 + 36	ΓFA -13.	9) 78	kWh/ye	ear:	
4. Water Assumed if TFA: if TFA: Annual av Reduce the not more th	r heating of the state of the s	pancy, I pancy, I l, N = 1 l, N = 1 e hot was l average litres per p	gy requi N + 1.76 x ater usag hot water person per	irement:  [1 - exp  ge in litre usage by r day (all w	o(-0.0003 es per da 5% if the d vater use, l	349 x (TF ay Vd,av lwelling is not and co	FA -13.9 erage = designed to	)2)] + 0.0 (25 x N) to achieve	0013 x (T + 36 a water us	ΓFA -13. se target o	1. 9) 78	kWh/yd	ear:	(42)
4. Water Assumed if TFA: if TFA: Annual av Reduce the not more th	r heating of the state of the s	pancy, I pancy, I l, N = 1 l, N = 1 e hot wa l average litres per p	rgy requi N + 1.76 x ater usag hot water person per Mar	irement:  [1 - exp ge in litre usage by r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av lwelling is hot and co	FA -13.9 erage = designed i	)2)] + 0.0 (25 x N) to achieve	0013 x (1 + 36	ΓFA -13.	9) 78	kWh/ye	ear:	(42)
4. Water  Assumed  if TFA :  if TFA :  Annual av  Reduce the  not more the	r heating of the second of the	pancy, I pancy, I N = 1 hot was average litres per partitions	gy requi N + 1.76 x ater usag hot water person per Mar day for ea	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av welling is not and co Jun ctor from	erage = designed if	)2)] + 0.0 (25 x N) to achieve Aug (43)	0013 x (1 + 36 a water us Sep	ΓFA -13. se target o	1. 9) 78 Nov	kWh/ye	ear:	(42)
4. Water  Assumed  if TFA :  if TFA :  Annual av  Reduce the  not more the	r heating of the state of the s	pancy, I pancy, I l, N = 1 l, N = 1 e hot wa l average litres per p	rgy requi N + 1.76 x ater usag hot water person per Mar	irement:  [1 - exp ge in litre usage by r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av lwelling is hot and co	FA -13.9 erage = designed i	)2)] + 0.0 (25 x N) to achieve	0013 x (7 + 36 a water us Sep	ΓFA -13. se target o Oct 79.61	9) 78 Nov 82.73	kWh/yo		(42) (43)
4. Water  Assumed  if TFA :  if TFA :  Annual av  Reduce the  not more the	r heating of the state of the s	pancy, N = 1 y, N = 1 e hot was average litres per per litres per 82.73	gy requive the second of the s	irement:  [1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa:	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld) Jul Table 1c x 70.24	(25 x N) to achieve  Aug (43) 73.36	0013 x (7 + 36 a water us Sep	FFA -13.  se target α  Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	kWh/yo	ear:	(42)
4. Water  Assumed if TFA if TFA if TFA if Annual average the not more the hot water u  (44)m= 8  Energy con	r heating of the state of the s	pancy, N = 1 y, N = 1 e hot was average litres per per litres per 82.73	gy requive the second of the s	irement:  [1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa:	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld) Jul Table 1c x 70.24	(25 x N) to achieve  Aug (43) 73.36	0013 x (7 + 36 a water us Sep	FFA -13.  se target α  Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	kWh/yo		(42) (43)
4. Water  Assumed if TFA if TFA if TFA if Annual average and the not more the not more than (44)m= 8  Energy con (45)m= 12	r heating of the state of the s	pancy, N = 1 I, N = 1 Ie hot was average litres per per litres per 82.73  hot water 111.35	gy requive the second of the s	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the avater use, I  May Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	erage = designed to ld)  Jul Table 1c x  70.24  m x nm x E  76.86	(25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	0013 x (7 + 36 a water us Sep 76.49 6 kWh/mon 89.25	Oct  79.61  Fotal = Su th (see Ta 104.01	1. 9) 78 Nov 82.73 m(44)12 = ables 1b, 1	kWh/ye 85 .05 Dec 85.85 = c, 1d)		(42) (43)
4. Water  Assumed if TFA: if TFA: Annual average and the second (44)m= 8  Energy con (45)m= 12  If instantance	r heating of the results of the resu	pancy, N = 1 I, N = 1 Ie hot was I average litres per p Itres per 82.73 hot water 111.35	rgy required to the second sec	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me 100.17	es per da 5% if the or vater use, I  May $Vd, m = fa$ $73.36$ $96.12$ $0$ hot water	349 x (TF ay Vd,av Iwelling is not and co Jun ctor from 1 70.24 190 x Vd,r 82.94	erage = designed to ld)  Jul Table 1c x  70.24  n x nm x E  76.86  enter 0 in	(25 x N) to achieve  Aug (43) 73.36  07m / 3600 88.2  boxes (46)	0013 x (7 + 36 a water us Sep 76.49 kWh/mon 89.25	Oct  79.61  Fotal = Su  104.01  Fotal = Su	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> =	kWh/ye 85 .05 Dec 85.85 = c, 1d)	936.55	(42) (43) (44) (45)
4. Water  Assumed if TFA if TF	r heating of the course of the cours was a second of the cours was a s	pancy, N = 1 I, N = 1 Ie hot was average litres per per 111.35 Interpretation of the second of the s	gy requive the second of the s	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the avater use, I  May Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	erage = designed to ld)  Jul Table 1c x  70.24  m x nm x E  76.86	(25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	0013 x (7 + 36 a water us Sep 76.49 6 kWh/mon 89.25	Oct  79.61  Fotal = Su th (see Ta 104.01	1. 9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54	kWh/ye 85 .05 Dec 85.85 = c, 1d)	936.55	(42) (43)
4. Water  Assumed if TFA if TFA if TFA if TFA if Annual average and if TFA if T	r heating of the state of the s	pancy, N = 1 l, N = 1 e hot way average litres per p litres per 82.73 hot water 111.35 ater heatin 16.7	gy requivalent of the second o	irement:  [1 - exp ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17	of (-0.0003)  es per da 5% if the of	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24 190 x Vd,r 82.94	erage = designed to ld)  Jul Table 1c x  70.24  76.86  enter 0 in  11.53	(25 x N) to achieve  Aug (43)  73.36  07m / 3600  88.2  boxes (46)  13.23	0013 x (7 + 36 a water us Sep 76.49 89.25 0 to (61) 13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	kWh/yc 85 .05 Dec 85.85 = c, 1d) 123.3	936.55	(42) (43) (44) (45) (46)
4. Water  Assumed if TFA if TF	r heating of the course of the cours was a second of the cours was a s	pancy, N = 1 I, N = 1 Ie hot was I average litres per p  Rebuiltres per  82.73  hot water  111.35  ater heatin  16.7  loss: Ie (litres)	gy requivalent of the second o	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me  100.17  for use (no	of (-0.0003)  es per da 5% if the of vater use, I  May Vd, m = far  73.36  onthly = 4.  96.12  o hot water 14.42  olar or W	349 x (TF ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44	erage = designed to ld)  Jul Table 1c x  70.24  76.86  enter 0 in  11.53	(25 x N) to achieve  Aug (43)  73.36  07m / 3600  88.2  boxes (46)  13.23  within sa	0013 x (7 + 36 a water us Sep 76.49 89.25 0 to (61) 13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	kWh/ye 85 .05 Dec 85.85 = c, 1d)	936.55	(42) (43) (44) (45)
4. Water  Assumed if TFA if TFA if TFA if TFA if Annual and Reduce the not more the not more the not more than 12 and 14	r heating of the control of the cont	pancy, N = 1 l, N = 1 e hot was laverage litres per p  Reb litres per  82.73 hot water  111.35 ater heatin 16.7 loss: e (litres) eating a stored	gy requivalent of the second o	irement:  [1 - exp ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17  for use (no	es per da 5% if the of the following the factor of the fac	349 x (TR ay Vd,av Iwelling is that and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS nter 110	erage = designed to ld)  Jul Table 1c x  70.24  76.86  enter 0 in  11.53  storage	(25 x N) to achieve  Aug (43)  73.36  07m / 3600  88.2  boxes (46)  13.23  within sa (47)	0013 x (7 + 36 a water us Sep 76.49 76.49 89.25 0 to (61) 13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	kWh/yc 85 .05 Dec 85.85 = c, 1d) 123.3	936.55	(42) (43) (44) (45) (46)
4. Water  Assumed if TFA if TF	r heating of the course of the cours was a second of the course	pancy, N = 1 l, N = 1 le hot was laverage litres per p  Rebuiltes per  82.73  hot water  111.35  ater heatin  16.7  loss: le (litres) leating a stored loss:	gy requivalent of the state of	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me  100.17  for use (no  15.03  and any se ank in dw er (this in	es per da 5% if the a vater use, I  May  Vd,m = far  73.36  onthly = 4.  96.12  old hot water  14.42  old or Water  velling, e	349 x (TF ay Vd,av (welling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS nter 110 nstantar	erage = designed in ld)  Jul Table 1c x  70.24  76.86  enter 0 in 11.53  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  73.36  07m / 3600  88.2  boxes (46)  13.23  within sa (47)	0013 x (7 + 36 a water us Sep 76.49 76.49 89.25 0 to (61) 13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	kWh/yo 85 .05 Dec 85.85 c, 1d) 123.3 18.49	936.55	(42) (43) (44) (45) (46)
4. Water  Assumed if TFA if TFA if TFA if TFA if Annual and Reduce the not more the not more the not more than 12 and 14	r heating of the course of the course was a second of the course of the	pancy, N = 1 l, N = 1 le hot was laverage litres per p  82.73  hot water  111.35  ater heatin  16.7  loss: le (litres) leating a stored loss: lurer's de	rgy required to the seclared line water to the s	irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me 100.17  for use (no 15.03  and any so ank in dw er (this ir	es per da 5% if the a vater use, I  May  Vd,m = far  73.36  onthly = 4.  96.12  old hot water  14.42  old or Water  velling, e	349 x (TF ay Vd,av (welling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS nter 110 nstantar	erage = designed in ld)  Jul Table 1c x  70.24  76.86  enter 0 in 11.53  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  73.36  07m / 3600  88.2  boxes (46)  13.23  within sa (47)	0013 x (7 + 36 a water us Sep 76.49 76.49 89.25 0 to (61) 13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	kWh/yc 85 .05 Dec 85.85 = c, 1d) 123.3	936.55	(42) (43) (44) (45) (46) (47)

											_	
Energy lost from water	•					(48) x (49)	) =			0		(50)
<ul><li>b) If manufacturer's of Hot water storage los</li></ul>		-								0	I	(51)
If community heating			IC 2 (IVV	11/11(10/00	·y /					U	İ	(31)
Volume factor from Ta										0		(52)
Temperature factor from	om Table	2b								0		(53)
Energy lost from water	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (54) in (	55)									0		(55)
Water storage loss ca	lculated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicate	ed solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (a	nnual) fro	m Table	- 3	•	•			•		0		(58)
Primary circuit loss ca	•			59)m = (	(58) ÷ 36	65 × (41)	m				1	
(modified by factor			,	•	. ,	, ,		r thermo	stat)			
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m	•				1	
(61)m= 43.75 38.08	40.57	37.72	37.39	34.64	35.79	37.39	37.72	40.57	40.8	43.75		(61)
Total heat required fo	r water h	eating ca	alculated	l for eac	h month	(62)m =	. 0 85 × (	/45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 171.06 149.43	1	137.89	133.51	117.58	112.65	125.58	126.97	144.58	154.34	167.05		(62)
Solar DHW input calculated		<u> </u>		<u> </u>	<u> </u>	<u> </u>		<u> </u>		<u> </u>		(- /
(add additional lines in								Continua	on to wate	i ricating)		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from water he											ł	, ,
(64)m= 171.06 149.43	T	137.89	133.51	117.58	112.65	125.58	126.97	144.58	154.34	167.05	1	
(0.1)	1		100.01				out from wa	<u> </u>		L	1696.11	(64)
Heat gains from wate	r heating	k\/\/h/m/	onth 0.2	5 ′ [0 85	v (45)m							٦, ,
(65)m= 53.27 46.54	48.35	42.74	41.31	36.24	34.5	38.67	39.11	44.73	47.95	51.93	]	(65)
		<u> </u>		<u> </u>	<u> </u>		<u> </u>	<u> </u>		<u> </u>		(00)
include (57)m in ca		. ,		yımder i	s in the d	aweiling	or not w	ater is ir	om com	munity n	eating	
5. Internal gains (se	e Table 5	and 5a	):									
Metabolic gains (Tabl										I _	I	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(22)
(66)m= 92.31 92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31		(66)
Lighting gains (calcula	ated in Ap	<del></del>	<del></del>		<del></del>	lso see					1	
(67)m= 15.91 14.14	11.5	8.7	6.51	5.49	5.93	7.71	10.35	13.15	15.34	16.36		(67)
Appliances gains (cal	culated ir	Append	dix L, eq	uation L		3a), also	see Tal	ble 5			•	
(68)m= 160.96 162.63	158.42	149.46	138.15	127.52	120.42	118.75	122.95	131.92	143.23	153.86		(68)
Cooking gains (calcul	ated in A	ppendix	L, equat	ion L15	or L15a)	), also se	ee Table	5			_	
(69)m= 32.23 32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23		(69)
Pumps and fans gain	s (Table s	ōa)										
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporati	on (nega	tive valu	es) (Tab	le 5)								
(71)m= -73.85 -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85		(71)
<u> </u>	1	1		1	I	·		I		I	1	

Water heating	g gains (T	able 5)												
(72)m= 71.6	69.26	64.98	59.36	55.52	5	0.33	46.38	51.	98 54.31	60.12	66.6	69.8		(72)
Total intern	al gains =				•	(66)	m + (67)m	+ (68	3)m + (69)m + (	70)m +	(71)m + (72)	m	•	
(73)m= 302.1	6 299.72	288.59	271.21	253.87	23	37.03	226.42	232	.13 241.31	258.8	7 278.86	293.71	]	(73)
6. Solar gai	ns:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and	associ	iated equa	tions	to convert to the	e applic	able orientat	ion.		
Orientation:		actor	Area			Flu			_ g		FF		Gains	
	Table 6d		m²			Tal	ole 6a		Table 6b		Table 6c		(W)	
Northeast 0.93	0.77	X	0.8	36	X	1	1.28	X	0.4	X	0.7	=	1.88	(75)
Northeast 0.93	0.77	X	0.3	32	X	1	1.28	X	0.4	X	0.7	=	0.7	(75)
Northeast 0.9	0.77	X	3.0	36	x	2	2.97	x	0.4	X	0.7	=	3.83	(75)
Northeast 0.9	0.77	x	0.3	32	X	2	2.97	X	0.4	X	0.7	=	1.43	(75)
Northeast 0.9	0.77	X	3.0	36	x	4	1.38	x	0.4	X	0.7	=	6.91	(75)
Northeast 0.9	0.77	Х	0.3	32	X	4	1.38	x	0.4	X	0.7	=	2.57	(75)
Northeast 0.9	0.77	X	3.0	36	X	6	7.96	x	0.4	X	0.7	=	11.34	(75)
Northeast 0.9	0.77	X	0.3	32	x	6	7.96	x	0.4	X	0.7	=	4.22	(75)
Northeast 0.9	0.77	X	0.0	36	x	9	1.35	x	0.4	×	0.7	=	15.24	(75)
Northeast 0.9	0.77	Х	0.3	32	x	9	1.35	x	0.4	x	0.7	=	5.67	(75)
Northeast 0.9	0.77	X	0.8	36	x	9	7.38	x	0.4	x	0.7	=	16.25	(75)
Northeast 0.9	0.77	x	0.3	32	x	9	7.38	x	0.4	×	0.7	_ =	6.05	(75)
Northeast 0.9	0.77	x	0.0	36	x	(	91.1	x	0.4	×	0.7	_ =	15.2	(75)
Northeast 0.9	0.77	X	0.3	32	х	(	91.1	x	0.4	×	0.7	_ =	5.66	(75)
Northeast 0.9	0.77	Х	0.0	36	x	7	2.63	x	0.4	×	0.7	=	12.12	(75)
Northeast 0.9	0.77	x	0.3	32	x	7	2.63	x	0.4	×	0.7	=	4.51	(75)
Northeast 0.9	0.77	х	0.0	36	x	5	0.42	x	0.4	×	0.7	=	8.41	(75)
Northeast 0.9	0.77	Х	0.3	32	x	5	0.42	х	0.4	×	0.7	=	3.13	(75)
Northeast 0.9	0.77	Х	0.0	36	x	2	8.07	x	0.4	×	0.7	=	4.68	(75)
Northeast 0.9	0.77	Х	0.3	32	x	2	8.07	x	0.4	×	0.7	=	1.74	(75)
Northeast 0.9	0.77	Х	0.0	36	x	,	14.2	х	0.4	×	0.7	=	2.37	(75)
Northeast 0.9	0.77	Х	0.3	32	x		14.2	x	0.4	×	0.7	=	0.88	(75)
Northeast 0.9	0.77	Х	0.0	36	x	(	9.21	x	0.4	×	0.7	=	1.54	(75)
Northeast 0.9	0.77	x	0.3	32	x	(	9.21	x	0.4	×	0.7	=	0.57	(75)
Southwest <sub>0.9</sub>	0.77	Х	2.0	)1	x	3	6.79		0.4	×	0.7	=	14.35	(79)
Southwest <sub>0.9</sub>	0.77	х	2.0	)1	х	3	6.79		0.4	×	0.7		14.35	(79)
Southwest <sub>0.9</sub>	0.77	X	1.4	16	x	3	6.79		0.4	×	0.7	_ =	10.42	(79)
Southwest <sub>0.9</sub>	0.77	х	2.0	)1	x	6	2.67		0.4	×	0.7	=	24.44	(79)
Southwest <sub>0.9</sub>		X	2.0	)1	x	6	2.67		0.4	×	0.7	<del>-</del> -	24.44	(79)
Southwest <sub>0.9</sub>		X	1.4	16	x		2.67		0.4	×	0.7	<del>=</del> -	17.76	(79)
Southwest <sub>0.9</sub>		X	2.0		x		35.75		0.4	×	0.7	= =	33.45	(79)
Southwest <sub>0.9</sub>	0.77	x	2.0		x	8	35.75		0.4	×	0.7		33.45	(79)

Southwar	eto o. F					,			1 !		0.1	1					7(70)
Southwes	<u> </u>	0.77	X	1.4		X		5.75	] 1		0.4	X	0.7	=	=	24.29	(79)
Southwes	<u> </u>	0.77	X	2.0		X		06.25	] ]		0.4	×	0.7	_	=	41.44	(79)
Southwes	<u> </u>	0.77	X	2.0		X		06.25	] 1		0.4	×	0.7	=	=	41.44	(79)
Southwes	<u> </u>	0.77	×	1.4		X		06.25	] i		0.4	→       ×	0.7	_	=	30.1	(79)
Southwes	<u> </u>	0.77	X	2.0		X		19.01	] 1		0.4	×	0.7	_	=	46.42	(79)
Southwes	<u> </u>	0.77	X	2.0	1	X	1	19.01			0.4	×	0.7	_	=	46.42	(79)
Southwes	<u> </u>	0.77	X	1.4	6	X	1	19.01			0.4	×	0.7	_	=	33.72	(79)
Southwes	<u> </u>	0.77	Х	2.0	1	X	1	18.15			0.4	X	0.7		=	46.08	(79)
Southwes	<u> </u>	0.77	X	2.0	1	X	1	18.15			0.4	X	0.7		=	46.08	(79)
Southwes	<u> </u>	0.77	X	1.4	6	X	1	18.15			0.4	X	0.7		=	33.47	(79)
Southwes	느	0.77	X	2.0	1	X	1	13.91			0.4	X	0.7		=	44.43	(79)
Southwes	<u> </u>	0.77	X	2.0	1	X	1	13.91			0.4	X	0.7		=	44.43	(79)
Southwes	St <sub>0.9x</sub>	0.77	X	1.4	6	X	1	13.91			0.4	X	0.7		=	32.27	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39			0.4	X	0.7		=	40.71	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39			0.4	X	0.7		=	40.71	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	1.4	6	X	1	04.39			0.4	X	0.7		=	29.57	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85			0.4	X	0.7		=	36.21	(79)
Southwes	St <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85			0.4	X	0.7		=	36.21	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	1.4	6	x	g	2.85			0.4	X	0.7		=	26.3	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	6	9.27			0.4	X	0.7		=	27.02	(79)
Southwes	st <sub>0.9x</sub>	0.77	х	2.0	1	X	6	9.27			0.4	x	0.7		=	27.02	(79)
Southwes	st <sub>0.9x</sub>	0.77	x	1.4	6	X	6	9.27			0.4	×	0.7		=	19.62	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07			0.4	x	0.7		=	17.19	(79)
Southwes	st <sub>0.9x</sub>	0.77	x	2.0	1	x	4	4.07			0.4	×	0.7		=	17.19	(79)
Southwes	st <sub>0.9x</sub>	0.77	x	1.4	6	X	4	4.07	j		0.4	×	0.7	一	=	12.49	(79)
Southwes	st <sub>0.9x</sub>	0.77	х	2.0	1	x	3	1.49	j		0.4	×	0.7		=	12.28	(79)
Southwes	st <sub>0.9x</sub>	0.77	X	2.0	1	X	3	1.49			0.4	×	0.7		=	12.28	(79)
Southwes	st <sub>0.9x</sub>	0.77	x	1.4	6	x	3	1.49			0.4	= x	0.7		=	8.92	(79)
Solar ga	ins in v	vatts, cal	culated	for each	n month	)			(83)m	ı = Sur	m(74)m .	(82)m					
(83)m=	41.71	71.9	100.66	128.54	147.46	14	47.93	141.98	127	.63	110.28	80.08	50.11	35.	59		(83)
Total gai	ins – in	ternal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts			-		_				
(84)m= 3	343.87	371.62	389.25	399.75	401.33	38	84.97	368.4	359	.76	351.59	338.9	328.97	329	.3		(84)
7. Mea	n interr	nal tempe	erature (	(heating	seasor	n)											
Tempe	rature (	during he	eating p	eriods in	the livi	ng	area	from Tal	ole 9,	, Th1	(°C)					21	(85)
Utilisati	on fact	or for ga	ins for li	iving are	a, h1,m	า (ร	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug	Sep	Oct	Nov	D	ec		
(86)m=	0.96	0.95	0.94	0.9	0.84	(	0.73	0.61	0.6	33	0.79	0.9	0.95	0.9	7		(86)
— Mean ir	nternal	tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able	9c)		•	•		•	
	18.64	18.85	19.21	19.72	20.22	_	0.64	20.85	20.		20.52	19.89	19.19	18.6	61		(87)
` '			!						<u> </u>				_1	1		I	
	19.96	during he	19.97	19.98	19.98	T	elling 20	20	20	-	19.99	19.98	19.98	19.9	97		(88)
(55)	. 5.55			. 5.50							. 5.55	70.00	1 .0.00	1		I	(/

Utilisatio	on factor fo	r gains for	rest of d	welling	h2 m (se	ee Table	9a)						
	0.96 0.9	<del>-</del>	0.88	0.81	0.67	0.5	0.53	0.74	0.88	0.94	0.96		(89)
∟ Mean in	ternal tem	erature ir	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	r 7 in Tabl	le 9c)	<u>I</u>	<u>I</u>	ı	
	17.81 18.0		18.88	19.36	19.76	19.92	19.91	19.65	19.06	18.37	17.79		(90)
				•		•		f	fLA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean in	ternal tem	perature (f	or the wh	nole dwel	lling) = f	I A 🗴 T1	+ (1 – fl	A) x T2					
	18.23 18.4	<del></del>	19.31	19.8	20.21	20.39	20.37	20.09	19.48	18.79	18.2		(92)
	djustment	o the mea	n interna	l temper	ture fro	m Table	4e, whe	ere appro	u opriate	l		I	
· · · · -	18.23 18.4	_	19.31	19.8	20.21	20.39	20.37	20.09	19.48	18.79	18.2		(93)
8. Space	e heating i	equiremer	nt										
	the mear		•		ed at st	ep 11 of	Table 9	o, so tha	nt Ti,m=(	76)m an	d re-calc	:ulate	
	Jan Fe	$\overline{}$	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	on factor fo			11107		1 00	7 10.9					I	
	0.95 0.9		0.87	0.8	0.68	0.55	0.57	0.74	0.87	0.93	0.95		(94)
Useful g	gains, hmG	m , W = (9	94)m x (8	4)m								,	
(95)m= 32	25.47 346.	79 354.69	348.21	321.81	263.56	201.51	206.58	261.67	295.65	305.64	313.3		(95)
Monthly	average e	xternal ter	nperature	e from Ta	able 8	•		•	•	•			
(96)m=	4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate for	nean inter	nal temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m= 88	84.68 857.	13 776.78	648.03	502.68	343.09	232.08	242.47	368.88	551.48	729.67	879.22		(97)
Space h	neating red	uirement f	or each r	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m	1	İ	
(98)m = 4	16.05 342.	95 314.04	215.87	134.57	0	0	0	0	190.33	305.3	421.04		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	2340.16	(98)
Space h	neating req	uirement i	n kWh/m	²/year								42.32	(99)
9a. Energ	gy requirer	nents – Ind	dividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space h	_												_
Fraction	of space	neat from	secondar	y/supple	mentary	system						0	(201)
Fraction	of space	neat from i	main sys	tem(s)			(202) = 1 -	- (201) =				1	(202)
Fraction	of total he	ating from	main sy	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficienc	cy of main	space hea	ting syst	em 1								90.3	(206)
Efficienc	cy of secor	dary/supp	lementar	y heating	g systen	n, %						0	(208)
	Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	neating rec	uirement (	calculate	d above)	)				-				
4	16.05 342.	95 314.04	215.87	134.57	0	0	0	0	190.33	305.3	421.04		
(211)m =	{[(98)m x	(204)] } x	100 ÷ (20	06)									(211)
				149.03	0	0	0	0	210.78	338.1	466.27		
46	60.75 379.	79 347.77	239.06	149.03							100.27	1	
46	60.75 379.	79 347.77	239.06	149.03		!		l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>		2591.54	(211)
	60.75 379. neating fue	ļ	!			l		l I (kWh/yea		L 211) <sub>15,1012</sub>		2591.54	(211)
Space h	ļ	(seconda	ry), kWh					l (kWh/yea		211) <sub>15,1012</sub>		2591.54	(211)
Space h	neating fue	(seconda	ry), kWh		0	0	Tota	0	1 ar) =Sum(2 0	0	0	2591.54	_
Space h = {[(98)m	neating fue	(seconda x 100 ÷ (2	ry), kWh	/month		0	Tota	0	L ar) =Sum(2	0	0	2591.54	(211)

Water heating								
Output from water heater (calculated above)  171.06	117.58 112.6	5 125.58	126.97	144.58	154.34	167.05	]	
Efficiency of water heater			1 .20.0.	1	1 .0	101.00	81	(216)
(217)m= 87.38 87.26 86.99 86.43 85.42	81 81	81	81	86.04	86.95	87.45		(217)
Fuel for water heating, kWh/month	ļ l						J	
$(219)$ m = $(64)$ m x $100 \div (217)$ m (219)m= $195.77$ $171.24$ $178.72$ $159.54$ $156.3$	145.17 139.0	8 155.04	156.75	168.05	177.51	191.02	1	
(219)111= 193.77 171.24 176.72 139.34 130.3	145.17 139.0		al = Sum(2)		177.51	191.02	1994.19	(219)
Annual totals			(		Wh/yea	r	kWh/year	_(219)
Space heating fuel used, main system 1					y oa.		2591.54	7
Water heating fuel used							1994.19	Ī
Electricity for pumps, fans and electric keep-ho	t							_
mechanical ventilation - balanced, extract or p		om outsid	e			218.89	1	(230a)
central heating pump:						30	<u>.</u> ]	(230c)
boiler with a fan-assisted flue						45	]	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =	:		293.89	7(231)
•			. 0. (2004)	(2009)				``′
Electricity for lighting							281.06	(232)
12a. CO2 emissions – Individual heating syste	ems including i	nicro-CHF	,					
	<b>Energy</b> kWh/yea	ır		Emiss kg CO	i <b>on fac</b> 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	559.77	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	430.75	(264)
Space and water heating	(261) + (26.	2) + (263) +	(264) =				990.52	(265)
Electricity for pumps, fans and electric keep-ho	t (231) x			0.5	19	=	152.53	(267)
Electricity for lighting	(232) x			0.5	19	=	145.87	(268)
Total CO2, kg/year			sum c	of (265)(2	271) =		1288.92	(272)

 $(272) \div (4) =$ 

**Dwelling CO2 Emission Rate** 

El rating (section 14)

(273)

(274)

23.31

83

		User De	etails:						
Assessor Name:	Adam Ritchie			a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012			are Vei				n: 1.0.4.25	
		Property A	Address	Flat Ty	pe A En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		Area	<u> </u>	(4-)		ight(m)	7(0-)	Volume(m³	_
				(1a) x	3	3.09	(2a) =	170.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 5	5.3	(4)					_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:									
	main seconda heating heating	ary o	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	X	10 =	20	(7a)
Number of passive vents	;			Ē	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x	40 =	0	(7c)
_				_					
							Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$	(7a)+(7b)+(7	(c) =	Γ	20		÷ (5) =	0.12	(8)
	peen carried out or is intended, proce	ed to (17), o	therwise o	continue fr	om (9) to	(16)	ĺ		7.00
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(0)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame of	or 0.35 for	masoni	v constr	uction	[(3)	1]X0.1 =	0	(11)
	resent, use the value corresponding			•					` /
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (coalo	d) also	ontor O					7(40)
If no draught lobby, en	,	J. I (Seale	u), eise	enter o				0	(12)
• •	s and doors draught stripped							0	(14)
Window infiltration		(	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	ur per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] +$	(8), otherwis	se (18) = (	16)				0.37	(18)
	es if a pressurisation test has been do	one or a degi	ree air pe	rmeability	is being u	sed	1		<b>-</b>
Number of sides sheltere Shelter factor	ed	(	(20) = 1 -	[0.0 <b>75</b> x (1	19)1 =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18		/ ]			1	(20)
Infiltration rate modified f	_	`	(= -) ()	(==)				0.37	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 ' 1 ' 1	1 1		•		1		ı	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
	2)	1				•		•	
Wind Factor (22a)m = (23a)m $= (27a)$ m $= ($	<del></del>	0.05	0.02	4	1.00	1 10	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltrat	tion rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
Calculate effect		•	rate for t	he appli	cable ca	se	!						
If mechanical If exhaust air hea			andiv N. (2	2h) _ (22c	) v Emy (c	auation (	VEVV othor	wico (22h	) - (222)		[	0	(23a)
If balanced with I									) = (23a)			0	
		-	-	_					26\m , /'	22h) [4	1 (220)	. 1001	(23c)
a) If balanced	o mechar	o lical ve	nulation	with nea	at recove		7R) (24a	$\frac{1)m = (22)}{0}$	20)m + (2 0	23b) <b>x</b> [	0	÷ 100j	(24a)
b) If balanced							ļ		<b>!</b>		U		(214)
(24b)m= 0	0 0	0	0	0 Without	0	overy (r	0	0	0	0	0		(24b)
c) If whole ho													(= .0)
if (22b)m				-	-				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	entilation	or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	!				
if (22b)m	= 1, ther	n (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air c	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				ı	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losses	and hea	t loss p	paramete	er:									
ELEMENT	Gross area (r		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Doors Type I					2.13	X	1	= [	2.13				(26)
Doors Type 1 Doors Type 2					2.13 0.96	x x	1	= [	2.13 0.96				(26) (26)
						=		=					` '
Doors Type 2					0.96	×	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x	1 1	= [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 2	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x 1	1 1 1 1 /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 3	2 3				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type 9 Windows Type 9 Windows Type 9	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type 1	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 1.94 0.42 7.189 2.25 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 8	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 8 Floor Walls Type 1 Walls Type 2 Walls Type 3 Walls Type 4	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Walls Type 9	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99 3.71				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)

\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ (33)33.3 Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)6083 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)6.77 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)40.08 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar Apr May Jun Jul Oct Nov Dec Aug Sen 32.79 (38)34.13 33.89 31.62 31.62 31.44 (38)m =34.37 32.58 31.99 32.58 33 33.44 Heat transfer coefficient, W/K (39)m = (37) + (38)m 74.45 74.21 73.97 72.87 72 66 71 7 71.7 71.52 72.07 72.66 73.08 73 52 (39)m =(39)Average =  $Sum(39)_{1...12}/12=$ 72.87 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.35 1.34 1.34 1.31 1.3 1.3 1.29 1.3 1.31 1.32 1.33 (40)m =(40)Average =  $Sum(40)_{1...12}/12=$ 1.32 Number of days in month (Table 1a) Feb Mar May Jan Jun .lul Aug Sep Oct Nov Dec Apr 31 30 (41)(41)m =31 4. Water heating energy requirement: kWh/vear: Assumed occupancy, N 1.85 (42)if TFA > 13.9, N = 1 + 1.76 x [1 -  $exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 78.05 (43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Oct Jan Feb Mar Apr May Jun Jul Aug Sep Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =85.85 82.73 79.61 76.49 73.36 70.24 70.24 73.36 76.49 79.61 82.73 85.85 (44)Total =  $Sum(44)_{1...12}$  = 936.55 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m =127.31 111.35 114.9 100.17 96.12 82.94 76.86 88.2 89.25 104.01 113.54 123.3 1227.97 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 17.24 (46)(46)m =19.1 16.7 15.03 14.42 12.44 11.53 13.23 13.39 15.6 17.03 18.49 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)0 Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year			(48) x (49)	=		(	0		(50)
b) If manufacturer's declared cylinder los								· 	
Hot water storage loss factor from Table 2 If community heating see section 4.3	z (Kvvn/iitre/day	/)				(	0		(51)
Volume factor from Table 2a							0		(52)
Temperature factor from Table 2b							0		(53)
Energy lost from water storage, kWh/year		(47) x (51)	x (52) x (	53) =	0			(54)	
Enter (50) or (54) in (55)						0			(55)
Water storage loss calculated for each mo	onth		((56)m = (	55) × (41)r	n				
(56)m= 0 0 0 0	0 0	0	0	0	0	0	0		(56)
If cylinder contains dedicated solar storage, (57)m =	= (56)m x [(50) – (H	111)] ÷ (50	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0 0 0 0	0 0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) from Table 3							0		(58)
Primary circuit loss calculated for each mo		58) ÷ 36	5 × (41)	m				l	, ,
(modified by factor from Table H5 if the	, , ,	•	, ,		thermo	stat)			
(59)m= 0 0 0 0	0 0	0	0	0	0	0	0		(59)
Combi loss calculated for each month (61	$1)m = (60) \div 365$	5 × (41)	ım						
	37.39 34.64	35.79	37.39	37.72	40.57	40.8	43.75		(61)
Total heat required for water heating calcu	ulated for each	month	(62)m =	0 85 x (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
<del></del>		112.65	125.58	126.97	144.58	154.34	167.05		(62)
Solar DHW input calculated using Appendix G or Ap									(- /
(add additional lines if FGHRS and/or WV		-			COMMIDUM	on to wate	i ricatirig)		
(63)m= 0 0 0 0	0 0	0	0	0	0	0	0		(63)
Output from water heater			-	-	-	-			, ,
· <del></del>	33.51 117.58	112.65	125.58	126.97	144.58	154.34	167.05		
(6.7)				out from wa				1696.11	(64)
Heat gains from water heating, kWh/mont	th 0 25 ′ [0 85 s	v (15)m	·			,			J` ′
	41.31 36.24	34.5	38.67	39.11	44.73	47.95	51.93	J	(65)
include (57)m in calculation of (65)m or								ooting.	(00)
	niy ii cylinder is	in the c	aweiling	or not w	aler is ir	OIII COIII	munity n	eating	
5. Internal gains (see Table 5 and 5a):									
Metabolic gains (Table 5), Watts			_		0.1			1	
<del>                                     </del>	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
` '	92.31 92.31	92.31	92.31	92.31	92.31	92.31	92.31		(66)
Lighting gains (calculated in Appendix L,	<del></del>							l	
` '	6.51 5.49	5.93	7.71	10.35	13.15	15.34	16.36		(67)
Appliances gains (calculated in Appendix	L, equation L1	3 or L13	3a), also	see Tal	ole 5			1	
(68)m= 160.96 162.63 158.42 149.46 13	38.15 127.52	120.42	118.75	122.95	131.92	143.23	153.86		(68)
Cooking gains (calculated in Appendix L,	equation L15 o	or L15a)	, also se	e Table	5				
(69)m= 32.23 32.23 32.23 32.23 3	32.23 32.23	32.23	32.23	32.23	32.23	32.23	32.23		(69)
Pumps and fans gains (Table 5a)									
(70)m= 3 3 3 3	3 3	3	3	3	3	3	3		(70)
Losses e.g. evaporation (negative values)	) (Table 5)								
(71)m= -73.85 -73.85 -73.85 -73.85 -7	73.85 -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85		(71)

Water heat	ting gains (	Table 5)												
(72)m= 71	<del> </del>	64.98	59.36	55.52	5	0.33	46.38	51.	98 54.31	60.12	66.6	69.8	]	(72)
Total inter	nal gains :	- <del></del>		<u> </u>		(66)ı	m + (67)m	+ (68	s)m + (69)m + (	70)m +	(71)m + (72)	m	ı	
(73)m= 302	<del>_</del>		271.21	253.87	23	37.03	226.42	232	13 241.31	258.8	7 278.86	293.71	]	(73)
6. Solar g	ains:													
		l using sola	r flux from	Table 6a	and	associ	ated equa	tions	to convert to the	e applic	able orientat	ion.		
Orientation	: Access		Area			Flux			g_		FF		Gains	
	Table 6	d	m²			Tab	le 6a		Table 6b		Table 6c		(W)	
Northeast 0	.9x 0.77	7 X	0.0	36	x	1	1.28	x	0.63	x	0.7	=	2.97	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	1	1.28	x	0.63	x	0.7	=	1.1	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	2:	2.97	x	0.63	x	0.7	=	6.04	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	2:	2.97	x	0.63	x	0.7	=	2.25	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	4	1.38	x	0.63	x	0.7	=	10.88	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	4	1.38	x	0.63	x	0.7	=	4.05	(75)
Northeast 0	.9x 0.77	7 X	0.8	36	x	6	7.96	x	0.63	x	0.7	=	17.86	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	6	7.96	x	0.63	x	0.7	=	6.65	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	9	1.35	x	0.63	x	0.7	=	24.01	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	9	1.35	x	0.63	x	0.7	=	8.93	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	9	7.38	x	0.63	x	0.7	=	25.6	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	9	7.38	x	0.63	x	0.7	=	9.52	(75)
Northeast 0	.9x 0.77	7 X	0.8	36	x	9	1.1	x	0.63	x	0.7	=	23.94	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	9	1.1	x	0.63	x	0.7	=	8.91	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	х	7:	2.63	x	0.63	×	0.7	=	19.09	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	7:	2.63	x	0.63	x	0.7	_ =	7.1	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	50	0.42	x	0.63	x	0.7	=	13.25	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	50	0.42	x	0.63	x	0.7	_ =	4.93	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	2	8.07	x	0.63	x	0.7	_ =	7.38	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	28	8.07	x	0.63	x	0.7	=	2.74	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	x	1	4.2	x	0.63	x	0.7	_ =	3.73	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	1	4.2	x	0.63	x	0.7	=	1.39	(75)
Northeast 0	.9x 0.77	7 X	0.0	36	х	9	).21	x	0.63	×	0.7	<u> </u>	2.42	(75)
Northeast 0	.9x 0.77	7 X	0.3	32	x	9	).21	x	0.63	x	0.7	_ =	0.9	(75)
Southwest <sub>0</sub>	.9x 0.77	7 X	2.0	01	x	30	6.79		0.63	x	0.7		22.6	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	2.0	01	x	3(	6.79		0.63	×	0.7	<del>-</del>	22.6	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	1.4	46	х	3(	6.79		0.63	x	0.7	=	16.42	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	2.0	01	x	6:	2.67		0.63	x	0.7	=	38.5	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	2.0	01	x	62	2.67		0.63	X	0.7	=	38.5	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	1.4	16	x	6:	2.67		0.63	X	0.7	=	27.96	(79)
Southwest <sub>0</sub>			2.0	)1	x		5.75		0.63	x	0.7	=	52.68	(79)
Southwest <sub>0</sub>	.9x 0.77	7 X	2.0	01	x	8	5.75		0.63	x	0.7	=	52.68	(79)

Southwest0.9x       0.77       x       1.46       x       85.75       0.63       x       0.7       =       38.26         Southwest0.9x       0.77       x       2.01       x       106.25       0.63       x       0.7       =       65.27         Southwest0.9x       0.77       x       1.46       x       106.25       0.63       x       0.7       =       47.41         Southwest0.9x       0.77       x       2.01       x       119.01       0.63       x       0.7       =       73.11         Southwest0.9x       0.77       x       2.01       x       119.01       0.63       x       0.7       =       73.11	<ul><li>(79)</li><li>(79)</li></ul>
Southwest <sub>0.9x</sub> 0.77       x       2.01       x       106.25       0.63       x       0.7       =       65.27         Southwest <sub>0.9x</sub> 0.77       x       1.46       x       106.25       0.63       x       0.7       =       47.41         Southwest <sub>0.9x</sub> 0.77       x       2.01       x       119.01       0.63       x       0.7       =       73.11	
Southwest0.9x       0.77       x       1.46       x       106.25       0.63       x       0.7       =       47.41         Southwest0.9x       0.77       x       2.01       x       119.01       0.63       x       0.7       =       73.11	
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 119.01 0.63 x 0.7 = 73.11	(79)
Cauthurant	(79)
Southwesto.9x $0.77$   x   2.01   x   119.01     0.63   x   0.7   =   73.11	(79)
	(79)
Southwest0.9x 0.77 × 1.46 × 119.01 0.63 × 0.7 = 53.1	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 118.15 0.63 x 0.7 = 72.58	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 118.15 0.63 x 0.7 = 72.58	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 118.15 0.63 x 0.7 = 52.72	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 113.91 0.63 x 0.7 = 69.97	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 113.91 0.63 x 0.7 = 69.97	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 113.91 0.63 x 0.7 = 50.83	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 104.39 0.63 x 0.7 = 64.13	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 104.39 0.63 x 0.7 = 64.13	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 104.39 0.63 x 0.7 = 46.58	(79)
Southwest <sub>0.9x</sub> $0.77$ x $2.01$ x $92.85$ $0.63$ x $0.7$ = $57.04$	(79)
Southwest <sub>0.9x</sub> $0.77$ x $2.01$ x $92.85$ $0.63$ x $0.7$ = $57.04$	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 92.85 0.63 x 0.7 = 41.43	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 69.27 0.63 x 0.7 = 42.55	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 69.27 0.63 x 0.7 = 42.55	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 69.27 0.63 x 0.7 = 30.91	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 44.07 0.63 x 0.7 = 19.66	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34	(79)
Southwest <sub>0.9x</sub> 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06	(83)
Total gains – internal and solar $(84)$ m = $(73)$ m + $(83)$ m , watts	
(84)m= 367.85 412.96 447.13 473.66 486.12 470.03 450.04 433.15 415 385 357.79 349.77	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 1 0.99 0.99 0.97 0.92 0.81 0.65 0.69 0.89 0.98 0.99 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 19.56 19.71 19.96 20.3 20.63 20.87 20.96 20.95 20.79 20.37 19.91 19.54	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 19.8	(88)
10.07   10.07	()

Litilica	tion foo	tor for a	aine for	roct of d	volling k	2 m (cc	o Tabla	00)						
(89)m=	1	0.99	0.98	0.96	welling, h	0.72	0.5	9a) 0.55	0.82	0.96	0.99	1		(89)
L			<u> </u>		<u> </u>		<u> </u>		<u> </u>		0.99	'		(00)
Г	17.91	18.13		the rest	of dwelli	ng 12 (fo	ollow ste	ps 3 to 1	/ in Tabl	e 9c)	18.44	17.89		(90)
(90)m=	17.91	10.13	18.5	19	19.45	19.75	19.63	19.63	!	LA = Livin		ļ	0.54	(90)
										L/( - L/VIII	g aroa . (-	,, –	0.51	(91)
г			<del>`</del>		ole dwel	<u> </u>	î .	<u> </u>	<del></del>			ı 1		
(92)m=	18.75	18.93	19.24	19.66	20.04	20.32	20.4	20.4	20.23	19.75	19.18	18.73		(92)
· · · · · <sub>-</sub> -					tempera		<del> </del>	· ·		·				(00)
(93)m=	18.75	18.93	19.24	19.66	20.04	20.32	20.4	20.4	20.23	19.75	19.18	18.73		(93)
•			uirement				44 6	T	41	. <del></del>	70)		1 .	
				mperatui using Ta		ed at ste	ep 11 of	Table 9	o, so tha	t II,m=(	/6)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
г			ains, hm						T					
(94)m=	0.99	0.99	0.98	0.96	0.9	0.76	0.58	0.62	0.84	0.96	0.99	1		(94)
			<u>`</u> _	4)m x (84	·			ı	1	ı		<del>- 1</del>		(0.5)
(95)m=	365.78	408.87	438.54	453.12	435.8	357.38	261.17	269.77	350.49	370.59	354.12	348.18		(95)
Г				·	from Ta		100	40.4		40.0	7.4			(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		1041.41	942.56	784.18	erature, l	_ff1 , vv =	=[(39)fff : 272.78	285.84	- (96)m 441.78	664.72	883.13	1068.04		(97)
` ′ L					nonth, kV							1000.04		(01)
(98)m=	528.12	425.07	374.99	238.36	126.87	0	0.02	0	0	218.83	380.88	535.57		
(11)								<u> </u>	l per year	<u> </u>		L	2828.69	(98)
Space	heating	g require	ement in	kWh/m²	/year				,	(*****************	,(-	- / 10,012	51.15	` (99)
·		• ,			eating sy	/stems i	ncluding	micro-C	;HP)					
	heatin		ito iriu	ividual II	cating sy	/Storris i	nordanig	TITIOTO C	<i>/</i>					
•		_	nt from s	econdar	y/supple	mentary	system						0	(201)
Fraction	on of sp	ace hea	nt from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ncy of r	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ncy of s	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
ſ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space	heating	g require	ement (c	alculate	d above)		•		-				-	
	528.12	425.07	374.99	238.36	126.87	0	0	0	0	218.83	380.88	535.57		
(211)m	= {[(98]	)m x (20	4)] } x 1	00 ÷ (20	16)									(211)
Ì	565.44	455.1	401.48	255.21	135.83	0	0	0	0	234.29	407.8	573.42		
_					!		!	Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	=	3028.58	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month							ı		_
•		•	00 ÷ (20	• •										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
_								Tota	l (kWh/yea	ar) =Sum(2	215),5,1012	=	0	(215)
												•		-

Water heating								
Output from water heater (calculated above)	447.50 440.05	1 405 50 1	400.07	144.50	15404	107.05	1	
	117.58 112.65	125.58	126.97	144.58	154.34	167.05		7(046)
Efficiency of water heater		1 00 0 1			07.04		80.3	(216)
(217)m= 87.7 87.54 87.19 86.42 84.92	80.3 80.3	80.3	80.3	86.09	87.24	87.78		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$								
	146.43 140.29	156.39	158.12	167.94	176.92	190.31		
		Total	= Sum(2	19a) <sub>112</sub> =			1997.25	(219)
Annual totals				k'	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1							3028.58	
Water heating fuel used							1997.25	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							281.06	(232)
12a. CO2 emissions – Individual heating system	ns including m	icro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO			kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	654.17	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	431.41	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1085.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	145.87	(268)
Total CO2, kg/year			sum o	of (265)(	271) =		1270.37	(272)

TER =

(273)

22.97

Address:

Located in: **England** Region: Thames valley

UPRN:

07 November 2019 Date of assessment: Date of certificate: 12 May 2020

New dwelling design stage Assessment type:

New dwelling Transaction type: Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

460 PCDF Version:

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

 $35 \text{ m}^2$ 3.09 m Floor 0

22 m<sup>2</sup> (fraction 0.629) Living area:

North East Front of dwelling faces:

- ( )	$n \cap n$	Ina -	†\ /	naci
U	DELL		ιv	pes:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_5_01	Manufacturer	Solid	_	_	Metal
Vent_05_03	Manufacturer	Solid			
Vent_05_01	Manufacturer	Solid			
Vent_D5_08	Manufacturer	Solid			
Window_05_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_05_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window 05 08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D_5_01	mm	0	0	1	2.13	1
Vent_05_03	mm	0	0	1	0.94	1
Vent_05_01	mm	0	0	1	0.75	1
Vent_D5_08	mm	0	0	1	0.68	1
Window_05_02	6mm	0.7	0.4	1.2	2	1
Window_05_01	6mm	0.7	0.4	1.2	1.04	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1
Window_05_08	6mm	0.7	0.4	1.2	1.45	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_5_01		5_01	North East	0	0
Vent_05_03		5_05	South West	0.57	1.65
Vent_05_01		5_01	North East	0.623	1.2
Vent_D5_08		5_05	South West	0.57	1.2
Window_05_02		5_05	South West	1.21	1.65
Window_05_01		5_01	North East	1.2	0.863
Fanlight		5_01	North East	1.01	0.315
Window_05_08		5_05	South West	1.21	1.2

Overshading:	Average or unknown
Oversnaumu.	Average of unknown

Overshading:		Average	e or unknown				
Opaque Elements:							
Type: G External Elements	oss area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
5_01 5_02 5_03 5_05 R_01	15.481 2.039 2.874 18.386 35	4.24 0 0 5.07 0	11.24 2.04 2.87 13.32 35	0.13 0.13 0.13 0.13 0.1	0 0 0 0	False False False False	N/A N/A N/A N/A N/A
Internal Elements Party Elements							
Thermal bridges:							
Thermal bridges: Ventilation:		No info	rmation on therm	nal bridging (y=0.	15) (y =0.15)		
Pressure test: Ventilation:		Balance Number Ductwo	designed) ed with heat recover of wet rooms: K rk: Insulation, rig ed Installation Sc	itchen + 1 gid			
Number of chimneys Number of open flue Number of fans: Number of passive s Number of sides she Pressure test:	es: tacks:	0 0 0 0 0 0 2.5					
Main heating system:							
Main heating system  Main heating Control		Gas boi Fuel: m Info So Manufa Efficien Conden Fuel Bu System: Central Design Room-s	lers and oil boiler lains gas urce: Manufactur cturer's data cy: 89.5% (SEDB ising combi with a rning Type: Modus with radiators heating pump: 2 flow temperature	er Declaration UK2009) automatic ignition ulation			
Main heating Control		Progran	nmer, room therr	mostat and TRVs			
-		-	code: 2106	The same same same same same same same sam			
Secondary heating sy							
Secondary heating s Water heating:	ystem:	None					
Water heating:		Water of Fuel :m No hot	nain heating syste code: 901 nains gas water cylinder nael: False	em			
Others:							
Electricity tariff:	03:	Standar Yes	d Tariff				

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Yes

In Smoke Control Area:

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

			Hearl	Details:						
	A 1 5% 1		USELL					0.70.0	.0.4.0.5.4.0	
Assessor Name: Software Name:	Adam Ritch Stroma FSA				a Num are Vei				019516 on: 1.0.4.25	
Software Name.	Stioma PSF	-	Property	Address			erav Eff		л. т.о.4.25	
Address :			гторону	71001000	. I lat Ty	ровен	orgy En	Office		
1. Overall dwelling dime	ensions:									
			Are	ea(m²)	_	Av. He	ight(m)		Volume(m³	)
Ground floor				35	(1a) x	3	.09	(2a) =	108.15	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1	1d)+(1e)+(	1n)	35	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3d	l)+(3e)+	.(3n) =	108.15	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	r
Number of chimneys	0	+ 0	+ [	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	<b>=</b>   +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ins	J <u>L </u>				0	x -	10 =	0	(7a)
Number of passive vents	<b>;</b>				F	0	x	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
Number of fluciess gas in	1103				L	0			U	(70)
								Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fa	ns = (6a)+(6b)+	·(7a)+(7b)+	·(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	een carried out or i	is intended, proce	ed to (17),	otherwise (	continue fr	rom (9) to (	(16)			<u>-</u>
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration	OF for stool and		0 0F f				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0  if both types of wall are p					•	uction			0	(11)
deducting areas of openi	•	, ,	to the gree	itor wan are	a janoi					
If suspended wooden		` ,	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•								0	(13)
Percentage of window	s and doors dra	lught stripped		0.05 10.0	) (4.4) 4	1001			0	(14)
Window infiltration Infiltration rate				0.25 - [0.2]	. ,	100] = 12) + (13) -	± (15) –		0	(15)
Air permeability value,	α50 eynressed	d in cubic met	res ner h					area	0	(16)
If based on air permeabil			•	•	•	elle oi e	ilvelope	aica	0.12	(17)
Air permeability value applie	-					is being u	sed		0.12	(.0)
Number of sides sheltered	ed								0	(19)
Shelter factor					[0.075 x (1	19)] =			1	(20)
Infiltration rate incorpora	_			(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	<del> </del>	<del>'</del>		1.	l _	-		_	1	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1	1					1	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
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 infilti	ration rate	(allowi	ng for sh	ıelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		-	rate for t	he appli	cable ca	se		!					
If mechanic			o o d'o N. (O	Ol-) (OO-		C (I	NEW - th-		\ (00-)			0.5	(23a
If exhaust air h		5 11	, ,	, (	, (		,, ,	`	) = (23a)			0.5	(23b
If balanced wit			-	_					<b>.</b>		. (00.)	75.65	(230
a) If balance	ed mechai			with hea	at recove	<del>,                                    </del>	HR) (248   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24	<u> </u>		0.26		0.27	]	(246
b) If balance			ı — ı			<del>, , ,</del>	<del>,                                    </del>	<del>í `</del>	<del> </del>		Ι ,	1	(24b
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24)
c) If whole h	nouse extr m < 0.5 ×			•	•				5 v (23h	۸			
(24c)m = 0		0	0	0	0	0	0	0	0	0	0	1	(240
d) If natural	<u> </u>	-			<u> </u>	<u> </u>		<u> </u>				J	
,	m = 1, the				•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	or (24k	o) or (24	c) or (24	ld) in bo	x (25)			•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	oo ood bod	at loop t	oromot	251	•			•			•	-	
ELEMENT	Gross area (	3	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	х	1		2.13	, 			(26)
Doors Type 2					0.94	x	1	<u> </u>	0.94				(26)
Doors Type 3					0.75	X	1	=		=			(26)
Doors Type 4								=	0.75				
Windows Type					0.68	X	1	= [ ] = [		_			(26)
<u>-</u>					0.68		1/[1/( 1.2 )+	= [	0.68				, ,
Windows Type					2	x1	/[1/( 1.2 )+	= [	0.68 2.29				(27)
	e 2				1.04	x1	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type	e 2 e 3 e 4	_	4.24		2 1.04 0.32 1.45	x1 x1 x1 x1 x1	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Walls Type1	e 2 e 3 e 4		4.24	$\exists$	2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x1	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29) (29)
Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x x1 x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48 2.04 2.87 18.39 35 elements,	) m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	ndow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	I I I I I I I I I I I I I I I I I I I	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m <sup>2</sup> ws, use e	0 0 5.07 0 effective winternal wall	ndow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	I I I I I I I I I I I I I I I I I I I	paragrapl		(27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both seeds on both seeds on both seeds on seeds with the seeds on s	m <sup>2</sup> ws, use e sides of in	0 0 5.07 0 effective winternal wall	ndow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are	e 2 e 3 e 4  15.48 2.04 2.87 18.39 35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m <sup>2</sup> ws, use e sides of in S (A x	0 5.07 0 stfective winternal walk	ndow U-ve	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)

can he i	isad insta	ad of a de	tailed calc	ulation										
			x Y) cal		usina An	pendix I	K						11.07	(36)
	Ŭ	`	are not kn		0 .	•							11.07	(00)
	abric hea			, ,	,	,			(33) +	(36) =			28.41	(37)
Ventila	ition hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38)
Heat tr	ansfer c	oefficier	nt, W/K		-	-	-		(39)m	= (37) + (	38)m			
(39)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		_
Heat Id	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	: Sum(39)₁ - (4)	12 /12=	37.63	(39)
(40)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		
Numbe	er of day	s in mor	nth (Tab	le 1a)		-			,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/y	ear:	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		.28	]	(42)
Annua Reduce	l averag the annua	e hot wa al average		usage by	5% if the $a$	lwelling is	designed	(25 x N) to achieve		se target o		1.62	]	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Hot wate			day for ea		,				Гоер	001	INOV	Dec		
(44)m=	71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08	1	
						ı					ım(44) <sub>112</sub> :		775.4	(44)
Energy (	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	(c, 1d)	•	
(45)m=	105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08		_
If instant	taneous w	ater heatii	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Total = Su	ım(45) <sub>112</sub> :	=	1016.67	(45)
(46)m=	15.81	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31	1	(46)
	storage		14.21	12.44	11.94	10.3	9.55	10.95	11.00	12.92	14.1	15.51		(40)
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0	]	(47)
If comr	munity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)					•	
			hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	(47)			
	storage				!	(1.1.1.//	- /-1 \ .						1	
,			eclared l		or is kno	wn (Kvvr	n/day):					0	]	(48)
•			m Table									0	]	(49)
•			storage eclared o	-		or is not	known:	(48) x (49)	) =			0		(50)
Hot wa	iter stora	age loss	factor fr	om Tabl								0	]	(51)
	e factor	_		JII T.U								0	1	(52)
			m Table	2b								0	<u> </u>	(53)
													-	

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53)	3) =	0	1	(54)
Enter (50) or (54) in (55)	(47) X (31) X (32) X (3	· -	0		(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		O		(00)
(56)m= 0 0 0 0 0 0 0	0 0	0 0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)]	÷ (50), else (57)m = (56)m			l ix H	` ,
(57)m= 0 0 0 0 0 0	0 0	0 0	0		(57)
Primary circuit loss (annual) from Table 3			0		(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	÷ 365 × (41)m			'	
(modified by factor from Table H5 if there is solar water he	eating and a cylinder	thermostat)			
(59)m =	0 0	0 0	0		(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (	(41)m				
(61)m= 36.22 31.53 33.59 31.23 30.95 28.68 29.6	64 30.95 31.23	33.59 33.78	36.22		(61)
Total heat required for water heating calculated for each mon	$nth (62)m = 0.85 \times (4)$	45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 141.63 123.72 128.72 114.17 110.53 97.35 93.2	27 103.97 105.12	119.7 127.78	138.3		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative qua	antity) (enter '0' if no solar	contribution to water	er heating)		
(add additional lines if FGHRS and/or WWHRS applies, see	Appendix G)				
(63)m= 0 0 0 0 0 0	0 0	0 0	0		(63)
Output from water heater					
(64)m= 141.63 123.72 128.72 114.17 110.53 97.35 93.2	27 103.97 105.12	119.7 127.78	138.3		
	Output from wat	ter heater (annual)	12	1404.27	(64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)	5)m + (61)m] + 0.8 x	[(46)m + (57)m	+ (59)m	]	
(65)m= 44.1 38.53 40.03 35.38 34.2 30 28.5	57 32.02 32.38	37.03 39.7	43		(65)
include (57)m in calculation of (65)m only if cylinder is in the	he dwelling or hot wa	ater is from com	munity h	eating	
5. Internal gains (see Table 5 and 5a):					
Metabolic gains (Table 5), Watts					
Wetabolic gains (Table 3), Watts					
Jan Feb Mar Apr May Jun Ju	ıl Aug Sep	Oct Nov	Dec		
	<del>-                                    </del>	Oct         Nov           76.84         76.84	Dec 76.84		(66)
Jan Feb Mar Apr May Jun Ju	84 76.84 76.84				(66)
Jan   Feb   Mar   Apr   May   Jun   Jun   Jun   Geb   Feb   Feb   Mar   Apr   Feb	84 76.84 76.84 1), also see Table 5				(66) (67)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 a), also see Table 5 8 12.71 17.05	76.84 76.84 21.65 25.27	76.84		
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	76.84 76.84 76.84  1), also see Table 5  18 12.71 17.05  L13a), also see Tab	76.84 76.84 21.65 25.27	76.84		
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84  1), also see Table 5  8 12.71 17.05  1 L13a), also see Tab  93 120.23 124.5	76.84 76.84  21.65 25.27  lle 5  133.57 145.02	76.84 26.94		(67)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84  1), also see Table 5  18 12.71 17.05  1.13a), also see Table 9  1.20.23 124.5  1.5a), also see Table 9	76.84 76.84  21.65 25.27  lle 5  133.57 145.02	76.84 26.94		(67)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84  1), also see Table 5  18 12.71 17.05  1.13a), also see Table 9  1.20.23 124.5  1.5a), also see Table 9	76.84 76.84  21.65 25.27  sle 5  133.57 145.02	76.84 26.94 155.79		(67) (68)
Jan Feb Mar Apr May Jun Jun (66)m= 76.84 7	84 76.84 76.84 1), also see Table 5 8 12.71 17.05 1 L13a), also see Tab 93 120.23 124.5 15a), also see Table 96 43.96	76.84 76.84  21.65 25.27  sle 5  133.57 145.02	76.84 26.94 155.79		(67) (68)
Jan Feb Mar Apr May Jun Jun (66)m= 76.84 7	84 76.84 76.84 1), also see Table 5 8 12.71 17.05 1 L13a), also see Tab 93 120.23 124.5 15a), also see Table 96 43.96	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96	76.84 26.94 155.79 43.96		(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 a), also see Table 5 8 12.71 17.05 c L13a), also see Table 93 120.23 124.5 d L5a), also see Table 96 43.96 43.96	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96	76.84 26.94 155.79 43.96		(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 a), also see Table 5 8 12.71 17.05 c L13a), also see Table 93 120.23 124.5 d 5a), also see Table 96 43.96 43.96	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96  3 3	76.84 26.94 155.79 43.96		(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 1), also see Table 5 8 12.71 17.05 1.13a), also see Tab 93 120.23 124.5 15a), also see Table 96 43.96 3 3 3 23 -51.23 -51.23	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96  3 3	76.84 26.94 155.79 43.96		(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 1), also see Table 5 8 12.71 17.05 1.13a), also see Tab 93 120.23 124.5 15a), also see Table 96 43.96 3 3 3 23 -51.23 -51.23	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96  3 3  -51.23 -51.23  49.77 55.14	76.84 26.94 155.79 43.96 3 -51.23		(67) (68) (69) (70) (71)
Jan         Feb         Mar         Apr         May         Jun         Jun           (66)m=         76.84	84 76.84 76.84 1), also see Table 5 8 12.71 17.05 12.13a), also see Table 93 120.23 124.5 15a), also see Table 96 43.96 43.96 3 3 3 23 -51.23 -51.23 4 43.03 44.97 67)m + (68)m + (69)m + (7	76.84 76.84  21.65 25.27  ble 5  133.57 145.02  5  43.96 43.96  3 3  -51.23 -51.23  49.77 55.14	76.84 26.94 155.79 43.96 3 -51.23		(67) (68) (69) (70) (71)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	1.04	x	11.28	x	0.4	x	0.7	=	2.28	(75)
Northeast 0.9x	0.77	X	0.32	x	11.28	x	0.4	х	0.7	] =	0.7	(75)
Northeast 0.9x	0.77	X	1.04	x	22.97	x	0.4	x	0.7	] =	4.63	(75)
Northeast 0.9x	0.77	X	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast 0.9x	0.77	X	1.04	x	41.38	x	0.4	x	0.7	] =	8.35	(75)
Northeast 0.9x	0.77	X	0.32	x	41.38	x	0.4	х	0.7	] =	2.57	(75)
Northeast 0.9x	0.77	X	1.04	x	67.96	x	0.4	x	0.7	] =	13.71	(75)
Northeast 0.9x	0.77	X	0.32	x	67.96	x	0.4	x	0.7	] =	4.22	(75)
Northeast 0.9x	0.77	X	1.04	x	91.35	x	0.4	x	0.7	] =	18.43	(75)
Northeast 0.9x	0.77	X	0.32	x	91.35	x	0.4	x	0.7	] =	5.67	(75)
Northeast 0.9x	0.77	X	1.04	x	97.38	x	0.4	x	0.7	] =	19.65	(75)
Northeast 0.9x	0.77	X	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast 0.9x	0.77	X	1.04	x	91.1	x	0.4	х	0.7	] =	18.38	(75)
Northeast 0.9x	0.77	X	0.32	x	91.1	x	0.4	х	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast 0.9x	0.77	X	0.32	x	72.63	x	0.4	х	0.7	] =	4.51	(75)
Northeast 0.9x	0.77	X	1.04	x	50.42	x	0.4	x	0.7	] =	10.17	(75)
Northeast 0.9x	0.77	X	0.32	x	50.42	x	0.4	x	0.7	] =	3.13	(75)
Northeast 0.9x	0.77	X	1.04	x	28.07	x	0.4	x	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	0.32	x	28.07	x	0.4	x	0.7	] =	1.74	(75)
Northeast 0.9x	0.77	X	1.04	x	14.2	x	0.4	x	0.7	j =	2.86	(75)
Northeast 0.9x	0.77	X	0.32	x	14.2	x	0.4	x	0.7	j =	0.88	(75)
Northeast 0.9x	0.77	X	1.04	x	9.21	x	0.4	x	0.7	] =	1.86	(75)
Northeast 0.9x	0.77	X	0.32	x	9.21	x	0.4	x	0.7	] =	0.57	(75)
Southwest <sub>0.9x</sub>	0.77	X	2	x	36.79		0.4	x	0.7	] =	14.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	36.79		0.4	x	0.7	] =	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	62.67		0.4	x	0.7	] =	24.32	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	62.67		0.4	x	0.7	] =	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	х	85.75		0.4	x	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	х	85.75		0.4	x	0.7	<b>=</b>	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	106.25	ĺ	0.4	x	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	106.25		0.4	x	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	х	119.01		0.4	x	0.7	<b>=</b>	46.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	119.01	ĺ	0.4	x	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	118.15		0.4	x	0.7	] =	45.85	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	118.15		0.4	x	0.7	j =	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	113.91		0.4	x	0.7	j =	44.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.45	x	113.91		0.4	x	0.7	] =	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	104.39	j	0.4	x	0.7	] =	40.51	(79)
				-		-				-		

Southwestig 9, 0.77																	
Southwesto as	Southw	est <sub>0.9x</sub>	0.77	X	1.4	15	X	1	04.39	] [		0.4	x	0.7	=	29.37	(79)
Southwesto 98	Southw	est <sub>0.9x</sub>	0.77	X	2	2	x	9	2.85	] [		0.4	x [	0.7	=	36.03	(79)
Southwesto so   So   Co   T   X   X   So   So   T   So   So   So   T   So   So	Southw	est <sub>0.9x</sub>	0.77	X	1.4	15	x	9	2.85	] [		0.4	x	0.7	=	26.12	(79)
Southwesto, as	Southw	est <sub>0.9x</sub>	0.77	X	2	2	x	6	9.27	] [		0.4	x [	0.7	=	26.88	(79)
Southwesto, ax	Southw	est <sub>0.9x</sub>	0.77	X	1.4	15	x	6	9.27	] [		0.4	x [	0.7	=	19.49	(79)
Solutivesto, sx	Southw	est <sub>0.9x</sub>	0.77	х	2	2	x	4	4.07	] [		0.4	x	0.7	=	17.1	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = Sum(74)m(82)m (83)m = Z7.61	Southw	est <sub>0.9x</sub>	0.77	X	1.4	15	x	4	4.07	] [		0.4	x	0.7	=	12.4	(79)
Solar gains in watts, calculated for each month   (83)m = Sum/74)m(82)m	Southw	est <sub>0.9x</sub>	0.77	x	2	2	x	3	1.49	<u> </u>		0.4	x	0.7	_ =	12.22	(79)
(83)	Southw	est <sub>0.9x</sub>	0.77	X	1.4	15	x	3	1.49	j į		0.4	x	0.7	=	8.86	(79)
(83)		_						•									
Total gains – intermal and solar (84)m = (73)m + (83)m, watts  (84)m= 348.68 365.89 374.05 376.46 372.92 357.21 342.97 337.6 334.56 331.35 331.26 336.61  7. Mean intermal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar	gains in	watts, ca	alculated	l for eac	h month				(83)m	= St	ım(74)m .	(82)m				
Relima   Sale	(83)m=	27.61	48.02	68.33	89.06	103.78	10	04.79	100.3	89.0	05	75.46	53.78	33.25	23.51	]	(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (88)m= 20 20 20.01 20.02 20.02 20.04 20.04 20.04 20.04 20.03 20.02 20.02 20.01 (88)  Mean internal temperature in the rest of dwelling from Table 9, Th2 (°C)  (88)m= 20 80 0.87 0.83 0.77 0.66 0.51 0.36 0.38 0.57 0.76 0.85 0.8 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.48 18.65 18.94 19.34 19.68 19.93 20.01 20.0 19.87 19.48 18.94 18.45 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (93)  8. Space heating requirement  Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains than Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor of orgains than Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor of orgains step Sec. (93)  8. Space heating requirement  Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 0.84 0.85 0.82 0.76 0.57 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Heat loss rate for mean internal temperature from Table 8  (96)m= 0.87 0.85 0.82 0.76 0.75 0.54 0.41 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 0.87 0.85 0.82 0.76 0.87 0.54 0.41 0.41 0.43 0.6 0.75 0.84 0.88 (94)	Total g	jains – i	nternal a	and solar	(84)m =	= (73)m	+ (8	83)m	, watts	•				•			
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	(84)m=	348.66	365.89	374.05	376.46	372.92	3	57.21	342.97	337	'.6	334.56	331.35	331.26	336.61	]	(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	7 Me	an inter	nal temr	perature	(heating	season	١.			-	-			•		1	
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					`			area	from Tak	ala Q	Th	1 (°C)				21	(85)
Sep			_	•			_			Jie 9,	111	i ( C)				21	(00)
Residual National Residual National Residual National Residual R	Utilisa			1	<u>`</u>		Ė			Ι	1	Can	0-4	Nov	Daa	1	
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       19.3       19.47       19.78       20.18       20.55       20.83       20.94       20.93       20.76       20.32       19.76       19.26       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20       20       20.01       20.02       20.04       20.04       20.03       20.02       20.02       20.01       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.87       0.83       0.77       0.66       0.51       0.36       0.38       0.57       0.76       0.85       0.9       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       18.48       18.65       18.94       19.34       19.68       19.93       20.01       20       19.87       19.48       18.45       18.45       (90)         (90)m=       18.49       19.61       19.47       19.87       20.23       20.49       20.59       20.58       20.43       20.01       19.46       18.96       18.96       (92) </td <td>(0C)m</td> <td></td> <td></td> <td><del>                                     </del></td> <td><del></del></td> <td><del>-</del></td> <td>┿</td> <td></td> <td></td> <td></td> <td>Ť</td> <td></td> <td></td> <td>+</td> <td></td> <td></td> <td>(96)</td>	(0C)m			<del>                                     </del>	<del></del>	<del>-</del>	┿				Ť			+			(96)
(87)me	(00)111=	0.9	0.00	0.65	0.6	0.71		0.57	0.44	0.4	.б	0.03	0.79	0.87	0.91	]	(80)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m=	Mean		l temper	1	<u> </u>	<del>- `</del>	_		<del></del>		_	9c)		,		1	
(88)m=	(87)m=	19.3	19.47	19.78	20.18	20.55	2	20.83	20.94	20.9	93	20.76	20.32	19.76	19.26		(87)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.89  0.87  0.83  0.77  0.66  0.51  0.36  0.38  0.57  0.76  0.85  0.9  (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.48  18.65  18.94  19.34  19.68  19.93  20.01  20  19.87  19.48  18.94  18.45  (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 18.99  19.16  19.47  19.87  20.23  20.49  20.59  20.58  20.43  20.01  19.46  18.96  (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99  19.16  19.47  19.87  20.23  20.49  20.59  20.58  20.43  20.01  19.46  18.96  (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87  0.85  0.82  0.76  0.67  0.54  0.41  0.43  0.6  0.75  0.84  0.88  (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 30.4.7  312.76  307.58  287.73  251.27  192.11  139.05  144.11  199.08  250.05  278.67  296.8  (95)  Monthly average external temperature from Table 8  (96)m= 4.3  4.9  6.5  8.9  11.7  14.6  16.6  16.4  14.1  10.6  7.1  4.2  (96)  Heat loss rate for mean internal temperature, Lm, W = [(93)m x [(93)m	Temp	erature	during h	neating p	eriods i	n rest of	dw	elling	from Ta	able 9	), Th	n2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.48 18.65 18.94 19.34 19.68 19.93 20.01 20 19.87 19.48 18.94 18.45 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 30.4.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm, W = ((39)m x (96)m)	(88)m=	20	20	20.01	20.02	20.02	2	20.04	20.04	20.0	04	20.03	20.02	20.02	20.01		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.48 18.65 18.94 19.34 19.68 19.93 20.01 20 19.87 19.48 18.94 18.45 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 30.4.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm, W = ((39)m x (96)m)	l Itilie:	ation fac	tor for a	ains for	rest of d	welling	h2	m (se	a Table	0a)				•	•	4	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m= 18.48 18.65 18.94 19.34 19.34 19.68 19.93 20.01 20 19.87 19.48 18.94 18.45         FLA = Living area + (4) = 0.63         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2         (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96       (93)         8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Utilisation factor for gains, hm:         (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)         Useful gains, hmGm , W = (94)m x (84)m         (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8       (95)         Monthly average external temperature from Table 8         (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2       (96)         Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m]							$\overline{}$			<del>É</del>	8	0.57	0.76	0.85	0.9	1	(89)
(90)me   18.48   18.65   18.94   19.34   19.68   19.93   20.01   20   19.87   19.48   18.94   18.45   (90)	, ,			<u> </u>		l i	<u> </u>							1 3.33			. ,
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]				†	r	1	Ť	<u> </u>		<del>i                                     </del>	$\overline{}$			T		1	(00)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99 19.16 19.47 19.87 20.23 20.49 20.59 20.58 20.43 20.01 19.46 18.96 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m-(96)m]	(90)m=	18.48	18.65	18.94	19.34	19.68	1	9.93	20.01	20	)						` ´
(92)m=												T	LA = LIVI	ng area ÷ (4	4) =	0.63	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.99  19.16  19.47  19.87  20.23  20.49  20.59  20.58  20.43  20.01  19.46  18.96  (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87  0.85  0.82  0.76  0.67  0.54  0.41  0.43  0.6  0.75  0.84  0.88  (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7  312.76  307.58  287.73  251.27  192.11  139.05  144.11  199.08  250.05  278.67  296.8  (95)  Monthly average external temperature from Table 8  (96)m= 4.3  4.9  6.5  8.9  11.7  14.6  16.6  16.4  14.1  10.6  7.1  4.2  (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1 -	– fL	A) × T2					
(93)   18.99   19.16   19.47   19.87   20.23   20.49   20.59   20.58   20.43   20.01   19.46   18.96   (93)   8. Space heating requirement    Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec    Utilisation factor for gains, hm:  (94)m= 0.87   0.85   0.82   0.76   0.67   0.54   0.41   0.43   0.6   0.75   0.84   0.88   (94)    Useful gains, hmGm , W = (94)m x (84)m    (95)m= 304.7   312.76   307.58   287.73   251.27   192.11   139.05   144.11   199.08   250.05   278.67   296.8   (95)    Monthly average external temperature from Table 8    (96)m= 4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)    Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(92)m=	18.99	19.16	19.47	19.87	20.23	2	20.49	20.59	20.5	58	20.43	20.01	19.46	18.96		(92)
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Apply	adjustn	nent to t	he mear	interna	l temper	atu	ıre fro	m Table	4e, \	whe	re appro	priate	_		_	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(93)m=	18.99	19.16	19.47	19.87	20.23	2	20.49	20.59	20.5	58	20.43	20.01	19.46	18.96		(93)
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	8. Sp	ace hea	ting requ	uirement													
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:           (94)m=           0.87         0.85         0.82         0.76         0.67         0.54         0.41         0.43         0.6         0.75         0.84         0.88         (94)           Useful gains, hmGm, W = (94)m x (84)m           (95)m=         304.7         312.76         307.58         287.73         251.27         192.11         139.05         144.11         199.08         250.05         278.67         296.8         (95)           Monthly average external temperature from Table 8           (96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2         (96)           Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Set T	i to the ı	mean int	ternal ter	mperatu	re obtair	ned	at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
Utilisation factor for gains, hm:	the ut	ilisation	factor fo	or gains	using Ta	able 9a	_		T						ı	1	
(94)m= 0.87 0.85 0.82 0.76 0.67 0.54 0.41 0.43 0.6 0.75 0.84 0.88 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]				<u> </u>	<u> </u>	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = $(94)$ m x $(84)$ m $(95)$ m= $304.7$ $312.76$ $307.58$ $287.73$ $251.27$ $192.11$ $139.05$ $144.11$ $199.08$ $250.05$ $278.67$ $296.8$ (95) Monthly average external temperature from Table 8 $(96)$ m= $4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ (96) Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m – $(96)$ m $]$							_							1	ı	1	
(95)m= 304.7 312.76 307.58 287.73 251.27 192.11 139.05 144.11 199.08 250.05 278.67 296.8 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]							_ (	0.54	0.41	0.4	3	0.6	0.75	0.84	0.88		(94)
Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]]				<del>- `</del>	<del></del>	<del>'</del>									1	1	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]				l					139.05	144.	.11	199.08	250.05	278.67	296.8		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]				1	i	i	_		ı		-			1	1	1	(85)
				ļ.	<u> </u>		_		<u> </u>					7.1	4.2	]	(96)
(97)m=   564.71   546.73   495.52   413.18   320.24   217.99   147.69   154.32   235.5   353.29   466.77   560.82   (97)				1	r	r	_		<del>-``                                   </del>	<del>- ` ` </del>	<del>_</del> т			1.		1	(0=)
	(97)m=	564.71	546.73	495.52	413.18	320.24	2	17.99	147.69	154.	.32	235.5	353.29	466.77	560.82	J	(97)

Space heating require				1	1			<del></del>		100.40		
98)m= 193.45 157.23	139.83	90.32	51.31	0	0	0 Tota	0 I per year	76.81	135.44 ) = Sum(9	196.43	1040.82	(98)
Conne booting require		14\A/lb/ma?	2/			Tula	i per year	(KVVII/yeai	) = Sum(9	0)15,912 =		╡ .
Space heating require										L	29.74	(99)
a. Energy requiremer	its – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating: Fraction of space hea	t from se	econdar	y/supple	mentary	system					Γ	0	(201
Fraction of space hea	t from m	ain syst	em(s)	_	•	(202) = 1 -	- (201) =			Ĺ	1	(202
Fraction of total heati	ng from i	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =		ř	1	(204
Efficiency of main spa	ace heat	ing syste	em 1							ř	90.4	(206
Efficiency of seconda	ry/supple	ementar	y heating	g systen	າ, %						0	(208
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ar
Space heating require	ement (c	alculate	d above)	)								
193.45 157.23	139.83	90.32	51.31	0	0	0	0	76.81	135.44	196.43		
211)m = {[(98)m x (20				<u> </u>								(211
213.99 173.92	154.68	99.91	56.76	0	0	0 Tota	0	84.97	149.82 211) <sub>15.1012</sub>	217.29	1151.05	7/244
Space booting fuel (s	ooondor	ν) ΙΛΛ/h/	month			Tota	i (KVVII/yea	ar) =5urri(2	11/15,1012	L	1151.35	(211
Space heating fuel (s : {[(98)m x (201)] } x 1			montn									
215)m = 0 0	0	0	0	0	0	0	0	0	0	0		
•						Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215
Vater heating												
Output from water hea	ter (calc 128.72	ulated al	110.53	97.35	93.27	103.97	105.12	119.7	127.78	138.3		
Efficiency of water hea				000	00.2.						80.3	(216
217)m= 85.84 85.66	85.26	84.47	83.25	80.3	80.3	80.3	80.3	83.97	85.2	85.93		(217
uel for water heating,	kWh/mo	onth										
$(219)m = (64)m \times 100$ $(219)m = 165 \times 144.43$	) ÷ (217) 150.97	m 135.16	132.77	121.24	116.15	129.48	130.91	142.56	149.98	160.94		
100   144.43	100.07	100.10	102.77	121.24	110.13		I = Sum(2		143.30	100.54	1679.6	(219
nnual totals									Wh/year	. L	kWh/yea	
Space heating fuel use	ed, main	system	1						,		1151.35	
Vater heating fuel use	d									Ī	1679.6	Ī
Electricity for pumps, fa	ans and	electric	keep-ho	t						_		_
mechanical ventilation	n - balan	ced, ext	ract or p	ositive i	nput fron	n outside	)			138.54		(230
central heating pump			•		•					30		(230
boiler with a fan-assis										45		(230
		\\/h/\.	r			eum	of (230a)	(230g) =		<del>_</del>	040.54	_
otal electricity for the electricity for lighting	above, ř	kvvii/yea	1			Suill	oi (200a).	(200g) =			213.54	(231
LOOTELOID / TOP LIGHTING										1	185.19	(232

	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 × 0.0	1 = 40.07 (240)
Space heating - main system 2	(213) x	0 x 0.0	1 = 0 (241)
Space heating - secondary	(215) x	13.19 × 0.0	1 = 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.0°	1 = 58.45 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.0°	1 = 28.17 (249)
(if off-peak tariff, list each of (230a) to ( Energy for lighting	230g) separately as applicable and a	apply fuel price according  13.19 × 0.0	
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) ar	nd (254) as needed		
Total energy cost	(245)(247) + (250)(254) =		271.11 (255)
11a. SAP rating - individual heating sy	rstems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	$[(255) \times (256)] \div [(4) + 45.0] =$		1.42 (257)
SAP rating (Section 12)			80.14 (258)
12a. CO2 emissions – Individual heati	ng systems including micro-CHP		
	Energy	<b>Emission factor</b>	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	<u> </u>		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh	kg CO2/year
	kWh/year (211) x	kg CO2/kWh	kg CO2/year  248.69 (261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =	kg CO2/year  248.69 (261)  0 (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	kg CO2/kWh  0.216 =  0.519 =  0.216 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	kg CO2/kWh  0.216 =  0.519 =  0.216 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =  0.519 =  0.519 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =  0.519 =  0.519 =  0.519 =  0.519 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m²	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =  0.519 =  0.519 =  0.519 =  0.519 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x	kg CO2/kWh  0.216 =  0.519 =  0.216 =  0.519 =  0.519 =  0.519 =  0.519 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  keep-hot (231) x  (232) x  Energy	kg CO2/kWh  0.216 =  0.519 =  0.519 =  0.519 =  0.519 =  272) ÷ (4) =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)  86 (274)  P. Energy
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)  13a. Primary Energy	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  (231) x  (232) x   Energy  kWh/year	kg CO2/kWh  0.216 =  0.519 =  0.519 =  0.519 =  272) ÷ (4) =  Primary factor	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)  86 (274)  P. Energy kWh/year
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)  13a. Primary Energy  Space heating (main system 1)	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  (231) x  (232) x   Energy  kWh/year  (211) x	kg CO2/kWh  0.216 =  0.519 =  0.519 =  0.519 =  272) ÷ (4) =  Primary factor  1.22 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)  86 (274)  P. Energy kWh/year  1404.64 (261)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)  13a. Primary Energy  Space heating (main system 1) Space heating (secondary)	kWh/year  (211) x  (215) x  (219) x  (261) + (262) + (263) + (264)  (231) x  (232) x   Energy  kWh/year  (211) x  (215) x	kg CO2/kWh  0.216 =  0.519 =  0.519 =  0.519 =  0.519 =  272) ÷ (4) =   Primary factor  1.22 =  3.07 =  1.22 =	kg CO2/year  248.69 (261)  0 (263)  362.79 (264)  611.48 (265)  110.83 (267)  96.11 (268)  818.42 (272)  23.38 (273)  86 (274)  P. Energy kWh/year  1404.64 (261)  0 (263)

Electricity for lighting (232) x 0 = 568.52 (268) 'Total Primary Energy sum of (265)...(271) = 4677.85 (272) **Primary energy kWh/m²/year** (272)  $\div$  (4) = 133.65 (273)

		l lear I	Details:						
Assessor Name:	Adam Ritchie	— <u> </u>	Strom	a Nium	her:		STDO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	Flat Ty	pe B En	ergy Eff	Only		
Address :									
Overall dwelling dimensional	nsions:	۸۳۵	a/m²\		Av. Ua	iaht/m)		Valuma/m³	81
Ground floor		Are	a(m²) 35	(1a) x		ight(m) :.09	(2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)		(4)			<b>」</b> ` ′		`
Dwelling volume	., . ( , . ( , . ( ,	,	55		)+(3c)+(3c	d)+(3e)+	(3n) =	108.15	(5)
				(==) - (==	, (00)	., ( ( ) ,	()	108.15	(3)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating	<b>-</b> + -	0	] = Г	0	x -	40 =	0	(6a)
Number of open flues	0 + 0	╡ + ト	0	]	0	x	20 =	0	(6b)
Number of intermittent far					0	x	10 =	0	(7a)
Number of passive vents				L	0	x	10 =	0	(7b)
Number of flueless gas fir	res			F	0	x	40 =	0	(7c)
gar ar naaraaa gaa				L					(, o)
							Air ch	nanges per ho	our
•	vs, flues and fans = $(6a)+(6b)+(6b)+(6b)$				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in th	een carried out or is intended, proce	ed to (17),	otherwise o	continue fr	om (9) to	(16)		0	(9)
Additional infiltration	ic awaiiing (115)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame of	r 0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are producting areas of opening	esent, use the value corresponding to gas): if equal user 0.35	to the grea	ter wall are	a (after					
•	loor, enter 0.2 (unsealed) or (	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent								0	(13)
<u>-</u>	and doors draught stripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)
Window infiltration Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es per ho					area	2.5	(17)
If based on air permeabili	ty value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = (	16)		·		0.12	(18)
	s if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_ 
Number of sides sheltered Shelter factor	a		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0	(19) (20)
Infiltration rate incorporati	ing shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		,	,				•	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
(22a)m= 1.27 1.25 1	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infilti	ration rate	(allowi	ng for sh	nelter an	id wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	se	!	!	!		!		
If mechanic			anadin N. (O	)OF) (OO.	-) <b></b>		\  <b> </b>		\ (00-\			0.5	(23a
If exhaust air h		0 11	, ,	, (	, (		,, .	`	) = (23a)			0.5	(23b
If balanced wit		-	-	_					<b>.</b>		4 (00.)	75.65	(230
a) If balance	ed mechai			with he	at recov	<del>,                                    </del>	HR) (24a   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24			0.26		0.27	J	(240
b) If balance						<del>, , ,</del>	<del></del>	<del>í `</del>	<del>r ´     `</del>		Ι ,	1	(24k
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(241
c) If whole h	nouse extr m < 0.5 × 1								5 v (23h	۸			
(24c)m = 0	0.5 2	0	0	0	0	0	0 = (221	0	0	0	0	1	(240
d) If natural	L			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				J	
,	m = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	) or (24h	o) or (24	c) or (24	d) in bo	x (25)	!		•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	as and had	et loop r	oromot	ori								4	
ELEMENT	Gross area (	3	Openin m	ıgs	Net Ar A ,r		U-val		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	X	1		2.13				(26)
Doors Type 2					0.94	x	1	<b>=</b> i	0.94	=			(26)
Doors Type 3					0.75	x		_ :		=			(26)
Doors Type 4							1	=	0.75				
Windows Type					0.68	X	1	= [ = [	0.75	$\exists$			(26)
	e 1							= [	0.68				` '
• •					2	x1	1/[1/( 1.2 )+	= [	0.68 2.29				(27)
Windows Type	e 2				1.04	x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27) (27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4	_	4 24	$\neg$	2 1.04 0.32 1.45	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4	극	4.24		2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0 0 5.07		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements,	m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	as given in	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [ ]	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	s given in	paragrapl		(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both seeds on both seeds on both seeds on seeds o	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m² ws, use e ides of in S (A x	0 5.07 0 effective winternal walk	indow U-va	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (29) (29) (29)

	used instea											,		_
	al bridge	`	,			•	<						11.07	(36
	of therma abric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =		Г	20.44	(37
	ition hea		alculated	l monthly	/				` '	, ,	25)m x (5)	L	28.41	(0
Ortino	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
88)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38
leat tr	ansfer c	oefficier	nt W/K			<u> </u>	<u> </u>	<u>!</u>	(39)m	= (37) + (37)		<u>[</u>		
9)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		
,							l	<u> </u>		L Average =	Sum(39) <sub>1</sub>	12 /12=	37.63	(3
leat lo	oss para	meter (H	HLP), W	m²K		•			(40)m	= (39)m ÷	(4)	·		
-0)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		<b>—</b> .
umbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(4
u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
	<u> </u>					<u> </u>	<u> </u>	<u>!</u>	<u> </u>	<u>Į</u>	<u> </u>			
l Wa	ater heat	ing ener	av teani	rement:								kWh/ye	ar:	
	ioi noai	ing onto	97 1094											
	ed occu			[4 0)(0	( 0 0002	) 40 v /TI	-A 420	\2\1 · O (	0012 v /	TEA 40		.28		(4
	A > 13.9		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9	)2)] + 0.0	JU13 X (	IFA -13.	.9)			
		•	ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		64	1.62		(4
educe	the annua	l average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o		-		·
t more	e that 125		-		ater use, r	not and co		1	<u> </u>	<u> </u>		<del></del> 1		
nt wate	Jan er usage ir	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 v	Aug	Sep	Oct	Nov	Dec		
			,			i	ı	· <i>′</i>	00.00	05.04	00.40	74.00		
4)m=	71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08	775 4	( <sub>4</sub>
nergy (	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> : ables 1b, 1		775.4	(-
5)m=	105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08		
,							<u> </u>	<u>!</u>		L Total = Su	<u>l</u> m(45) <sub>112</sub> =	=	1016.67	(4
nstan	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
6)m=	15.81	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31		(4
	storage													
·		` ,		•			Ū	within sa	ame ves	sel		0		(4
comr	munity h	•			•			` '	ora) onto	or 'O' in /	<b>47</b> \			
	VISE II IIC		not wate	1 (11115 11	iciuues i	HStafftaf	ieous cc	ווטט וטוווע	ers) erik	91 0 111 (	47)			
therv		loss:			ممامات	wn (kWł	n/day):					0		(4
therv ater	storage nanufacti		eclared l	oss facto	or is kno		• ,							
therv ater ) If m	storage	urer's de			or is kno							0		(4
therwater  ater  If make  empe	storage nanufacti erature fa	urer's de actor fro	m Table	2b				(48) x (49)	) =					
thervitater  in If maken the second the seco	storage nanufacti	urer's de actor fro m water	m Table storage	2b , kWh/ye	ear	or is not		(48) x (49)	) =			0		
therv /ater ) If m empe nergy ) If m ot wa	storage nanufactor erature fa lost from nanufactor ater stora	urer's de actor fro m water urer's de age loss	m Table storage eclared of factor fr	2b , kWh/ye cylinder l om Tabl	ear oss fact		known:	(48) x (49)	) =					(5
therw /ater a) If m empe nergy b) If m ot wa comi	storage nanufacto erature fa lost from nanufacto ater stora munity h	urer's de actor fro m water urer's de age loss eating s	m Table storage eclared of factor fr ee section	2b , kWh/ye cylinder l om Tabl	ear oss fact		known:	(48) x (49)	) =			0		(4 (5 (5
therw 'ater ) If m empe nergy ) If m ot wa comi	storage nanufactor erature fa lost from nanufactor ater stora	urer's de actor fro m water urer's de age loss eating s from Tal	m Table storage eclared of factor fr ee section ble 2a	2b , kWh/ye cylinder I om Tabl on 4.3	ear oss fact		known:	(48) x (49)	) =			0		(5

Energy lost from wa	-	e, kWh/ye	ear			(47) x (51)	) x (52) x (5	53) =		0		(54)
Enter (50) or (54) ii	` '									0		(55)
Water storage loss	calculated	for each	month			((56)m = (	55) × (41)r	n				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedic	ated solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss	(annual) fro	om Table	e 3							0		(58)
Primary circuit loss			•	•	` '	, ,						
(modified by facto	1	1				<del></del>	<del></del>		<del></del>		l	(==)
(59)m = 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculat	ed for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 36.22 31.5	3 33.59	31.23	30.95	28.68	29.64	30.95	31.23	33.59	33.78	36.22		(61)
Total heat required	or water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 141.63 123.	2 128.72	114.17	110.53	97.35	93.27	103.97	105.12	119.7	127.78	138.3		(62)
Solar DHW input calcula	ed using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	contributi	ion to wate	er heating)	'	
(add additional lines	if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	eater	-	•				•				•	
(64)m= 141.63 123.	2 128.72	114.17	110.53	97.35	93.27	103.97	105.12	119.7	127.78	138.3		
<u> </u>		•				Outp	out from wa	ater heate	r (annual)₁	12	1404.27	(64)
Heat gains from wa		LeVA/les/see		- ′ [0 0=	(45)	(0.4)		- ( )	(\)			_
rical gains nom wa	er neating	, KVVN/M	ontn U.Zt	C8.0J C	× (45)m	ı + (61)m	ו + 0.8 א	: [(46)m	+ (5/)m	+ (59)m	]	
(65)m= 44.1 38.5		35.38	34.2	30	× (45)m 28.57	+ (61)m 32.02	1] + 0.8 x 32.38	37.03	+ (57)m 39.7	+ (59)m 43	]	(65)
(65)m= 44.1 38.5	3 40.03	35.38	34.2	30	28.57	32.02	32.38	37.03	39.7	43		(65)
(65)m= 44.1 38.5 include (57)m in o	40.03 alculation	35.38 of (65)m	34.2 only if c	30	28.57	32.02	32.38	37.03	39.7	43		(65)
(65)m= 44.1 38.5 include (57)m in 6 5. Internal gains (5	40.03 alculation see Table 5	35.38 of (65)m 5 and 5a	34.2 only if c	30	28.57	32.02	32.38	37.03	39.7	43		(65)
include (57)m in of the following state of th	40.03 alculation see Table (	35.38 of (65)m 5 and 5a	34.2 only if c	30 ylinder i	28.57 s in the o	32.02 dwelling	32.38 or hot w	37.03 ater is fr	39.7 om com	43 munity h		(65)
include (57)m in of the first state of the first st	alculation tee Table 5 tole 5), War	35.38 of (65)m 5 and 5a tts Apr	34.2 only if c	30 ylinder i: Jun	28.57	32.02 dwelling Aug	32.38 or hot w	37.03 ater is fr	39.7 om com	43 munity h		(65)
(65)m= 44.1 38.5 include (57)m in comparison of the following states of the fo	40.03  alculation  ee Table 5  ole 5), Wat  b Mar  4 64.04	35.38 of (65)m 5 and 5a tts Apr 64.04	34.2 only if c : May 64.04	30 ylinder i: Jun 64.04	28.57 s in the c Jul 64.04	32.02 dwelling Aug 64.04	32.38 or hot w Sep 64.04	37.03 ater is fr	39.7 om com	43 munity h		
include (57)m in of the first state of the first st	alculation eee Table (cole 5), War b Mar 4 64.04	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix	34.2 only if c : May 64.04 L, equati	30 ylinder is Jun 64.04 ion L9 o	28.57 s in the c  Jul 64.04 r L9a), a	32.02 dwelling Aug 64.04 lso see	32.38 or hot w Sep 64.04 Table 5	37.03 ater is fr Oct 64.04	39.7 om com Nov 64.04	43 munity h  Dec 64.04		(66)
include (57)m in 6  5. Internal gains (57)  Metabolic gains (Taylor)  Jan Fe (66)m= 64.04 64.04  Lighting gains (calce (67)m= 10.49 9.3	alculation tee Table (cole 5), War to Mar 4 64.04 ulated in A	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73	34.2 only if c : May 64.04 L, equati 4.29	30 ylinder is Jun 64.04 ion L9 of	28.57 s in the c  Jul 64.04 r L9a), a 3.91	32.02 dwelling Aug 64.04 lso see 5.08	32.38 or hot w Sep 64.04 Table 5 6.82	37.03 ater is fr Oct 64.04	39.7 om com	43 munity h		
include (57)m in of the first includ	alculation lee Table 5 lole 5), War lo Mar 4 64.04 llated in A 7.57 alculated ir	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append	34.2 only if c : May 64.04 L, equati 4.29 dix L, eq	Jun 64.04 ion L9 of 3.62 uation L	28.57 s in the c  Jul 64.04 r L9a), a 3.91 13 or L1	32.02 dwelling Aug 64.04 lso see 5.08 3a), also	32.38 or hot w Sep 64.04 Table 5 6.82 o see Tal	37.03  ater is fr  Oct 64.04  8.66  ble 5	39.7 om com Nov 64.04	Dec 64.04		(66) (67)
include (57)m in control (55)m= 44.1 38.5 include (57)m in control (57)m i	alculation see Table (cole 5), War b Mar 4 64.04 ulated in A 7.57 alculated ir 3 107.47	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Appendix 101.39	34.2 only if c :  May 64.04 L, equati 4.29 dix L, eq 93.72	Jun 64.04 ion L9 of 3.62 uation L	Jul 64.04 r L9a), a 3.91 13 or L1: 81.69	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41	37.03  ater is fr  Oct 64.04  8.66  ble 5 89.49	39.7 om com Nov 64.04	43 munity h  Dec 64.04		(66)
include (57)m in or 5. Internal gains (57)m in or 5. Internal gains (58)  Metabolic gains (Taylor)  Jan Fee (66)m= 64.04 64.04  Lighting gains (calce (67)m= 10.49 9.3  Appliances gains (color)  (68)m= 109.19 110.  Cooking gains (calce cooking gains gains (calce cooking gains gai	alculation lee Table (sole 5), War b Mar 4 64.04 llated in A 7.57 alculated ir 3 107.47 ulated in A	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 Appendix 101.39 ppendix	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat	Jun 64.04 ion L9 o 3.62 uation L 86.51 ion L15	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1 81.69 or L15a)	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56	32.38 or hot w Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table	37.03  ater is fr  Oct 64.04  8.66  ole 5  89.49  5	39.7 om com Nov 64.04 10.11	Dec 64.04		(66) (67) (68)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04	alculation lee Table 5 lole 5), War lo Mar 4 64.04 llated in A 7.57 alculated ir 3 107.47 ulated in A 29.4	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4	34.2 only if c :  May 64.04 L, equati 4.29 dix L, eq 93.72	Jun 64.04 ion L9 of 3.62 uation L	Jul 64.04 r L9a), a 3.91 13 or L1: 81.69	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41	37.03  ater is fr  Oct 64.04  8.66  ble 5 89.49	39.7 om com Nov 64.04	Dec 64.04		(66) (67)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m   Jan   Fe   Geometria (66)m   Geometria (64.04   64.04   64.04   64.04   64.04   64.04   64.04   64.04   64.04   64.04   64.04   660)m   10.49   9.3   Appliances gains (calcalled (68)m   109.19   110.04   110.0	alculation lee Table (sole 5), War b Mar 4 64.04 llated in A 7.57 alculated ir 3 107.47 ulated in A 29.4 ns (Table (solution))	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 Appendix 101.39 ppendix 29.4 5a)	34.2 only if c :  May 64.04 L, equati 4.29 dix L, eq 93.72 L, equat	Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4	Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4	32.02 dwelling 64.04 lso see 5.08 3a), also 80.56 ), also see 29.4	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table 29.4	37.03  ater is fr  Oct 64.04  8.66  ble 5 89.49  5 29.4	39.7 om com Nov 64.04 10.11 97.16	Dec 64.04 10.78 104.38		(66) (67) (68) (69)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04	alculation lee Table (sole 5), War b Mar 4 64.04 llated in A 7.57 alculated in A 107.47 ulated in A 29.4 ns (Table (solution))	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4 5a) 3	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat 29.4	Jun 64.04 ion L9 o 3.62 uation L 86.51 ion L15 29.4	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1 81.69 or L15a)	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56	32.38 or hot w Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table	37.03  ater is fr  Oct 64.04  8.66  ole 5  89.49  5	39.7 om com Nov 64.04 10.11	Dec 64.04		(66) (67) (68)
include (57)m in control of the include (57)m in control of th	alculation see Table (see Table (	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Appendix 101.39 ppendix 29.4 5a) 3 tive valu	34.2 only if c :  May 64.04 L, equati 4.29 dix L, eq 93.72 L, equat 29.4  3 es) (Tab	30 ylinder is  Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4  3 le 5)	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56 , also se 29.4	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table 29.4	37.03 ater is fr  Oct 64.04  8.66 ble 5 89.49 5 29.4	39.7 om com Nov 64.04 10.11 97.16	10.78  Dec 64.04  10.78		(66) (67) (68) (69) (70)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04	alculation see Table (see Table (	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4 5a) 3	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat 29.4	Jun 64.04 ion L9 o 3.62 uation L 86.51 ion L15 29.4	Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4	32.02 dwelling 64.04 lso see 5.08 3a), also 80.56 ), also see 29.4	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table 29.4	37.03  ater is fr  Oct 64.04  8.66  ble 5 89.49  5 29.4	39.7 om com Nov 64.04 10.11 97.16	Dec 64.04 10.78 104.38		(66) (67) (68) (69)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04 or include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (57)m include (56)m include (57)m include (56)m include (57)m include (56)m include (57)m includ	alculation lee Table (sole 5), War b Mar 4 64.04 llated in A 7.57 alculated in A 107.47 llated in A 29.4 lns (Table solution (negation (negation (negation (Table 5)))	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4 5a) 3 tive valu -51.23	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat 29.4  3 es) (Tab	30 ylinder is  Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4  3 le 5) -51.23	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4  3	32.02 dwelling 64.04 lso see 5.08 3a), also 80.56 ), also se 29.4	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table 29.4  3	37.03 ater is fr  Oct 64.04  8.66 ble 5 89.49 5 29.4  3	39.7 om com Nov 64.04 10.11 97.16 29.4 3	10.78  Dec 64.04  10.78  104.38  29.4  3		(66) (67) (68) (69) (70)
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m (58)m  alculation lee Table (sole 5), War b Mar 4 64.04 llated in A 7.57 alculated in A 107.47 llated in A 29.4 lns (Table solution (negation (negation (negation (Table 5)))	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Appendix 101.39 ppendix 29.4 5a) 3 tive valu	34.2 only if c :  May 64.04 L, equati 4.29 dix L, eq 93.72 L, equat 29.4  3 es) (Tab	30 ylinder is  Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4  3 le 5) -51.23	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4  3  -51.23	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56 ), also se 29.4 3	32.38 or hot w  Sep 64.04 Table 5 6.82 see Tal 83.41 ee Table 29.4  3  -51.23	37.03 ater is fr  Oct 64.04  8.66 ble 5 89.49 5 29.4  3 -51.23	39.7 om com Nov 64.04 10.11 97.16 29.4 3	10.78  104.38  29.4  3  -51.23		(66) (67) (68) (69) (70)	
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04 or include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (56)m include (57)m include (56)m include (57)m include (56)m include (57)m include (56)m include (57)m includ	alculation see Table (cole 5), War (alculated in Alculated  35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4 5a) 3 tive valu -51.23	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat 29.4  3 es) (Tab	30 ylinder is  Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4  3 le 5) -51.23	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4  3  -51.23	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56 ), also se 29.4 3	32.38 or hot w  Sep 64.04 Table 5 6.82 o see Tal 83.41 ee Table 29.4  3	37.03 ater is fr  Oct 64.04  8.66 ble 5 89.49 5 29.4  3 -51.23	39.7 om com Nov 64.04 10.11 97.16 29.4 3	10.78  104.38  29.4  3  -51.23		(66) (67) (68) (69) (70)	
include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (57)m in or include (58)m include (54.04	40.03  alculation  alculation  bee Table ( ble 5), War  4 64.04  ulated in A  7.57  alculated ir  3 107.47  ulated in A  29.4  ns (Table (  3 -51.23  (Table 5)  4 53.8  5 =	35.38 of (65)m 5 and 5a tts Apr 64.04 ppendix 5.73 n Append 101.39 ppendix 29.4 5a) 3 tive valu -51.23	34.2 only if c ):  May 64.04 L, equati 4.29 dix L, equ 93.72 L, equat 29.4  3 es) (Tab	30 ylinder is  Jun 64.04 ion L9 of 3.62 uation L 86.51 ion L15 29.4  3 le 5) -51.23	28.57 s in the of  Jul 64.04 r L9a), a 3.91 13 or L1: 81.69 or L15a) 29.4  3  -51.23	32.02 dwelling Aug 64.04 lso see 5.08 3a), also 80.56 ), also se 29.4 3	32.38 or hot w  Sep 64.04 Table 5 6.82 see Tal 83.41 ee Table 29.4  3  -51.23	37.03 ater is fr  Oct 64.04  8.66 ble 5 89.49 5 29.4  3 -51.23	39.7 om com  Nov 64.04  10.11  97.16  29.4  3  -51.23	10.78  104.38  29.4  3  -51.23		(66) (67) (68) (69) (70)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	11.28	x	0.4	x	0.7	] =	2.28	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	11.28	x	0.4	x	0.7	=	0.7	(75)
Northeast 0.9x 0.77	x	1.04	x	22.97	x	0.4	x	0.7	=	4.63	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	41.38	x	0.4	x	0.7	=	8.35	(75)
Northeast 0.9x 0.77	x	0.32	x	41.38	x	0.4	x	0.7	=	2.57	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	67.96	x	0.4	x	0.7	=	13.71	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	67.96	x	0.4	X	0.7	=	4.22	(75)
Northeast 0.9x 0.77	x	1.04	x	91.35	x	0.4	x	0.7	=	18.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.35	x	0.4	x	0.7	=	5.67	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	97.38	x	0.4	x	0.7	=	19.65	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	91.1	x	0.4	x	0.7	=	18.38	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.1	x	0.4	x	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	72.63	x	0.4	x	0.7	=	4.51	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	50.42	x	0.4	x	0.7	=	10.17	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	50.42	x	0.4	x	0.7	=	3.13	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	28.07	x	0.4	X	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	28.07	x	0.4	x	0.7	=	1.74	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	14.2	x	0.4	x	0.7	=	2.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	14.2	x	0.4	X	0.7	=	0.88	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	9.21	x	0.4	x	0.7	=	1.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	9.21	x	0.4	x	0.7	=	0.57	(75)
Southwest <sub>0.9x</sub> 0.77	X	2	x	36.79	]	0.4	X	0.7	=	14.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	36.79	]	0.4	X	0.7	=	10.35	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	62.67	]	0.4	X	0.7	=	24.32	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	62.67	]	0.4	X	0.7	=	17.63	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	85.75	]	0.4	X	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	X	85.75	]	0.4	X	0.7	=	24.13	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	106.25	]	0.4	X	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	106.25	]	0.4	X	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	119.01	]	0.4	X	0.7	=	46.19	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	119.01	]	0.4	X	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub> 0.77	x	2	x	118.15	]	0.4	x	0.7	=	45.85	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	118.15	]	0.4	x	0.7	=	33.24	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	113.91	]	0.4	x	0.7	=	44.21	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	113.91	]	0.4	x	0.7	=	32.05	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	×	104.39	]	0.4	x	0.7	=	40.51	(79)

Southwe	est <sub>0.9x</sub>	0.77	X	1.4	15	X	10	04.39			0.4	×	0.7	=	29.37	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2	2	X	9	2.85			0.4	x	0.7	=	36.03	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	1.4	<b>4</b> 5	X	9	2.85	]		0.4	x [	0.7	=	26.12	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2	2	x	6	9.27	]		0.4	x [	0.7	=	26.88	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	x	6	9.27	]		0.4	x [	0.7	=	19.49	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2	2	x	4	4.07	]		0.4	x [	0.7	=	17.1	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	x	4	4.07			0.4	x	0.7	=	12.4	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	2	2	x	3	1.49			0.4	x	0.7	=	12.22	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	x	3	1.49			0.4	x	0.7		8.86	(79)
Solar g	ains in w	atts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	27.61	48.02	68.33	89.06	103.78	10	04.79	100.3	89.	05	75.46	53.78	33.25	23.51		(83)
Total g	ains – in	ternal a	nd sola	r (84)m =	= (73)m	+ (8	83)m	, watts					_	_	_	
(84)m=	251.78	270.21	282.38	290.55	292.96	2	81.8	269.5	262	.93	255.88	246.91	240.87	241.67		(84)
7. Mea	an intern	al temp	erature	(heating	season	)										
	erature c			,		<i>'</i>	area f	from Tal	ole 9,	, Th	1 (°C)				21	(85)
•	tion facto	•				-					, ,					
ſ	Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	0.95	0.94	0.91	0.87	0.79	(	0.67	0.53	0.5	66	0.73	0.87	0.93	0.95		(86)
Mean	internal	temner	ature in	living ar	ea T1 (fo	مااہ	w sta	ns 3 to 7	7 in T	ahle	9c)					
(87)m=	18.91	19.11	19.46	19.94	20.39	_	0.74	20.9	20.		20.64	20.08	19.43	18.87	7	(87)
L				<u> </u>	<u> </u>	_		l	I							, ,
· r	erature o	uring n	20.01	20.02	20.02	_	eiiing 20.04	20.04	20.		20.03	20.02	20.02	20.01	7	(88)
(88)m=				<u> </u>	L	I		l	<u> </u>	04	20.03	20.02	20.02	20.01		(00)
г	tion facto			1	· · ·	<del>-                                    </del>		·	<del>–</del>				_		7	
(89)m=	0.94	0.93	0.9	0.85	0.75		0.6	0.44	0.4	17	0.68	0.85	0.92	0.95		(89)
Mean	internal	temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)	_		_	
(90)m=	18.1	18.3	18.64	19.12	19.54	1	9.87	19.99	19.	98	19.78	19.26	18.62	18.07		(90)
											f	LA = Liv	ing area ÷ (4	4) =	0.63	(91)
Mean	internal	temper	ature (fo	or the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) × T2					
(92)m=	18.61	18.8	19.15	19.63	20.07	1	0.42	20.56	20.		20.32	19.78	19.13	18.57		(92)
Apply	adjustm	ent to th	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate				
(93)m=	18.61	18.8	19.15	19.63	20.07	2	0.42	20.56	20.	55	20.32	19.78	19.13	18.57		(93)
8. Spa	ace heati	ng requ	uiremen													
				•		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-ca	lculate	
the uti	lisation f					_		l					T	I _	7	
[	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Г	tion facto				0.70	Γ,	2.02	0.40	T 0.5	<u> </u>	0.00	0.04	T 0.04	0.04		(94)
(94)m=	0.93	0.91	0.89	0.84	0.76		0.63	0.49	0.5	02	0.69	0.84	0.91	0.94		(94)
(95)m=	l gains, h	246.89	250.46	243.49	221.74	1-1-	77.15	132.62	136	12	177.82	207.24	218.57	226.07		(95)
L	ly avera					1		102.02	130	.74	111.02	201.24	210.07			(55)
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.	<sub>.4</sub> T	14.1	10.6	7.1	4.2		(96)
L	oss rate			<u> </u>	<u> </u>				ļ				1	L <u>-</u>		(/
(97)m=		532.93	483.59	404.13	314.38	_	15.21	146.53	152	<del>_</del> _	231.42	344.57	454.3	546.11		(97)
(= )													1		_	, ,

Space heatin	g require	ement fo	r each m	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m= 234.99	192.21	173.45	115.66	68.93	0	0	0	0	102.17	169.73	238.11		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	1295.24	(98)
Space heatin	g require	ement in	kWh/m²	/year							[	37.01	(99)
9a. Energy red	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space heating	_			, .							г		7,
Fraction of sp			-		mentary	-	(000) 4	(204)			ļ	0	(201)
Fraction of sp			-	• •			(202) = 1 -	,	(202)]		ļ	1	(202)
Fraction of to		_	•				(204) = (20	02) <b>x</b> [1 –	(203)] =		Į	1	(204)
Efficiency of	•					. 0/					Į	90.4	(206)
Efficiency of					· ·							0	(208)
Jan Space heatin	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
234.99	192.21	173.45	115.66	68.93	0	0	0	0	102.17	169.73	238.11		
(211)m = {[(98	)m x (20	4)1 } x 1	00 ÷ (20	)6)	<u> </u>								(211)
259.95	212.63	191.87	127.94	76.24	0	0	0	0	113.02	187.75	263.39		,
							Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	1432.79	(211)
Space heatin	•		- /	month							_		_
$= \{[(98)m \times (20)]\}$	I				ı				Ι	I			
(215)m= 0	0	0	0	0	0	0	0 Tota	0 L (k\\/b/vo	0 ar) =Sum(2	0	0		7(245)
Water heating	•						Tota	i (KVVII/yea	ar) =00111(2	2 1 3) <sub>15,1012</sub>		0	(215)
Output from w	_	ter (calc	ulated al	oove)									
141.63	123.72	128.72	114.17	110.53	97.35	93.27	103.97	105.12	119.7	127.78	138.3		
Efficiency of w	ater hea	ter										80.3	(216)
(217)m= 86.32	86.16	85.8	85.08	83.9	80.3	80.3	80.3	80.3	84.66	85.77	86.41		(217)
Fuel for water $(219)m = (64)$	•												
(219)m = 164.08	143.59	150.02	134.18	131.74	121.24	116.15	129.48	130.91	141.4	148.99	160.06		
	•				•		Tota	I = Sum(2	19a) <sub>112</sub> =			1671.85	(219)
Annual totals									k\	Wh/year	 -	kWh/yea	_
Space heating	fuel use	ed, main	system	1								1432.79	╛
Water heating	fuel use	d									Ĺ	1671.85	
Electricity for p	oumps, f	ans and	electric	keep-ho	t								
mechanical v	entilatio	n - balan	iced, ext	ract or p	ositive ii	nput fron	n outside	€			138.54		(230a
central heatin	ng pump	•									30		(230c
boiler with a f	fan-assis	ted flue									45		(230e
Total electricity for the above, kWh/year sum of (230a)(230g) = 213.54 (231)											(231)		
Electricity for I	-		-									185.19	

	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	309.48 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	361.12 (264)
Space and water heating	(261) + (262) + (263) + (264) =		670.6 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	110.83 (267)
Electricity for lighting	(232) x	0.519 =	96.11 (268)
Total CO2, kg/year	sum	of (265)(271) =	877.54 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	25.07 (273)
El rating (section 14)			85 (274)

		Hear	Details:						
	A.I. D''.I.	Oser					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Name.	Ottoma 1 0/11 2012		y Address			ergy Eff		71. 1.0.4.20	
Address :		· ·	,	,			,		
1. Overall dwelling dime	nsions:								
Ground floor		Ar	ea(m²)	(4.5)		ight(m)	<b>1</b> (0-)	Volume(m³	<u>-</u>
		4 \		(1a) x	3	.09	(2a) =	108.15	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	+(1n)	35	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	108.15	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
N. arkana fallerana	heating he	ating		, ,			40	-	_
Number of chimneys	0 +	0 +	0	] = [	0		40 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				L	2	X '	10 =	20	(7a)
Number of passive vents	i			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	20		÷ (5) =	0.18	(8)
•	peen carried out or is intended,			ontinue fr			. (0) =	0.16	
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of openir		oriding to the gre	ater wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unsealed	d) or 0.1 (sea	iled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught strip	pped						0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	arron avance and in authic		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	5	(17)
•	es if a pressurisation test has b				is beina u	sed		0.43	(18)
Number of sides sheltere			, ,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	x (20) =				0.43	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ÷ 4								
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
<u> </u>						-		ı	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51	]	
Calculate effec		-	rate for t	he appli	cable ca	se	!	!	!	ļ	·	J	
If mechanica			and the NI (O	10h) (00	-) <b>- - -</b> (-		MEN - 11 -		) (00-)			С	
If exhaust air h		•	•	, ,	,	•		,	) = (23a)			C	
If balanced with		-	•	_					21.) (	001 ) [	4 (00.)	4007	(23c)
a) If balance	ed mecha	anical ve	entilation 0	with he	at recove	ery (MVI	HR) (24a 	$\frac{a)m = (22)}{0}$	2b)m + (   0	23b) × [	1 – (23c) 1 <sub>0</sub>	i ÷ 100] 1	(24a)
		<u> </u>		<u> </u>		<u> </u>					0	J	(24a)
b) If balance (24b)m= 0	o mech	anicai ve	o tiliation	without 0	neat rec		0 (24)	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2b)m + (.	230)	0	1	(24b)
c) If whole h	<u> </u>	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>	<u> </u>				J	(210)
,				•	o); other				.5 × (23b	)	_	,	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n				•	ve input erwise (2				0.5]				
(24d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63	]	(24d)
Effective air	change	rate - er	nter (24a	) or (24l	b) or (24	c) or (24	d) in bo	x (25)				•	
(25)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63	]	(25)
3. Heat losse	s and he	at loss r	naramet	or.	•							•	
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		AXU	Z)	k-value		A X k kJ/K
	arca	(111)											
Doors Type 1									(W/l	N)	kJ/m²-	IX.	
Doors Type 1 Doors Type 2					2.13	x	1	= [	2.13	N)	KJ/III	K.	(26)
Doors Type 2					2.13	x x	1	= [	2.13	N)	KJ/III	· ·	(26) (26)
Doors Type 2 Doors Type 3					2.13 0.94 0.75	x x x	1 1	=	2.13 0.94 0.75		KJ/IIII	· ·	(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	a 1				2.13 0.94 0.75 0.68	x x x x x	1 1 1 1	= [ = [ = [	2.13 0.94 0.75 0.68	> 	KJ/IIII	· ·	(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type					2.13 0.94 0.75 0.68 1.77	x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35		KJ/IIII		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type	e 2				2.13 0.94 0.75 0.68 1.77 0.92	x x x x x x x 1 x 1	1 1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35 1.22		KJ/IIII		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type	e 2 e 3				2.13 0.94 0.75 0.68 1.77 0.92 0.28	x x x x x x x x x 1 x x 1 x 1	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37		KJ/IIII		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type	e 2 e 3 e 4	10	4.09		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7		KJ/IIII	~ 	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1	2 2 3 4 4 15.4		4.08	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05		KJ/IIII		(26) (26) (26) (26) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2	2 2 2 3 4 4 15.4 2.00	4	0	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	2 2 2 3 4 4 15.4 2.0 2.8	7	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 2 3 4 4 15.4 2.0 2.8 18.3	7	0 0 4.67		2.13 0.94 0.75 0.68 1.77 0.92 0.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	2.04 2.04 2.04 2.85 18.3	7 39	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2.8 18.3 15.4 2.0 2.8 18.3 35	4 7 89 , m <sup>2</sup>	0 0 4.67	·	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55				(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 18.3 35 elements di roof winders on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55			13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area Fabric heat los	2.04 2.04 2.85 18.3 35 28lements 1 roof winddas on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x (A x k)	0 4.67 0 effective winternal wall	indow U-va	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35 73.78 alue calculatitions	x x x x x1 x1 x1 x1 x1 x1 x2 x x x added using	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in (2) + (32a).	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instea	ad of a do	tailed calc	ulation										
Thermal bridge				usina An	pendix I	K						3.69	(36)
if details of therma	,	,			•							0.00	(00)
Total fabric hea	at loss		, ,	,	,			(33) +	(36) =			23.78	(37)
Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 23.33	23.12	22.91	21.93	21.75	20.89	20.89	20.73	21.22	21.75	22.12	22.51		(38)
Heat transfer of	coefficier	nt, W/K		-	-	-	-	(39)m	= (37) + (37)	38)m	-		
(39)m= 47.11	46.9	46.69	45.71	45.52	44.67	44.67	44.51	45	45.52	45.9	46.28		
Heat loss para	meter (H	HLP), W/	′m²K			-	-		Average = = (39)m ÷		12 /12=	45.71	(39)
(40)m= 1.35	1.34	1.33	1.31	1.3	1.28	1.28	1.27	1.29	1.3	1.31	1.32		
Number of day	s in mor	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	1.31	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•		•	•	•	•		•	•	•	!	
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
A a a		NI.										1	(40)
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		.28		(42)
Annual averag	,	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		64	1.62		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	f		l	
						•	ı .			l	I _	1	
Jan Hot water usage ir	Feb	Mar day for ea	Apr	Vd m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08		
(44)m= 71.08	00.49	05.91	03.32	00.74	36.10	30.10	60.74		Total = Su	<u> </u>		775.4	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			( /		770.4	(\.,
(45)m= 105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08		
									Total = Su	m(45) <sub>112</sub> =	-	1016.67	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 15.81	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31		(46)
Water storage Storage volum		includin	na anv eo	alar or M	WHRS	etorana	within es	ma vas	امء		0	1	(47)
If community h	` ,					_		arric ves	301		0		(47)
Otherwise if no	_			_			. ,	ers) ente	er '0' in (	47)			
Water storage			•					,	`	,			
a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	=			0		(50)
b) If manufact			-								0	l	(E4)
Hot water stora If community h	-			€ ∠ (KVVI	i // ii (i <del>C</del> /U2	ay <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53)	3) =	0		(54)
Enter (50) or (54) in (55)			0		(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$				
(56)m= 0 0 0 0 0 0	0 0	0 0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m	where (H11) is fro	m Append	x H	
(57)m= 0 0 0 0 0 0	0 0	0 0	0		(57)
Primary circuit loss (annual) from Table 3			0		(58)
Primary circuit loss calculated for each month (59)m = (58) $\div$	365 × (41)m				
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder t	thermostat)			
(59)m= 0 0 0 0 0 0	0 0	0 0	0		(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	41)m				
(61)m= 36.22 31.53 33.59 31.23 30.95 28.68 29.64	4 30.95 31.23	33.59 33.78	36.22		(61)
Total heat required for water heating calculated for each mon	$sin (62) m = 0.85 \times (48)$	5)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 141.63 123.72 128.72 114.17 110.53 97.35 93.2	7 103.97 105.12	119.7 127.78	138.3		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar	ntity) (enter '0' if no solar c	contribution to wate	er heating)		
(add additional lines if FGHRS and/or WWHRS applies, see	Appendix G)				
(63)m= 0 0 0 0 0 0	0 0	0 0	0		(63)
Output from water heater					
(64)m= 141.63 123.72 128.72 114.17 110.53 97.35 93.2	7 103.97 105.12	119.7 127.78	138.3		_
	Output from water	er heater (annual) <sub>1</sub>	12	1404.27	(64)
Heat gains from water heating, kWh/month 0.25 ´[0.85 x (45	)m + (61)m] + 0.8 x [	(46)m + (57)m	+ (59)m	]	
(65)m= 44.1 38.53 40.03 35.38 34.2 30 28.5	7 20 00 20 00				
	7 32.02 32.38	37.03 39.7	43		(65)
include (57)m in calculation of (65)m only if cylinder is in th				eating	(65)
				eating	(65)
include (57)m in calculation of (65)m only if cylinder is in th				eating	(65)
include (57)m in calculation of (65)m only if cylinder is in th 5. Internal gains (see Table 5 and 5a):	e dwelling or hot wat			eating	(65)
include (57)m in calculation of (65)m only if cylinder is in th  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	e dwelling or hot wat	ter is from com	munity h	eating	(65)
include (57)m in calculation of (65)m only if cylinder is in th  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	e dwelling or hot wat  Aug Sep  4 64.04 64.04	ter is from com  Oct Nov	munity h	eating	
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04	e dwelling or hot wat  Aug Sep 4 64.04 64.04 , also see Table 5	ter is from com  Oct Nov	munity h	eating	
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04 , also see Table 5	Oct         Nov           64.04         64.04           8.9         10.39	Dec 64.04	eating	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04 , also see Table 5 2 5.22 7.01 L13a), also see Table	Oct         Nov           64.04         64.04           8.9         10.39	Dec 64.04	eating	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04  , also see Table 5 2 5.22 7.01  L13a), also see Table 9 80.56 83.41	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16	Dec 64.04	eating	(66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04 , also see Table 5 2 5.22 7.01 L13a), also see Table 9 80.56 83.41 5a), also see Table 5	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16	Dec 64.04	eating	(66) (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04 , also see Table 5 2 5.22 7.01 L13a), also see Table 9 80.56 83.41 5a), also see Table 5	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16	Dec 64.04 11.08	eating	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.05 64.04 64.04 64.05 64.05 67)m= 10.78 9.57 7.78 5.89 4.41 3.72 4.02 Appliances gains (calculated in Appendix L, equation L13 or (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.65 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep 4 64.04 64.04 , also see Table 5 2 5.22 7.01 L13a), also see Table 9 80.56 83.41 5a), also see Table 5	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16	Dec 64.04 11.08	eating	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64.04  , also see Table 5 5.22 7.01  L13a), also see Table 9 80.56 83.41  5a), also see Table 5 2 29.4 29.4	Oct Nov 64.04 64.04  8.9 10.39  e 5  89.49 97.16  5  29.4 29.4	Dec 64.04 11.08 104.38	eating	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul	Aug Sep 4 64.04 64.04  , also see Table 5 5.22 7.01  L13a), also see Table 9 80.56 83.41  5a), also see Table 5 2 29.4 29.4	Oct Nov 64.04 64.04  8.9 10.39  e 5  89.49 97.16  5  29.4 29.4	Dec 64.04 11.08 104.38	eating	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan	Aug Sep 4 64.04 64.04  , also see Table 5 5.22 7.01  L13a), also see Table 9 80.56 83.41  5a), also see Table 5 2 29.4 29.4	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16 5 29.4 29.4	Dec 64.04 11.08 104.38 29.4	eating	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep 4 64.04 64	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16 5 29.4 29.4	Dec 64.04 11.08 104.38 29.4	eating	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 67.00 Eighting gains (calculated in Appendix L, equation L9 or L9a) (67)m= 10.78 9.57 7.78 5.89 4.41 3.72 4.02 Appliances gains (calculated in Appendix L, equation L13 or (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69 Cooking gains (calculated in Appendix L, equation L15 or L18 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep 4 64.04 64	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16 6 29.4 29.4  3 3  -51.23 -51.23	Dec 64.04  11.08  104.38  29.4  3  -51.23	eating	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 67.00 Eighting gains (calculated in Appendix L, equation L9 or L9a) (67)m= 10.78 9.57 7.78 5.89 4.41 3.72 4.02 Appliances gains (calculated in Appendix L, equation L13 or (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep 4 64.04 64.04  , also see Table 5 5.22 7.01  L13a), also see Table 9 80.56 83.41  5a), also see Table 5 29.4 29.4  3 3 3 -51.23 -51.23  43.03 44.97  7)m + (68)m + (69)m + (70)	Oct Nov 64.04 64.04  8.9 10.39 e 5 89.49 97.16 6 29.4 29.4  3 3  -51.23 -51.23	Dec 64.04  11.08  104.38  29.4  3  -51.23	eating	(66) (67) (68) (69) (70)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0.92	x	11.28	x	0.63	x	0.7	] =	3.17	(75)
Northeast 0.9	0.77	X	0.28	x	11.28	X	0.63	X	0.7	=	0.97	(75)
Northeast 0.9	0.77	X	0.92	х	22.97	X	0.63	x	0.7	=	6.46	(75)
Northeast 0.9	0.77	X	0.28	x	22.97	x	0.63	x	0.7	=	1.97	(75)
Northeast 0.9	0.77	X	0.92	x	41.38	x	0.63	x	0.7	=	11.63	(75)
Northeast 0.9	0.77	X	0.28	х	41.38	X	0.63	x	0.7	=	3.54	(75)
Northeast 0.9	0.77	X	0.92	х	67.96	x	0.63	x	0.7	<u> </u>	19.11	(75)
Northeast 0.9	0.77	X	0.28	x	67.96	x	0.63	x	0.7	=	5.82	(75)
Northeast 0.9	0.77	X	0.92	x	91.35	X	0.63	x	0.7	=	25.68	(75)
Northeast 0.9	0.77	X	0.28	x	91.35	X	0.63	X	0.7	=	7.82	(75)
Northeast 0.9	0.77	X	0.92	x	97.38	X	0.63	X	0.7	=	27.38	(75)
Northeast 0.9	0.77	X	0.28	x	97.38	X	0.63	x	0.7	=	8.33	(75)
Northeast 0.9	0.77	X	0.92	x	91.1	X	0.63	X	0.7	=	25.61	(75)
Northeast 0.9	0.77	X	0.28	x	91.1	X	0.63	X	0.7	=	7.8	(75)
Northeast 0.9	0.77	X	0.92	x	72.63	x	0.63	x	0.7	] =	20.42	(75)
Northeast 0.9	0.77	X	0.28	х	72.63	x	0.63	x	0.7	<u> </u>	6.21	(75)
Northeast 0.9	0.77	X	0.92	x	50.42	X	0.63	X	0.7	=	14.18	(75)
Northeast 0.9	0.77	X	0.28	x	50.42	x	0.63	x	0.7	=	4.31	(75)
Northeast 0.9	0.77	X	0.92	х	28.07	x	0.63	x	0.7	<u> </u>	7.89	(75)
Northeast 0.9	0.77	X	0.28	x	28.07	x	0.63	x	0.7	=	2.4	(75)
Northeast 0.9	0.77	X	0.92	x	14.2	x	0.63	x	0.7	=	3.99	(75)
Northeast 0.9	0.77	X	0.28	x	14.2	x	0.63	х	0.7	] =	1.21	(75)
Northeast 0.9	0.77	X	0.92	х	9.21	x	0.63	x	0.7	<u> </u>	2.59	(75)
Northeast 0.9	0.77	X	0.28	x	9.21	x	0.63	x	0.7	=	0.79	(75)
Southwest <sub>0.9</sub>	0.77	X	1.77	х	36.79		0.63	X	0.7	=	19.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	36.79		0.63	x	0.7	=	14.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	62.67		0.63	x	0.7	=	33.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	62.67		0.63	X	0.7	=	24.52	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	85.75		0.63	x	0.7	=	46.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	85.75		0.63	x	0.7	=	33.55	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	106.25		0.63	x	0.7	=	57.48	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	106.25		0.63	x	0.7	=	41.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	119.01	Ì	0.63	x	0.7	=	64.38	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	119.01	ĺ	0.63	x	0.7	=	46.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	118.15	ĺ	0.63	x	0.7	=	63.91	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	118.15	j	0.63	x	0.7	] =	46.22	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	113.91	j	0.63	x	0.7	] =	61.62	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	113.91	Ī	0.63	x	0.7	] =	44.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	х	104.39	j	0.63	х	0.7	=	56.47	(79)

	_															
Southw	est <sub>0.9x</sub>	0.77	x	1.2	28	X	10	04.39	] [		0.63	X	0.7	=	40.84	(79)
Southw	est <sub>0.9x</sub>	0.77	x	1.7	77	X	9	2.85	] [		0.63	X	0.7	=	50.23	(79)
Southw	est <sub>0.9x</sub>	0.77	x	1.2	28	X	9	2.85	] [		0.63	X	0.7	=	36.32	(79)
Southw	est <sub>0.9x</sub>	0.77	x	1.7	77	X	6	9.27	] [		0.63	X	0.7	=	37.47	(79)
Southw	est <sub>0.9x</sub>	0.77	x	1.2	28	x	6	9.27	] [		0.63	x	0.7	=	27.1	(79)
Southw	est <sub>0.9x</sub>	0.77	х	1.7	77	X	4	4.07			0.63	x	0.7	=	23.84	(79)
Southw	est <sub>0.9x</sub>	0.77	х	1.2	28	X	4	4.07			0.63	х	0.7	=	17.24	(79)
Southw	est <sub>0.9x</sub>	0.77	х	1.7	77	x	3	1.49	] [		0.63	X	0.7	=	17.03	(79)
Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	3	1.49			0.63	X	0.7		12.32	(79)
	_				_											
Solar g	ains in y	watts, ca	alculated	for eac	h month				(83)m	= St	ım(74)m .	(82)m				
(83)m=	38.43	66.84	95.11	123.96	144.43	14	45.84	139.59	123.	.94	105.04	74.86	46.29	32.73		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m	, watts							-	
(84)m=	262.89	289.3	309.38	325.6	333.73	32	22.95	308.9	297.	.97	285.64	268.24	254.19	251.19		(84)
7. Me	an interi	nal temp	erature	(heating	season	)										
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	Th1	1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for I	iving are	ea, h1,m	ı (se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ι,	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.98	0.96	0.9	C	).77	0.61	0.6	4	0.85	0.97	0.99	1		(86)
Mean	internal	temper	ature in	living ar	ea T1 (fo	ollo	w ste	ps 3 to 7	in T	able	9c)		•		•	
(87)m=	19.64	19.79	20.03	20.37	20.68	_	20.9	20.97	20.9	_	20.83	20.44	19.99	19.63		(87)
Tomn	oroturo	during h	neating p	oriode ir	roct of	dw	allina	from To	hla C	 . Th	.2 (°C)		1	1		
(88)m=	19.8	19.81	19.81	19.84	19.84	_	9.86	19.86	19.8	_	19.85	19.84	19.83	19.82		(88)
					l	<u> </u>			<u> </u>				1			, ,
ı	0.99	0.99	ains for r	0.95		_	m (se	0.46	r –	4	0.78	0.95	0.99	0.99		(89)
(89)m=			0.98		0.86	<u> </u>			0.5				0.99	0.99		(69)
			ature in			$\overline{}$				$\overline{}$					ı	
(90)m=	18.02	18.24	18.6	19.1	19.52	1	9.79	19.85	19.8	85	19.71	19.21	18.56	18.02		(90)
											Ť	LA = Liv	ing area ÷ (	4) =	0.63	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llin	g) = fl	_A × T1	+ (1 -	– fL	A) × T2				-	
(92)m=	19.04	19.21	19.5	19.9	20.25	2	0.49	20.56	20.5	55	20.41	19.98	19.46	19.03		(92)
			he mean		<del></del>	_				$\overline{}$					ı	
(93)m=	19.04	19.21	19.5	19.9	20.25	2	0.49	20.56	20.5	55	20.41	19.98	19.46	19.03		(93)
•		•	uirement										<i>(</i> )			
			ernal ter or gains (			ned	at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m=	:(76)m an	d re-cald	culate	
	Jan	Feb	Mar	Apr	May	Π	Jun	Jul	Δι	ug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		Iviay	<u> </u>	oun	Oui		<u> </u>	ОСР	000	1100	000		
(94)m=	0.99	0.99	0.98	0.95	0.88		).73	0.55	0.5	9	0.82	0.95	0.99	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (8	4)m	_										
(95)m=	260.69	285.38	301.73	308.11	292.68	23	35.49	170.8	176.	.59	233.98	255.29	250.45	249.45		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able	e 8									
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	- (96)m	]			•	
(97)m=	694.38	671.17	606.97	502.84	389.24	26	63.07	176.77	184.	.79	284.04	427.09	567.3	686.42		(97)

(98)m= 322.66 259.29	. SINGIN IC	or each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m= 322.66 259.25	5 227.1	140.2	71.84	0	0	0	0	127.82	228.13	325.1		
						Tota	l per year	(kWh/year	) = Sum(98	3) <sub>15,912</sub> =	1702.1	(98)
Space heating requ	irement in	ı kWh/m²	<sup>2</sup> /year								48.63	(99)
9a. Energy requirem	ents – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating:			, .							г		¬,,,,
Fraction of space he				mentary	•		(004)			Ĺ	0	(201)
Fraction of space he		•	` ,			(202) = 1 -	, ,	(000)1		Į	1	(202)
Fraction of total hea	•	•				(204) = (20	02) <b>×</b> [1 –	(203)] =		ļ	1	(204)
Efficiency of main s										ļ	93.4	(206)
Efficiency of second	lary/suppl	ementar	y heating	g system	1, %						0	(208)
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requ	<del>`</del>	calculate	d above)	0	0	0	0	127.82	228.13	325.1		
ļ				0	U	0	U	127.02	220.13	323.1		(04.4)
$(211)$ m = {[(98)m x (2)] 345.47   277.5	<del></del>	100 ÷ (20 150.11	76.91	0	0	0	0	136.85	244.25	348.07		(211)
010.11   211.0	12.0.10	100.11	70.01	Ů	Ů		_		211) <sub>15.1012</sub>		1822.38	(211)
Space heating fuel	`	• , .	month							L		`
$= \{[(98)m \times (201)] \} \times (215)m = 0 \qquad 0$	100 + (20	0	0	0	0	0	0	0	0	0		
(=15)							l (kWh/yea	ar) =Sum(2	215) <sub>15.1012</sub>	-	0	(215)
Water heating										L		
Output from water he		ulated a	bove)									
141.63 123.72	2 128.72	114.17	110.53	97.35	93.27	103.97	105.12	119.7	127.78	138.3		
							105.12					_
		I							1		80.3	(216)
Efficiency of water he (217)m= 87.06 86.87	86.47	85.57	84	80.3	80.3	80.3	80.3	85.22	86.49	87.13	80.3	(216) (217)
(217)m= 87.06 86.87 Fuel for water heatin	86.47 g, kWh/m	onth	84	80.3	80.3			85.22	86.49	87.13	80.3	
(217)m= 87.06 86.87 Fuel for water heatin (219)m = (64)m x 1	86.47 g, kWh/m 00 ÷ (217)	onth	131.59	80.3	80.3	80.3	80.3	140.47	86.49	87.13	80.3	
(217)m= 87.06 86.87 Fuel for water heatin (219)m = (64)m x 1	86.47 g, kWh/m 00 ÷ (217)	onth )m				80.3	80.3	140.47			80.3 1663.69	(217)
(217)m= $87.06$ $86.87Fuel for water heatin(219)$ m = $(64)$ m x 1 (219)m= $162.68$ $142.4Annual totals$	86.47 g, kWh/mo 00 ÷ (217) 1 148.87	onth )m 133.42	131.59			80.3	80.3	140.47 19a) <sub>112</sub> =		158.73	1663.69 <b>kWh/yea</b>	(217)
(217)m= $87.06$ $86.87Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4Annual totals$	86.47 g, kWh/mo 00 ÷ (217) 1 148.87	onth )m 133.42	131.59			80.3	80.3	140.47 19a) <sub>112</sub> =	147.73	158.73	1663.69	(217)
(217)m= 87.06 86.87  Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4   Annual totals  Space heating fuel u	86.47 g, kWh/m 00 ÷ (217) 1 148.87 sed, main	onth )m 133.42	131.59			80.3	80.3	140.47 19a) <sub>112</sub> =	147.73	158.73	1663.69 <b>kWh/yea</b>	(217)
(217)m= 87.06 86.87  Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4   Annual totals  Space heating fuel us  Water heating fuel us	86.47 g, kWh/mc 00 ÷ (217) 1 148.87 sed, main	onth )m 133.42	131.59	121.24		80.3	80.3	140.47 19a) <sub>112</sub> =	147.73	158.73	1663.69 <b>kWh/yea</b> 1822.38	(217)
(217)m= 87.06 86.87  Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4   Annual totals  Space heating fuel us  Water heating fuel us	86.47 g, kWh/mc 00 ÷ (217) 1 148.87 sed, main sed fans and	onth )m 133.42	131.59	121.24		80.3	80.3	140.47 19a) <sub>112</sub> =	147.73	158.73	1663.69 <b>kWh/yea</b> 1822.38	(217)
Fuel for water heatin (219)m = (64)m x 1 (219)m = 162.68 142.4  Annual totals Space heating fuel use Electricity for pumps	86.47 g, kWh/mc 00 ÷ (217) 1 148.87 sed, main sed fans and	onth )m 133.42 system electric	131.59	121.24		80.3	80.3	140.47 19a) <sub>112</sub> =	147.73	158.73	1663.69 <b>kWh/yea</b> 1822.38	(217) (219) r (2300
(217)m= 87.06 86.87  Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4   Annual totals  Space heating fuel use  Electricity for pumps central heating pum  boiler with a fan-ass	86.47 g, kWh/m 00 ÷ (217) 1 148.87 sed, main sed fans and	onth )m 133.42 system electric	131.59	121.24		80.3 129.48 Tota	80.3	140.47 19a) <sub>112</sub> = <b>k</b> 1	147.73 <b>Wh/year</b>	158.73	1663.69 <b>kWh/yea</b> 1822.38	(217)
(217)m= 87.06 86.87  Fuel for water heatin (219)m = (64)m x 1 (219)m= 162.68 142.4  Annual totals  Space heating fuel use Electricity for pumps central heating pum	86.47 g, kWh/m 00 ÷ (217) 1 148.87 sed, main sed fans and	onth )m 133.42 system electric	131.59	121.24		80.3 129.48 Tota	80.3 130.91 I = Sum(2 <sup>-1</sup>	140.47 19a) <sub>112</sub> = <b>k</b> 1	147.73 <b>Wh/year</b>	158.73	1663.69 <b>kWh/yea</b> 1822.38 1663.69	(217)  (219)  (230c) (230c)

Energy

kWh/year

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

**Emissions** 

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216 =	393.63 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	359.36 (264)
Space and water heating	(261) + (262) + (263) + (264) =		752.99 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	98.78 (268)
Total CO2, kg/year	sum	of (265)(271) =	890.7 (272)

TER =

(273)

25.45

## **SAP Input**

### Property Details: Flat Type C Energy Eff only

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:  $35.12 \text{ m}^2$  3.09 m

Living area: 23.9 m<sup>2</sup> (fraction 0.681)

Front of dwelling faces: North East

### Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D6_01	Manufacturer	Solid			Metal
Vent_06_01	Manufacturer	Solid			
Vent_06_05	Manufacturer	Solid			
Vent_06_04	Manufacturer	Solid			
Vent_06_06	Manufacturer	Solid			
V_D6_01	Manufacturer	Solid			Metal
Window_06_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D6_01	mm	0	0	1	2.13	1
Vent_06_01	mm	0	0	1	0.72	1
Vent_06_05	mm	0	0	1	0.99	1
Vent_06_04	mm	0	0	1	0.72	1
Vent_06_06	mm	0	0	1	0.72	1
V_D6_01	mm	0	0	1	0.63	1
Window_06_01	6mm	0.7	0.4	1.2	1.08	1
Window_06_04	6mm	0.7	0.4	1.2	1.97	1
Window_06_04	6mm	0.7	0.4	1.2	1.42	1
Window_06_05	6mm	0.7	0.4	1.2	1.45	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D6_01		06_01	North East	0	0
Vent_06_01		06_03	North East	0.6	1.2
Vent_06_05		06_03	South East	0.6	1.65
Vent_06_04		06_05	South West	0.6	1.2

## **SAP Input**

Vent_06_06	06_06	South West	0.6	1.2
V_D6_01	06_01	North East	0.3	2.11
Window_06_01	06_03	North East	0.9	1.2
Window_06_04	06_04	South East	1.195	1.65
Window_06_04	06_05	South West	1.185	1.2
Window_06_05	06_06	South West	1.21	1.2
Fanlight	06_01	North East	1.01	0.315

Overshading: Average or unknown

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element							
06_01	10.506	3.08	7.43	0.13	0	False	N/A
06_03	8.065	2.79	5.27	0.13	0	False	N/A
06_04	19.498	1.97	17.53	0.13	0	False	N/A
06_05	9.425	2.14	7.29	0.13	0	False	N/A
06_06	9.023	2.17	6.85	0.13	0	False	N/A
R6_01	35.12	0	35.12	0.1	0		N/A
Internal Element	S						

Thermal bridges:

Party Elements

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Manufacturer Declaration

Manufacturer's data

Efficiency: 89.5% (SEDBUK2009)

Condensing combi with automatic ignition

Fuel Burning Type: Modulation

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

## **SAP Input**

Water heating

Water heating: From main heating system

Water code: 901 Fuel :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:

Terrain type:

EPC language:

Wind turbine:

Photovoltaics:

Assess Zero Carbon Home:

100%

Dense urban

English

No

No

No

		User De	etails:						
Assessor Name:	Adam Ritchie			a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012			are Vei				n: 1.0.4.25	
		Property A	Address	Flat Ty	pe C En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		Area	• •	(10) v		ight(m)	(2a) =	Volume(m³	_
	\			(1a) x	3	.09	(2a) =	108.52	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 35	5.12	(4)			·		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	108.52	(5)
2. Ventilation rate:	main seconda		other		40401			m³ nor hou	-
	main seconda heating heating		otner		total		ı	m³ per hou	r 
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	X	10 =	0	(7a)
Number of passive vents	1			Ī	0	x	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	<b>X</b>	40 =	0	(7c)
				_					
							Air ch	anges per ho	ur
,	ys, flues and fans = $(6a)+(6b)+$				0		÷ (5) =	0	(8)
Number of storeys in t	neen carried out or is intended, proce the dwelling (ns)	ed to (17), o	therwise o	continue tr	om (9) to (	(16)		0	(9)
Additional infiltration	no awaiiing (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 for	masoni	y constr	uction	-		0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding	to the greate	er wall are	a (after			'		_
deducting areas of openii	ngs);	0.1 (sealed	d). else	enter 0				0	(12)
If no draught lobby, en	,	(000.00	,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration		(	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelope	area	2.5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has been do	one or a degi	ree air pe	rmeability	is being u	sed			7(40)
Shelter factor	eu .	(	(20) = 1 -	[0.075 x (1	9)] =			0	(19)
Infiltration rate incorporat	ting shelter factor	(	(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	-								<b></b> ` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 Easter (22a)m (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(-20)	5 1.00 0.95	1 3.33	0.02		L	12	10	I	

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se	-		•			'	
If mechanical If exhaust air he			andiv N (S	3h) - (23a	a) v Emy (e	aguation (l	NS)) other	wice (23h	l) = (23a)		[	0.5	(2
If balanced with									) = (25a)			0.5	(2
a) If balance		-		_					2h\m + ('	23h) ∨ [·	1 _ (23c)	75.65	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(2
b) If balance	L1		<u> </u>			<u> </u>			<u>.                                    </u>				·
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extin < 0.5 ×			•	•				.5 × (23b	·)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the			•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(2
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(2
oors Type 2					0.72	Х	1	=	0.72				(:
oors Type 3					0.99	Х	1	=	0.99				(:
oors Type 4					0.72	X	1	= [	0.72				(:
													(:
oors Type 5					0.72	X	1	= [	0.72				
• •					0.72	_	1	= [	0.72				(
oors Type 6	<del>)</del> 1					×		= [					
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				(; (; (;
oors Type 5 oors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				(2
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	2 3 4 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(:
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 falls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type indows Type	2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
pors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				(1)

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity Cm	= S(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass par	, ,	⊃ = Cm ÷	: TFA) ir	n kJ/m²K			Indica	tive Value:	: Low		100	(35)
For design assessmen	ts where the de	tails of the	•			ecisely the				able 1f	100	(00)
can be used instead of Thermal bridges:			ucina An	nondiy l	<b>/</b>						40.75	7(26)
if details of thermal brid	` ,		• .	•							13.75	(36)
Total fabric heat lo		10WH (30) =	= 0.03 X (3	1)			(33) +	(36) =			36.08	(37)
Ventilation heat lo	ss calculated	d monthly	У				(38)m	= 0.33 × (	25)m x (5)			
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	96 9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer coef	ficient, W/K						(39)m	= (37) + (3	38)m		l	
(39)m= 46.15 46	.04 45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss paramet	er (HLP), W	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	45.34	(39)
(40)m= 1.31 1.	31 1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
N. salasa at da sala		I - 4 - \					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.29	(40)
Number of days in Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	28 31	30	31	30	31	31	30	31	30	31		(41)
(41)1112	-0   01	1 00	01			01	00	01		01		(***)
4. Water heating	energy requ	irement:								kWh/ye	ear:	
Assumed occupar if TFA > 13.9, N	= 1 + 1.76 x	([1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		28		(42)
	= 1 + 1.76 x = 1		`	,	•	, <b>-</b>	,	ΓFA -13.	9)			(42)
if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76 x = 1 ot water usagerage hot water	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 64	.68		` '
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual average not more that 125 litres	= 1 + 1.76 x = 1 ot water usage age hot water s per person per	ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is thot and co	erage = designed ( ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` '
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual average not more that 125 litres	= 1 + 1.76 x = 1 ot water usage age hot water s per person per	ge in litre usage by r day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 64			` '
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre	= 1 + 1.76 x = 1 ot water usage age hot water s per person per	ge in litre usage by r day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` '
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre	= 1 + 1.76 x = 1 of water usage age hot water is per person per eb Mar es per day for ea	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed to lid)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us  Sep  63.39	Oct	9) 64 Nov	.68  Dec  71.15	776.21	` '
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre	= 1 + 1.76 x = 1 of water usage age hot water is per person per feb Mar es per day for ea	ge in litre usage by a r day (all w Apr ach month 63.39	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from	erage = designed in the designed in the designed in the designed in the design in thed	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Total = Sur	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average has Reduce the annual average has not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot water and the second seco	= 1 + 1.76 x = 1 of water usage age hot water is per person per feb Mar es per day for ea	ge in litre usage by a r day (all w Apr ach month 63.39	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from	erage = designed in the designed in the designed in the designed in the design in thed	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Total = Sur	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot to  (45)m= 105.52 92	= 1 + 1.76 x = 1 of water usage age hot water is per person per es per day for ea .56 65.98 water used - cal	ge in litre usage by r day (all w  Apr ach month 63.39	es per da 5% if the orater use, I May Vd,m = far 60.8 onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 07m / 3600 73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Total = Sunth (see Tail 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1	.68  Dec  71.15  c, 1d)  102.19	776.21	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot w (45)m= 105.52 92  If instantaneous water	e 1 + 1.76 x e 1 ot water usage hot water is per person per e b Mar es per day for ea e.56 65.98 water used - cal e.29 95.23 heating at point	ge in litre usage by a r day (all w Apr ach month 63.39    Culated me 83.02	es per da 5% if the a vater use, I May Vd,m = fa 60.8 onthly = 4.	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  68.39  73.97  70 to (61)	Oct  65.98  Total = Sur  86.21  Total = Sur	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43) (44) (45)
if TFA > 13.9, N if TFA £ 13.9, N Annual average has reduce the annual average has reduce the annual average in litres  Jan F Hot water usage in litres  (44)m= 71.15 68  Energy content of hot water average in litres  (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13	e 1 + 1.76 x e 1 ot water usage age hot water s per person per es per day for ea es	ge in litre usage by r day (all w  Apr ach month 63.39	es per da 5% if the orater use, I May Vd,m = far 60.8 onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 07m / 3600 73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Total = Sunth (see Tail 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average has Reduce the annual average has not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss	e 1 + 1.76 x e 1 ot water usage hot water is per person per es per day for ea es per	ge in litre usage by a r day (all w Apr ach month 63.39  culated me 83.02  t of use (no	es per da 5% if the a vater use, $I$ May $Vd,m = fa$ $60.8$ $79.66$ $0$ hot water $11.95$	ay Vd,av Iwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to ld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96	+ 36 a water us  Sep  63.39  6Wh/more 73.97  1 to (61)  11.1	Oct  65.98  Fotal = Surith (see Tail 86.21  Fotal = Surith 12.93	9) 64  Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot to  (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss Storage volume (li	= 1 + 1.76 x = 1 of water usage age hot water is per person per son	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  t of use (no	es per da 5% if the orater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or W	ay Vd,av lwelling is not and co  Jun ctor from 7  58.22  190 x Vd,r  68.74  storage),  10.31	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa	+ 36 a water us  Sep  63.39  6Wh/more 73.97  1 to (61)  11.1	Oct  65.98  Fotal = Surith (see Tail 86.21  Fotal = Surith 12.93	9) 64  Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43) (44) (45)
if TFA > 13.9, N if TFA £ 13.9, N Annual average have not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot w (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss Storage volume (little community heating of the community heating	e 1 + 1.76 x e 1 ot water usage hot water is per person per es per day for each sper day for each sper used - calculating at point in the sper day for each specific for each	ge in litre usage by a r day (all w Apr ach month 63.39  culated me 83.02  t of use (not 12.45  and any seanth in dw	es per da 5% if the a vater use, I May $Vd,m = fa$ 60.8 on the following of the following	ay Vd,av Iwelling is not and co  Jun ctor from 1  58.22  190 x Vd,r  68.74  r storage),  10.31  /WHRS nter 110	erage = designed of ld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56  storage  Ditres in	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  10 to (61)  11.1  ame vess	Oct  65.98  Total = Sunth (see Tail 86.21   9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)	
if TFA > 13.9, N if TFA £ 13.9, N Annual average he Reduce the annual ave not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot to  (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss Storage volume (li If community heati Otherwise if no sto Water storage loss	= 1 + 1.76 x = 1  of water usage age hot water is per person per ses per day for each ses pe	ge in litre usage by r day (all w Apr ach month 63.39  culated me 83.02  t of use (no 12.45  and any so ank in dw er (this in	es per da 5% if the o rater use, I  May  Vd,m = fa  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e acludes i	ay Vd,av lwelling is not and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  10 to (61)  11.1  ame vess	Oct  65.98  Total = Sunth (see Tail 86.21   9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)	
if TFA > 13.9, N if TFA £ 13.9, N Annual average have not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot w (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss Storage volume (li If community heati Otherwise if no sto Water storage loss a) If manufactures	e 1 + 1.76 x e 1 ot water usage hot water is per person per es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es per day for ea es es es per day for ea es es es per day for ea es es es es es es es es es es es es es	ge in litre usage by a r day (all w  Apr ach month 63.39  deculated me 83.02  t of use (no 12.45  and in dw er (this in	es per da 5% if the o rater use, I  May  Vd,m = fa  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e acludes i	ay Vd,av lwelling is not and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  10 to (61)  11.1  ame vess	Oct  65.98  Total = Sunth (see Tail 86.21   9) 64 Nov 68.56 m(44)12 = ables 1b, 1 94.1 m(45)12 = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)	
if TFA > 13.9, N if TFA £ 13.9, N Annual average have not more that 125 litres    Jan   F	= 1 + 1.76 x = 1  of water usage hot water is per person person person person person person day for each is per day for each is per day for each is person day for each is person day for each is person day for each is including and no taken in and no taken is including and no taken is including and no taken is declared by from Table in from Table	ge in litre usage by r day (all w Apr ach month 63.39  culated mo 83.02  t of use (no 12.45  ank in dw er (this in coss factor 2b	es per da 5% if the of water use, I  May  Vd,m = fact 60.8  onthly = 4.  79.66  o hot water 11.95  color or Water velling, encludes in	ay Vd,av lwelling is not and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to ld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56  storage 0 litres in neous con/day):	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47) mbi boil	+ 36 a water us  Sep  63.39 b kWh/mor  73.97 11.1 ame vess ers) ente	Oct  65.98  Total = Sunth (see Tail 86.21   9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33  0		(43) (44) (45) (46) (47) (48) (49)	
if TFA > 13.9, N if TFA £ 13.9, N Annual average have not more that 125 litres  Jan F Hot water usage in litre  (44)m= 71.15 68  Energy content of hot w (45)m= 105.52 92  If instantaneous water  (46)m= 15.83 13  Water storage loss Storage volume (li If community heati Otherwise if no sto Water storage loss a) If manufactures	e 1 + 1.76 x e 1 ot water usage hot water is per person per es per day for ea es per	ge in litre usage by a r day (all w Apr ach month 63.39  culated mo 83.02  t of use (no 12.45  and any so ank in dw er (this in coss facto 2b e, kWh/ye	es per da $5\%$ if the a vater use, I May $Vd,m = fa$ $60.8$ $0$ that water $11.95$ olar or W velling, e acludes i or is knowear	ay Vd,av lwelling is not and co Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39 b kWh/mor  73.97 11.1 ame vess ers) ente	Oct  65.98  Total = Sunth (see Tail 86.21   9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)	

Hot water stora	age loss f	factor fr	om Tabl	e 2 (kWl	h/litre/da	ay)					0		(51)
If community h	•		on 4.3										
Volume factor			01							-	0		(52)
Temperature fa											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 calc	ulated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicated	solar stor	rage, (57)r	m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (anr	nual) fro	m Table	3							0		(58)
Primary circuit	loss calc	culated f	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified by	factor fro	om Tabl	e H5 if t	here is s	solar wat	ter 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 cal	lculated f	or each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 36.26	31.56	33.62	31.26	30.98	28.71	29.67	30.98	31.26	33.62	33.81	36.26		(61)
Total heat requ	uired for v	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	1
(62)m= 141.78	123.84	128.85	114.29	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45		(62)
Solar DHW input of					<u> </u>	<u> </u>	<u> </u>			<u> </u>			, ,
(add additional									. commode	on to wate	or riodairig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ter heat	er			<u> </u>	ļ.	<u> </u>			<u> </u>			
Output Hom W	ator ricuti	C1											
(64)m= 141.78	123.84	128.85	114.29	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45		
(64)m= 141.78	123.84	128.85	114.29	110.65	97.45	93.37	104.08 Outr	105.23	119.83	127.91	138.45	1405.73	<b>(64)</b>
	l I					l	Outp	out from wa	ater heate	I r (annual)₁	12	1405.73	(64)
Heat gains from	m water h	neating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	Outr + (61)m	out from wa	ater heater	I r (annual)₁ + (57)m	+ (59)m		<b>_</b>
Heat gains from (65)m= 44.15	m water h	neating,	kWh/mo	onth 0.25	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	(64) (65)
Heat gains from (65)m= 44.15 include (57)r	m water h	neating, 40.07	kWh/mo 35.42 of (65)m	onth 0.28 34.23 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	<b>_</b>
Heat gains from (65)m= 44.15	m water h	neating, 40.07	kWh/mo 35.42 of (65)m	onth 0.28 34.23 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)n 5. Internal gain	m water h 38.57 m in calcu ains (see	neating, 40.07 ulation of Table 5	kWh/mo 35.42 of (65)m and 5a	34.23 only if c	5 ´ [0.85 30.03 ylinder i	× (45)m 28.6 s in the 0	Outp + (61)m 32.05 dwelling	32.41 or hot w	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain Metabolic gain Jan	m water h  38.57 m in calculatins (see is (Table Feb	neating, 40.07 ulation of Table 5 5), Watt	kWh/mo 35.42 of (65)m and 5a)	onth 0.29 34.23 only if c	5 ´ [0.85 30.03 ylinder is	× (45)m 28.6 s in the o	Outp + (61)m 32.05 dwelling	out from wa a] + 0.8 x 32.41 or hot w	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74 oom com	+ (59)m 43.04 munity h	]	(65)
Heat gains from (65)m= 44.15 include (57)r  5. Internal gain Metabolic gain Jan (66)m= 77.01	m water h 38.57 m in calculains (see s (Table Feb 77.01	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01	34.23 only if c	5 ´ [0.85 30.03 ylinder is Jun 77.01	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 77.01	out from wa 31 + 0.8 x 32.41 or hot w Sep 77.01	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain Metabolic gain Jan	m water h 38.57 m in calculains (see s (Table Feb 77.01	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01	34.23 only if c	5 ´ [0.85 30.03 ylinder is Jun 77.01	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 77.01	out from wa 31 + 0.8 x 32.41 or hot w Sep 77.01	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74 oom com	+ (59)m 43.04 munity h	]	(65)
Heat gains from (65)m= 44.15 include (57)r  5. Internal gain Metabolic gain Jan (66)m= 77.01	m water h 38.57 m in calculains (see s (Table Feb 77.01	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01	34.23 only if c	5 ´ [0.85 30.03 ylinder is Jun 77.01	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 77.01	out from wa 31 + 0.8 x 32.41 or hot w Sep 77.01	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74 oom com	+ (59)m 43.04 munity h	]	(65)
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain Metabolic gain Jan (66)m= 77.01 Lighting gains	m water h  38.57 m in calculate Feb 77.01 (calculate 22.18	neating, 40.07 ulation of the control of the contro	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 opendix I	onth 0.28 34.23 only if c  May 77.01 L, equati 10.21	5 ´ [0.85 30.03 ylinder is Jun 77.01 ion L9 o	× (45)m  28.6 s in the of  Jul  77.01 r L9a), a  9.31	Outp + (61)m 32.05 dwelling Aug 77.01 lso see	Sep 77.01 Table 5	oter heater (46)m 37.07 atter is from Oct 77.01	(annual), + (57)m 39.74 rom com Nov 77.01	+ (59)m 43.04 munity h Dec 77.01	]	(65)
Heat gains from (65)m= 44.15 include (57)m  5. Internal gain Jan (66)m= 77.01  Lighting gains (67)m= 24.98	m water h  38.57 m in calculate Feb 77.01 (calculate 22.18	neating, 40.07 ulation of the control of the contro	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 opendix I	onth 0.28 34.23 only if c  May 77.01 L, equati 10.21	5 ´ [0.85 30.03 ylinder is Jun 77.01 ion L9 o	× (45)m  28.6 s in the of  Jul  77.01 r L9a), a  9.31	Outp + (61)m 32.05 dwelling Aug 77.01 lso see	Sep 77.01 Table 5	oter heater (46)m 37.07 atter is from Oct 77.01	(annual), + (57)m 39.74 rom com Nov 77.01	+ (59)m 43.04 munity h Dec 77.01	]	(65)
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain  Metabolic gain  Jan  (66)m= 77.01  Lighting gains  (67)m= 24.98  Appliances gain	m water h  38.57 m in calculates Feb 77.01 (calculates 22.18 ins (calculates 165.11	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01 opendix I 13.66 Appendix I 151.74	onth 0.25 34.23 only if c : May 77.01 L, equati 10.21 dix L, equati	Jun 77.01 ion L9 o 8.62 uation L	x (45)m  28.6 s in the o  Jul  77.01 r L9a), a  9.31 13 or L1  122.25	Outp + (61)m 32.05 dwelling Aug 77.01 lso see 12.11 3a), also 120.55	Sep 77.01  Table 5 16.25 see Tal 124.83	Oct 77.01 20.63 ble 5 133.92	(annual), + (57)m 39.74 rom com Nov 77.01	+ (59)m 43.04 munity h  Dec 77.01	]	(65)
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain  Metabolic gain  Jan (66)m= 77.01  Lighting gains (67)m= 24.98  Appliances gain (68)m= 163.41	m water h  38.57 m in calculates Feb 77.01 (calculates 22.18 ins (calculates 165.11	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01 opendix I 13.66 Appendix I 151.74	onth 0.25 34.23 only if c : May 77.01 L, equati 10.21 dix L, equati	Jun 77.01 ion L9 o 8.62 uation L	x (45)m  28.6 s in the o  Jul  77.01 r L9a), a  9.31 13 or L1  122.25	Outp + (61)m 32.05 dwelling Aug 77.01 lso see 12.11 3a), also 120.55	Sep 77.01  Table 5 16.25 see Tal 124.83	Oct 77.01 20.63 ble 5 133.92	(annual), + (57)m 39.74 rom com Nov 77.01	+ (59)m 43.04 munity h  Dec 77.01	]	(65)
Heat gains from (65)m= 44.15 include (57)n  5. Internal gain  Metabolic gain  Jan  (66)m= 77.01  Lighting gains  (67)m= 24.98  Appliances gain  (68)m= 163.41  Cooking gains  (69)m= 43.98	m water h  38.57 m in calculations (see s (Table 177.01) (calculate 22.18) ins (calculate 165.11) (calculate 43.98)	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 red in Ap	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 opendix I 13.66 Appendix 151.74 opendix 43.98	onth 0.25 34.23 only if c : May 77.01 L, equati 10.21 dix L, equati 140.25 L, equat	Jun 77.01 ion L9 o 8.62 uation L 129.46	x (45)m 28.6 s in the o  Jul 77.01 r L9a), a 9.31 13 or L1 122.25 or L15a)	Outp + (61)m 32.05 dwelling 77.01 lso see 12.11 3a), also 120.55	Sep 77.01  Table 5 16.25  See Table 124.83	Oct 77.01 20.63 ble 5 133.92 5	(annual), + (57)m 39.74 com com  Nov 77.01  24.08	+ (59)m 43.04 munity h  Dec 77.01 25.67	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)m  5. Internal gain  Metabolic gain  Jan  (66)m= 77.01  Lighting gains  (67)m= 24.98  Appliances gain  (68)m= 163.41  Cooking gains	m water h  38.57 m in calculations (see s (Table 177.01) (calculate 22.18) ins (calculate 165.11) (calculate 43.98)	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 ed in Ap 43.98	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 opendix I 13.66 Appendix 151.74 opendix 43.98	onth 0.25 34.23 only if c : May 77.01 L, equati 10.21 dix L, equati 140.25 L, equat	Jun 77.01 ion L9 o 8.62 uation L 129.46	x (45)m 28.6 s in the o  Jul 77.01 r L9a), a 9.31 13 or L1 122.25 or L15a)	Outp + (61)m 32.05 dwelling 77.01 lso see 12.11 3a), also 120.55	Sep 77.01  Table 5 16.25  See Table 124.83	Oct 77.01 20.63 ble 5 133.92 5	(annual), + (57)m 39.74 com com  Nov 77.01  24.08	+ (59)m 43.04 munity h  Dec 77.01 25.67	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)m  5. Internal gain  Metabolic gain  Jan (66)m= 77.01  Lighting gains (67)m= 24.98  Appliances gain (68)m= 163.41  Cooking gains (69)m= 43.98  Pumps and far (70)m= 3	m water h  38.57 m in calculations (see s (Table Feb 77.01 (calculate 22.18 ins (calculate (calculate 43.98 ns gains (	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 red in Ap 43.98 (Table 5	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 ppendix I 13.66 Appendix 43.98 ia) 3	onth 0.25 34.23 only if c 34.23 only if c 34.23 77.01 L, equati 10.21 dix L, equati 140.25 L, equati 43.98	Jun 77.01 ion L9 o 8.62 uation L 129.46 iion L15 43.98	x (45)m  28.6 s in the o  Jul  77.01 r L9a), a  9.31 13 or L1  122.25 or L15a)  43.98	Outp + (61)m 32.05 dwelling  Aug 77.01 lso see 12.11 3a), also 120.55 ), also se 43.98	Sep 77.01  Table 5 16.25  See Tal 124.83  Pee Table 43.98	Oct 77.01 20.63 ble 5 133.92 5 43.98	(annual), + (57)m 39.74 rom com Nov 77.01 24.08	+ (59)m 43.04 munity h  Dec 77.01 25.67 156.2	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)m  5. Internal games and Jan (66)m= 77.01 Lighting gains (67)m= 24.98 Appliances games (68)m= 163.41 Cooking gains (69)m= 43.98 Pumps and far	m water h  38.57 m in calculations (see s (Table Feb 77.01 (calculate 22.18 ins (calculate (calculate 43.98 ns gains (	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 red in Ap 43.98 (Table 5	kWh/mo 35.42 of (65)m and 5a) ts Apr 77.01 ppendix I 13.66 Appendix 43.98 ia) 3	onth 0.25 34.23 only if c 34.23 only if c 34.23 77.01 L, equati 10.21 dix L, equati 140.25 L, equati 43.98	Jun 77.01 ion L9 o 8.62 uation L 129.46 iion L15 43.98	x (45)m  28.6 s in the o  Jul  77.01 r L9a), a  9.31 13 or L1  122.25 or L15a)  43.98	Outp + (61)m 32.05 dwelling  Aug 77.01 lso see 12.11 3a), also 120.55 ), also se 43.98	Sep 77.01  Table 5 16.25  See Tal 124.83  Pee Table 43.98	Oct 77.01 20.63 ble 5 133.92 5 43.98	(annual), + (57)m 39.74 rom com Nov 77.01 24.08	+ (59)m 43.04 munity h  Dec 77.01 25.67 156.2	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)m  5. Internal games and Jan (66)m= 77.01 Lighting gains (67)m= 24.98 Appliances games (68)m= 163.41 Cooking gains (69)m= 43.98 Pumps and far (70)m= 3 Losses e.g. ev (71)m= -51.34	m water h  38.57 m in calculate s (Table Feb 77.01 (calculate 22.18 ins (calculate 43.98 ns gains ( 3 raporatior -51.34	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 red in Ap 43.98 (Table 5 3 n (negat -51.34	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01 opendix I 13.66 Appendix 43.98 opendix 43.98 ive value	onth 0.25 34.23 only if c  May 77.01 L, equati 10.21 dix L, equati 140.25 L, equati 43.98  3 es) (Tab	Jun 77.01 ion L9 o 8.62 uation L 129.46 ion L15 43.98	× (45)m  28.6 s in the of  Jul  77.01 r L9a), a  9.31 13 or L1  122.25 or L15a)  43.98	Outp + (61)m 32.05 dwelling  Aug 77.01 lso see 12.11 3a), also 120.55 ), also se 43.98	Sep 77.01 Table 5 16.25 see Tal 124.83 ee Table 43.98	Oct 77.01  20.63 ble 5 133.92 5 43.98	(annual), + (57)m 39.74 rom com Nov 77.01 24.08 145.41 43.98	+ (59)m  43.04 munity h  Dec  77.01  25.67  156.2	]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 44.15 include (57)n  5. Internal gains  Metabolic gain  Jan  (66)m= 77.01  Lighting gains  (67)m= 24.98  Appliances gain  (68)m= 163.41  Cooking gains  (69)m= 43.98  Pumps and far  (70)m= 3  Losses e.g. ev	m water h  38.57 m in calculate s (Table Feb 77.01 (calculate 22.18 ins (calculate 43.98 ns gains ( 3 raporatior -51.34	neating, 40.07 ulation of Table 5 5), Watt Mar 77.01 ed in Ap 18.04 ulated in 160.83 red in Ap 43.98 (Table 5 3 n (negat -51.34	kWh/mo 35.42 of (65)m and 5a ts Apr 77.01 opendix I 13.66 Appendix 43.98 opendix 43.98 ive value	onth 0.25 34.23 only if c  May 77.01 L, equati 10.21 dix L, equati 140.25 L, equati 43.98  3 es) (Tab	Jun 77.01 ion L9 o 8.62 uation L 129.46 ion L15 43.98	× (45)m  28.6 s in the of  Jul  77.01 r L9a), a  9.31 13 or L1  122.25 or L15a)  43.98	Outp + (61)m 32.05 dwelling  Aug 77.01 lso see 12.11 3a), also 120.55 ), also se 43.98	Sep 77.01 Table 5 16.25 see Tal 124.83 ee Table 43.98	Oct 77.01  20.63 ble 5 133.92 5 43.98	(annual), + (57)m 39.74 rom com Nov 77.01 24.08 145.41 43.98	+ (59)m  43.04 munity h  Dec  77.01  25.67  156.2	]	(65) (66) (67) (68) (69)

Total interr		1	T	T	Т.	<u> </u>		· `	<del>′</del>	· / ·		(71)m + (72)		1	(70)
(73)m= 320.3		305.39	287.24	269.13	2	52.45	242.66	248	.39	258.75	277.03	3 297.34	312.38		(73)
6. Solar ga		Lucina colo	r flux from	Toblo 6	000	Lococci	otod ogus	tiono	to oon	wort to the	o applia	abla ariantat	ion		
Orientation:		Ü	Area		a and	rassoci Flu:		1110115			з аррііс	FF	ЮП.	Gains	
Onemation.	Table 60		m <sup>2</sup>	ı			ole 6a			g_ able 6b		Table 6c		(W)	
Northeast 0.9	0.77	×	1.0	08	X	1	1.28	x		0.4	X	0.7	=	2.36	(75)
Northeast 0.9	0.77	×	0.3	32	X	1	1.28	X		0.4	X	0.7	=	0.7	(75)
Northeast 0.9	0.77	×	1.0	08	X	2	2.97	X		0.4	X	0.7	=	4.81	(75)
Northeast 0.9	× 0.77	×	0.3	32	X	2	2.97	X		0.4	X	0.7	=	1.43	(75)
Northeast 0.9	0.77	×	1.0	08	X	4	1.38	X		0.4	x	0.7	=	8.67	(75)
Northeast 0.9	0.77	<u> </u>	0.3	32	X	4	1.38	X		0.4	x	0.7	=	2.57	(75)
Northeast 0.9	0.77	×	1.0	08	X	6	7.96	X		0.4	x	0.7	=	14.24	(75)
Northeast 0.9	0.77	X	0.3	32	X	6	7.96	X		0.4	x	0.7	=	4.22	(75)
Northeast 0.9	0.77	<u> </u>	1.0	08	X	9	1.35	X		0.4	x	0.7	=	19.14	(75)
Northeast 0.9	0.77	×	0.3	32	X	9	1.35	X		0.4	X	0.7	=	5.67	(75)
Northeast 0.9	0.77	×	1.0	08	X	9	7.38	X		0.4	X	0.7	=	20.41	(75)
Northeast 0.9	0.77	×	0.3	32	X	9	7.38	X		0.4	X	0.7	=	6.05	(75)
Northeast 0.9	0.77	×	1.0	08	X	9	1.1	X		0.4	X	0.7	=	19.09	(75)
Northeast 0.9	0.77	X	0.3	32	X	9	91.1	X		0.4	x	0.7	=	5.66	(75)
Northeast 0.9	0.77	×	1.0	08	X	7.	2.63	X		0.4	X	0.7	=	15.22	(75)
Northeast 0.9	0.77	X	0.3	32	X	7	2.63	x		0.4	x	0.7	=	4.51	(75)
Northeast 0.9	0.77	×	1.0	08	X	5	0.42	X		0.4	x	0.7	=	10.57	(75)
Northeast 0.9	0.77	X	0.3	32	X	5	0.42	X		0.4	x	0.7	=	3.13	(75)
Northeast 0.9	0.77	×	1.0	08	X	2	8.07	X		0.4	X	0.7	=	5.88	(75)
Northeast 0.9	0.77	, X	0.3	32	X	2	8.07	x		0.4	x	0.7	=	1.74	(75)
Northeast 0.9	0.77	×	1.0	08	X	1	4.2	X		0.4	X	0.7	=	2.98	(75)
Northeast 0.9	0.77	, X	0.3	32	X	1	4.2	X		0.4	x	0.7	=	0.88	(75)
Northeast 0.9	0.77	×	1.0	08	X	9	).21	X		0.4	X	0.7	=	1.93	(75)
Northeast 0.9	0.77	×	0.3	32	X	9	).21	X		0.4	X	0.7	=	0.57	(75)
Southeast 0.9	0.77	×	1.9	97	X	3	6.79	X		0.4	x	0.7	=	14.06	(77)
Southeast 0.9	0.77	×	1.9	97	X	6	2.67	X		0.4	x	0.7	=	23.96	(77)
Southeast 0.9	0.77	×	1.9	97	X	8	5.75	X		0.4	X	0.7	=	32.78	(77)
Southeast 0.9	0.77	X	1.9	97	X	10	06.25	x		0.4	x	0.7	=	40.62	(77)
Southeast 0.9	0.77	×	1.9	97	X	11	19.01	x		0.4	X	0.7	=	45.49	(77)
Southeast 0.9	0.77	×	1.9	97	X	11	18.15	x		0.4	X	0.7	=	45.16	(77)
Southeast 0.9	0.77	×	1.9	97	X	11	13.91	x		0.4	X	0.7	=	43.54	(77)
Southeast 0.9	0.77	×	1.9	97	X	10	04.39	x		0.4	X	0.7	=	39.9	(77)
Southeast 0.9	0.77	×	1.9	97	X	9	2.85	X		0.4	x	0.7	=	35.49	(77)

0.77

Southeast 0.9x

26.48

Southeast 0.9k
Southwesto, 9x 0,77 x 1,42 x 36,79 0,4 x 0,7 = 10,14 (79) Southwesto, 9x 0,77 x 1,45 x 36,79 0,4 x 0,7 = 10,35 (79) Southwesto, 9x 0,77 x 1,45 x 62,67 0,4 x 0,7 = 17,27 (79) Southwesto, 9x 0,77 x 1,45 x 62,67 0,4 x 0,7 = 17,63 (79) Southwesto, 9x 0,77 x 1,45 x 62,67 0,4 x 0,7 = 23,63 (79) Southwesto, 9x 0,77 x 1,45 x 85,75 0,4 x 0,7 = 23,63 (79) Southwesto, 9x 0,77 x 1,42 x 106,25 0,4 x 0,7 = 24,13 (79) Southwesto, 9x 0,77 x 1,45 x 106,25 0,4 x 0,7 = 29,89 (79) Southwesto, 9x 0,77 x 1,45 x 106,25 0,4 x 0,7 = 29,89 (79) Southwesto, 9x 0,77 x 1,45 x 106,25 0,4 x 0,7 = 22,29 (79) Southwesto, 9x 0,77 x 1,45 x 119,01 0,4 x 0,7 = 32,79 (79) Southwesto, 9x 0,77 x 1,45 x 119,01 0,4 x 0,7 = 33,34 (79) Southwesto, 9x 0,77 x 1,45 x 119,01 0,4 x 0,7 = 33,34 (79) Southwesto, 9x 0,77 x 1,45 x 118,15 0,4 x 0,7 = 33,24 (79) Southwesto, 9x 0,77 x 1,45 x 118,15 0,4 x 0,7 = 33,24 (79) Southwesto, 9x 0,77 x 1,45 x 113,91 0,4 x 0,7 = 33,24 (79) Southwesto, 9x 0,77 x 1,45 x 113,91 0,4 x 0,7 = 33,24 (79) Southwesto, 9x 0,77 x 1,45 x 113,91 0,4 x 0,7 = 33,24 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 22,87 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 12,14 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 12,14 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 12,14 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7 = 19,99 (79) Southwesto, 9x 0,77 x 1,45 x 104,39 0,4 x 0,7
Southwesto, 9x
Southwesto.9x
Southwesto, 9x
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Southwesto.9x         0.77         x         1.42         x         69.27         0.4         x         0.7         =         19.09         (79)           Southwesto.9x         0.77         x         1.45         x         69.27         0.4         x         0.7         =         19.49         (79)           Southwesto.9x         0.77         x         1.42         x         44.07         0.4         x         0.7         =         12.14         (79)           Southwesto.9x         0.77         x         1.42         x         31.49         0.4         x         0.7         =         12.4         (79)           Southwesto.9x         0.77         x         1.42         x         31.49         0.4         x         0.7         =         8.68         (79)           Southwesto.9x         0.77         x         1.42         x         31.49         0.4         x         0.7         =         8.68         (79)           Solar gains in watts, calculated for each month         (83)m = Sum(74)m(82)m         (83)m = Sum(74)m(82)m         (83)m = Sum(74)m(82)m         (83)m = Sum(74)m(82)m         (84)m = Sum (74)m(82)m         (84)m = Sum (74)m(82)m         (84)m = Sum (74)m
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Southwesto.9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.86 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 358 382.45 397.16 405.49 405.71 389.87 374.38 366.16 359.64 349.71 342.58 344.45 (84)  7. Mean internal temperature (heating season)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 358 382.45 397.16 405.49 405.71 389.87 374.38 366.16 359.64 349.71 342.58 344.45  7. Mean internal temperature (heating season)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 358 382.45 397.16 405.49 405.71 389.87 374.38 366.16 359.64 349.71 342.58 344.45  7. Mean internal temperature (heating season)
(84)m= 358 382.45 397.16 405.49 405.71 389.87 374.38 366.16 359.64 349.71 342.58 344.45 (84)  7. Mean internal temperature (heating season)
7. Mean internal temperature (heating season)
Temperature during heating periods in the living area from Table 9, Th1 (°C)
Utilisation factor for gains for living area, h1,m (see Table 9a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(86)m= 0.91 0.89 0.86 0.81 0.72 0.59 0.47 0.49 0.66 0.81 0.88 0.92 (86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.86 19.07 19.44 19.92 20.38 20.74 20.89 20.88 20.64 20.08 19.4 18.81 (87)
(87)m= 18.86 19.07 19.44 19.92 20.38 20.74 20.89 20.88 20.64 20.08 19.4 18.81 (87)
(87)m=     18.86     19.07     19.44     19.92     20.38     20.74     20.89     20.88     20.64     20.08     19.4     18.81       Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)       (88)m=     19.83     19.83     19.85     19.85     19.86     19.86     19.86     19.86     19.85     19.84     19.84
(87)m= 18.86 19.07 19.44 19.92 20.38 20.74 20.89 20.88 20.64 20.08 19.4 18.81 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

	18.13	18.49	18.97	19.39	19.7	19.82	19.81	7 in Tabl	19.12	18.47	17.89		(90)
90)m= 17.92	10.13	10.49	10.91	19.59	19.7	19.02	19.01			g area ÷ (4		0.68	(91)
										`	,	0.00	(0.7
Mean internal							<u> </u>						(00)
92)m= 18.56	18.77	19.13	19.62	20.06	20.41	20.55	20.54	20.31	19.78	19.1	18.52		(92)
Apply adjustm		ı											(00)
93)m= 18.56	18.77	19.13	19.62	20.06	20.41	20.55	20.54	20.31	19.78	19.1	18.52		(93)
8. Space heat													
Set Ti to the n the utilisation			•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fact				iviay	Juli	Jui	Aug	ОСР	001	1407	Dec		
94)m= 0.88	0.86	0.83	0.77	0.68	0.56	0.43	0.45	0.62	0.77	0.85	0.89		(94)
Useful gains,					0.00	0.10	0.10	0.02	0	0.00	0.00		(= 1)
95)m= 314.93	328.54	328.1	312.2	277.5	217.17	160.64	165.72	221.47	268.27	291.04	305.69		(95)
Monthly avera						100.04	100.72	221.47	200.27	201.04	000.00		()
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										7.1	7.2		()
97)m= 658.02	638.54	580.2	486.23	378.42	259.47	176.57	184.41	279.16	415.26	545.92	654.34		(97)
Space heating											004.04		(0.)
98)m= 255.25	208.32	187.56	125.3	75.08	0	0.02	0	0	109.36	183.52	259.4		
233.23	200.32	107.50	120.0	73.00	U	0							7(00)
							Tota	i per year	(Kvvn/year	) = Sum(9	8) <sub>15,912</sub> =	1403.79	(98)
Space heating	g require	ement in	kWh/m²	?/year			Tota	l per year	(kvvn/year	) = Sum(9	8) <sub>15,912</sub> =	39.97	(99)
· ·	•				ystems i	ncluding			(kvvn/year	) = Sum(9	8)15,912 =		<b>=</b>  ``
Space heating a. Energy req Space heatin	uiremer				ystems i	ncluding			(kvvn/year	) = Sum(9	8) <sub>15,912</sub> =		(99)
a. Energy req	uiremer ıg:	nts – Indi	vidual h	eating sy					kvvnyear	) = Sum(9	8)15,912 =		(99)
a. Energy req	uiremer ig: ace hea	nts – Indi	vidual h	eating sy		system		CHP)	kvvnyear	) = Sum(9	8)15,912 =	39.97	(99)
a. Energy req Space heatin Fraction of sp	uiremer  ig: ace hea ace hea	nts – Indi nt from se nt from m	vidual h econdar ain syst	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP)		) = Sum(9	8)15,912	39.97	(201
Space heating Fraction of sp Fraction of tot	uiremen ig: ace hea ace hea tal heatin	nts - Indi nt from se nt from m	vidual h econdary ain syst main sys	eating sy y/supple em(s) stem 1		system	micro-C (202) = 1 -	CHP) - (201) =		) = Sum(9	8)15,912 =	39.97 0 1	(99) (201 (202 (204
Space heatin Fraction of sp Fraction of tot Efficiency of n	uiremen ng: ace hea ace hea al heatii main spa	nts – Indi at from se at from m ag from r ace heati	vidual h econdary nain syst main systeng syste	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =		) = Sum(9	8)15,912	39.97 0 1 1 90.4	(201 (202 (204 (206
Space heatin Fraction of sp Fraction of tot Efficiency of s	uiremen ig: ace hea ace hea al heatii main spa seconda	at from set trom ming from race heati	vidual hecondary nain systemain systemain systementar	eating sy y/supple em(s) stem 1 em 1 y heating	mentary	system	micro-C (202) = 1 - (204) = (20	CHP) - (201) = 02) × [1 -	(203)] =			39.97 0 1 1 90.4	(201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of sp  Efficiency of sp  Jan	uiremen ig: ace hea ace hea tal heatin main spa seconda Feb	nts – Indi at from se at from m ng from r ace heati ry/supple Mar	vidual h econdary nain syst main sys ng syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 -	CHP) - (201) =		Nov	Dec	39.97 0 1 1 90.4	(201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of sp  Jan Space heating	uiremen ig: ace hea ace hea tal heatii main spa seconda Feb g require	nts – Indi	vidual hecondary ain systemain systemain systementar Apr alculate	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system  1, %  Jul	micro-C (202) = 1 - (204) = (204)	CHP) - (201) = 02) × [1 - (	(203)] =	Nov	Dec	39.97 0 1 1 90.4	(201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of sp  Efficiency of sp  Jan	uiremen ig: ace hea ace hea tal heatin main spa seconda Feb	nts – Indi at from se at from m ng from r ace heati ry/supple Mar	vidual h econdary nain syst main sys ng syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (20	CHP) - (201) = 02) × [1 -	(203)] =			39.97 0 1 1 90.4	(201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of sp  Jan Space heating	uiremen ace hea ace hea al heatii main spa seconda Feb g require 208.32	at from set from many from reace heating the many supplement (c. 187.56	vidual hecondary ain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system  1, %  Jul	micro-C (202) = 1 - (204) = (204)	CHP) - (201) = 02) × [1 - (	(203)] =	Nov	Dec	39.97 0 1 1 90.4	(99) (201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of s  Jan Space heating	uiremen ace hea ace hea al heatii main spa seconda Feb g require 208.32	at from set from many from reace heating the many supplement (c. 187.56	vidual hecondary ain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system  1, %  Jul	micro-C (202) = 1 - (204) = (204)	CHP) - (201) = 02) × [1 - (	(203)] =	Nov	Dec	39.97 0 1 1 90.4	(99) (201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of s  Jan Space heating  255.25  211)m = {[(98)]	uiremen ace hea ace hea tal heatin main spa seconda Feb g require 208.32	at from set from mace heating from mace heating from Mar lement (c. 187.56	vidual hecondary nain systemain systementar Apr alculated 125.3 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 75.08	mentary g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = 0	CHP) - (201) = 02) × [1 - 0]	Oct 109.36	Nov 183.52	Dec 259.4 286.95	39.97 0 1 1 90.4	(201 (202 (204 (206 (208 ear
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of s  Jan Space heating  255.25  211)m = {[(98)]	uiremen ace hea ace hea ace hea al heatin main spa seconda Feb g require 208.32 om x (20 230.44	at from set from many from reace heating the many from the	vidual hecondary nain systemain systementar Apr alculatee 125.3 00 ÷ (20 138.61	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 75.08	mentary g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = 0	Sep  0	Oct 109.36	Nov 183.52	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating Fraction of sp Fraction of tot Efficiency of sp  Efficiency of sp  Space heating  255.25  211)m = {[(98)]	uiremen ace hea ace hea ace hea al heatin main spa seconda Feb g require 208.32 )m x (20 230.44	at from set from many from reace heating ry/supplement (colors, 187.56)  4)] } x 1  207.48	vidual hecondary nain systemain systemantar Apr alculated 125.3 00 ÷ (20 138.61	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 75.08	mentary g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = 0	Sep  0	Oct 109.36	Nov 183.52	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201 (202 (204 (206 (208 ear
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of space heating 255.25  211)m = {[(98) 282.36]	uiremen ace hea ace hea ace hea al heatin main spa seconda Feb g require 208.32 )m x (20 230.44	at from set from many from reace heating ry/supplement (colors, 187.56)  4)] } x 1  207.48	vidual hecondary nain systemain systemantar Apr alculated 125.3 00 ÷ (20 138.61	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 75.08	mentary g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = 0	Sep  0	Oct 109.36	Nov 183.52	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of s  Jan Space heating  255.25  211)m = {[(98)  282.36}  Space heating  [(98)m x (20)	uirementage: ace heatage heata	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (co 187.56 4)] } x 1 207.48 econdary 00 ÷ (20)	vidual hecondary nain systemain systematar Apr alculater 125.3 00 ÷ (20 138.61	eating syly/supple em(s) stem 1 em 1 y heating May d above) 75.08 em 1 stem 1 stem 1 may describe the stem 1 may describe the stem 1 stem 1 may describe the stem 1 stem 1 may describe the stem 1 may	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	Sep  0  (kWh/yea	Oct  109.36  120.97  ar) = Sum(2	Nov 183.52 203 211) <sub>15,1012</sub>	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201 (202 (204 (206 (208 ear
Space heating Fraction of sp Fraction of tot Efficiency of sp Efficiency of sp Space heating  255.25  211)m = {[(98)  282.36}  Space heating  {[(98)m x (20)  215)m=  0	uiremen  ig: ace hea ace hea al heatin main spa seconda  Feb g require 208.32  )m x (20 230.44  g fuel (se	at from set from many from race heating from the many from	vidual hecondary nain systemain systematar Apr alculater 125.3 00 ÷ (20 138.61	eating syly/supple em(s) stem 1 em 1 y heating May d above) 75.08 em 1 stem 1 stem 1 may describe the stem 1 may describe the stem 1 stem 1 may describe the stem 1 stem 1 may describe the stem 1 may	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	Sep  0  0  0  0  0  0  0  0  0  0  0  0  0	Oct  109.36  120.97  ar) = Sum(2	Nov 183.52 203 211) <sub>15,1012</sub>	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201 (202 (204 (206 (208 ear
Space heating Fraction of sp Fraction of tot Efficiency of n Efficiency of sp  Space heating  255.25  211)m = {[(98)  282.36  Space heating  2(98)m x (20  215)m=  0	uiremen ag: ace hea ace hea acal heatin main spa seconda Feb g require 208.32 )m x (20 230.44  g fuel (se	t from set from many from reace heating from the ment (continue) and the ment	vidual hecondary nain systemain systeman systementar Apr alculated 125.3 00 ÷ (20 138.61	eating sylvy/supple em(s) stem 1 em 1 y heating May d above 75.08 06) 83.05	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	Sep  0  0  0  0  0  0  0  0  0  0  0  0  0	Oct  109.36  120.97  ar) = Sum(2	Nov 183.52 203 211) <sub>15,1012</sub>	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(99) (201 (202 (204 (206 (208
Space heating Fraction of sp Fraction of tot Efficiency of sp Efficiency of sp Space heating  255.25  211)m = {[(98)  282.36}  Space heating  {[(98)m x (20)  215)m=  0	uiremen ag: ace hea ace hea acal heatin main spa seconda Feb g require 208.32 )m x (20 230.44  g fuel (se	t from set from many from reace heating from the ment (continue) and the ment	vidual hecondary nain systemain systeman systementar Apr alculated 125.3 00 ÷ (20 138.61	eating sylvy/supple em(s) stem 1 em 1 y heating May d above 75.08 06) 83.05	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	Sep  0  0  0  0  0  0  0  0  0  0  0  0  0	Oct  109.36  120.97  ar) = Sum(2	Nov 183.52 203 211) <sub>15,1012</sub>	Dec 259.4 286.95	0 1 1 90.4 0 kWh/ye	(201 (202 (204 (206 (208 ear

									-	
(217)m= 86.51 86.35 86 85.28	84.1	80.3	80.3	80.3	80.3	84.82	85.96	86.61		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$										
(219)m= 163.87 143.42 149.84 134.01	131.57 1	121.36	116.27	129.62	131.05	141.27	148.81	159.85		_
				Tota	I = Sum(2				1670.94	(219)
Annual totals Space heating fuel used, main system	1					k'	Wh/yea	r	<b>kWh/year</b> 1552.87	٦
Water heating fuel used	•								1670.94	_   
Electricity for pumps, fans and electric	keep-hot								1670.94	_
mechanical ventilation - balanced, ext	tract or pos	sitive inp	put from	n outside	Э			139.02	]	(230a)
central heating pump:								30	]	(230c)
boiler with a fan-assisted flue								45	]	(230e)
Total electricity for the above, kWh/yea	ar			sum	of (230a)	(230g) =			214.02	(231)
Electricity for lighting									176.43	(232)
10a. Fuel costs - individual heating sy	stems:									
		Fue	.I			Fuel P	rica		Fuel Cost	
			n/year			(Table			£/year	
Space heating - main system 1		(211)	x			3.4	8	x 0.01 =	54.04	(240)
Space heating - main system 2		(213)	X			0		x 0.01 =	0	(241)
Space heating - secondary		(215)	X			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219)	1			3.4	8	x 0.01 =	58.15	(247)
Pumps, fans and electric keep-hot		(231)	ı			13.	19	x 0.01 =	28.23	(249)
(if off-peak tariff, list each of (230a) to ( Energy for lighting	(230g) sepa	arately (232)		icable a	nd apply	fuel pri		rding to x 0.01 =	Table 12a 23.27	(250)
Additional standing charges (Table 12)	1								120	(251)
Appendix Q items: repeat lines (253) a	nd (254) a	s poods	ad							_
Total energy cost	(245)(24			=					283.69	(255)
11a. SAP rating - individual heating sy	ystems									
Energy cost deflator (Table 12)									0.42	(256)
Energy cost factor (ECF)	[(255) x (25	56)] ÷ [(4)	) + 45.0]	=					1.49	(257)
SAP rating (Section 12)									79.25	(258)
12a. CO2 emissions – Individual heat	ing system	ns includ	ding mid	cro-CHP	)					
		<b>Ene</b> kWh	e <b>rgy</b> n/year			<b>Emiss</b> kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)		(211)	X			0.2	16	=	335.42	(261)
Space heating (secondary)		(215)	X			0.5	19	=	0	(263)
Water heating		(219)	X			0.2	16	=	360.92	(264)

Space and water heating	(261) + (262) + (263) + (264) =		696.34 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	111.07 (267)
Electricity for lighting	(232) x	0.519 =	91.57 (268)
Total CO2, kg/year	sur	m of (265)(271) =	898.98 (272)
CO2 emissions per m <sup>2</sup>	(27	72) ÷ (4) =	25.6 (273)
El rating (section 14)			85 (274)

## 13a. Primary Energy

	<b>Energy</b> kWh/year	Primary factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	1894.5 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	2038.54 (264)
Space and water heating	(261) + (262) + (263) + (264) =		3933.04 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	657.03 (267)
Electricity for lighting	(232) x	0 =	541.64 (268)
'Total Primary Energy	sum	of (265)(271) =	5131.7 (272)
Primary energy kWh/m²/year	(272	?) ÷ (4) =	146.12 (273)

Assessor Name:   Adam Ritchie   Stroma Number:   STRO019516
Software Name:   Stroma FSAP 2012   Software Version:   Version: 1.0.4.25
Address:  1. Overall dwelling dimensions:    Area(m²)
Area(m²)
Area(m²)   Av. Height(m)   Volume(m³)   (3a)   (3
Ground floor 3.5.12 (1a) x 3.09 (2a) = 108.52 (3a)  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 3.5.12 (4)  Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 108.52 (5)  2. Ventilation rate:    Main   Secondary   Other   total   m³ per hour
Dwelling volume
Dwelling volume
2. Ventilation rate:    main   secondary   other   total   m³ per hour
Number of chimneys
Number of chimneys $0$ + $0$ + $0$ + $0$ = $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$
Number of intermittent fans  Number of passive vents  Number of flueless gas fires $0 \times 10 = 0  (7a)$ Number of flueless gas fires $0 \times 10 = 0  (7b)$ Number of flueless gas fires  Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0  (5) = 0  (8)$ If a pressurisation test has been carried out or is intended, proceed to $(17)$ , otherwise continue from $(9)$ to $(16)$ Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - $[0.2 \times (14) \div 100] = 0  (15)$ Infiltration rate  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$
Number of passive vents  0
Number of flueless gas fires  Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 \cdot [0.2 \times (14) \div 100] = 0 (15)  Infiltration rate  (8) \cdot (10) \cdot (11) \cdot (12) \cdot (13) \cdot (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = \( \begin{array}{c} (17) \div 20\end{array} \times (8) \div (therwise (18) = (16)  \end{array}
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - $[0.2 \times (14) \div 100] = 0$ (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = $[(17) \div 20]+(8)$ , otherwise (18) = (16)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Q (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - $[0.2 \times (14) \div 100] = 0$ (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = $[(17) \div 20]+(8)$ , otherwise (18) = (16)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Q (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - $[0.2 \times (14) \div 100] = 0$ (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = $[(17) \div 20]+(8)$ , otherwise (18) = (16)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  O (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)
Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  13)  Percentage of windows and doors draught stripped  Window infiltration  0 (14)  Window infiltration  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) $\div$ 20]+(8), otherwise (18) = (16)  0 (10)  (11)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) $\div$ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) $\div$ 20]+(8), otherwise (18) = (16)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) $\div$ 100] =  0 (14)  Window infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) $\div$ 20]+(8), otherwise (18) = (16)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration $0                                   $
If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0$ $0.25 - [0.2 \times (14) \div 100] = 0$ If based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.25 - [0.2 \times (14) \div 100] = 0$ $0.25 - [0.2 \times (14) $
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0 = (14)$ $0 = (15)$ $0 = (15)$ $0 = (15)$ $0 = (16)$ $0 = (15)$ $0 = (16)$ $0 = (16)$ $0 = (17)$
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$ (15)  Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.12$ (18)
Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = $ $ (16) $ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $ (2.5) $ (17) If based on air permeability value, then $ (18) = [(17) \div 20] + (8), \text{ otherwise } (18) = (16) $ $ (18) $
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ O.12  (18)
Air names ability valva applica if a processination test has been done as a domes air names ability in being your
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Number of sides sheltered $0  mtext{(19)}$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 1  mtext{(20)}$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.12$ $(21)$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 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

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se			•				
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)										[	0.5	(2	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =										0.5	(2		
a) If balance		-		_					2h\m + ('	23h) ∨ [·	1 _ (23c)	75.65 · 1001	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	+ 100j	(2
b) If balance			<u> </u>			<u> </u>	<u> </u>		<u>.                                    </u>				
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	nouse extinution of the contraction of the contract			•	•				.5 × (23b	·)		l	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the			•	•				0.5]			•	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(:
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(:
oors Type 2					0.72	X	1	= [	0.72				(
oors Type 3					0.99	X	1	= [	0.99				(
oors Type 4					0.72	x	1	=	0.72				(
oors Type 5					0.72	x	1	<u> </u>	0.72				(
					0.72	=	1	= [	0.72				•
oors Type 6	<del>,</del> 1					×		= [					(3
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	e 2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (;
oors Type 5 cors Type 6 indows Type indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				()
oors Type 6 indows Type indows Type indows Type indows Type indows Type	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				() () () ()
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4 e 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(.)
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
oors Type 6 indows Type indows Type indows Type indows Type	2 2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				
cors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
cors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity Cm = S	$S(A \times k)$						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass param	·		Indica		100	(35)						
For design assessments w can be used instead of a d	here the de	tails of the	,			ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges : S (I	,		• .	•	K						13.75	(36)
if details of thermal bridging Total fabric heat loss			36.08	(37)								
Ventilation heat loss of			00.00	(0.7								
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	25)m x (5)	Dec		
(38)m= 10.07 9.96	9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer coefficie	ent, W/K						(39)m	= (37) + (37)	38)m		l	
(39)m= 46.15 46.04	45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss parameter (	(HLP), W/	/m²K			•			Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	45.34	(39)
(40)m= 1.31 1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
Number of days in mo	onth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.29	(40)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating end	ergy requi	irement:								kWh/ye	ear:	
Assumed occupancy,	NI											
if TFA > $13.9$ , N = $1$	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		28		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w	+ 1.76 x vater usaç	ge in litre	` es per da	ay Vd,av	erage =	(25 x N)	+ 36		.9)	.68		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1	+ 1.76 x vater usaç e hot water	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		.9)			` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average	+ 1.76 x vater usaç e hot water	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		.9)			` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x vater usage hot water r person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed i	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	+ 1.76 x vater usage hot water r person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed i	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per	+ 1.76 x  vater usage hot water reperson per  Mar er day for each 65.98	ge in litre usage by a r day (all w Apr Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av fwelling is that and co Jun ctor from	erage = designed in the state of the state o	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Total = Su	9) 64 Nov 68.56 m(44)112 =	.68  Dec  71.15	776.21	` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56	+ 1.76 x  vater usage hot water reperson per  Mar er day for each 65.98	ge in litre usage by a r day (all w Apr Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av fwelling is that and co Jun ctor from	erage = designed in the state of the state o	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Total = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water	+ 1.76 x rater usage hot water r person per Mar er day for ea 65.98 r used - call	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of	ay Vd,av Iwelling is that and co Jun ctor from 58.22 190 x Vd,r	erage = designed and designed a	(25 x N) to achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  6Wh/mon  73.97	Oct  65.98  Total = Su  th (see Ta  86.21	9) 64 Nov 68.56 m(44)112 = ables 1b, 1	.68  Dec  71.15	776.21 1017.73	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water hear	+ 1.76 x vater usage hot water r person per Mar er day for ea 65.98 r used - call 95.23	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66	ay Vd,av Iwelling is that and co Jun ctor from 58.22 190 x Vd,r 68.74	erage = designed in individual state of the series of the	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  6Wh/more 73.97	Oct  65.98  Total = Sunth (see Tail 86.21  Total = Sunth (see Tail 86.21)	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15		(43) (44) (45)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29	+ 1.76 x rater usage hot water r person per Mar er day for ea 65.98 r used - call	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of	ay Vd,av Iwelling is that and co Jun ctor from 58.22 190 x Vd,r	erage = designed and designed a	(25 x N) to achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  6Wh/mon  73.97	Oct  65.98  Total = Su  th (see Ta  86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84	rater usage hot water reperson per Mar 65.98 err used - calculating at point 14.28	ge in litre usage by a r day (all w Apr ach month 63.39 culated me 83.02 f of use (no	es per da 5% if the a vater use, $I$ May $Vd, m = fa$ $60.8$ $79.66$ $O$ hot water $O$	ay Vd,av Iwelling is hot and co Jun ctor from 58.22 190 x Vd,r 68.74	rerage = designed in did)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96	+ 36 a water us  Sep  63.39  73.97  70 (61)  11.1	Oct  65.98  Fotal = Su  with (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15		(43) (44) (45)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water head  (46)m= 15.83 13.84  Water storage loss:  Storage volume (litres  If community heating Otherwise if no stored	rater usage hot water reperson per Mar 65.98 95.23 ting at point 14.28 s) includinand no ta	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  r of use (no	es per da 5% if the orater use, I May Vd,m = face 60.8 Photowater 11.95 Photography elling, e	ay Vd,av twelling is that and co  Jun ctor from 58.22  190 x Vd,r 68.74  r storage), 10.31	rerage = designed in did)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56  storage 0 litres in	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  10 (61)  11.1  ame ves:	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  102.19  15.33		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84 Water storage loss: Storage volume (litres of the storage volume) If community heating of the storage loss: Water storage loss:	rater usage hot water reperson per Mar er day for ea 65.98  95.23  ting at point 14.28  s) includinand no tall hot water states at hot water states and no tall hot water states and no tall hot water states at hot water states and no tall hot water states at hot water states and no tall hot water states at hot water states are states at hot water states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states are states at hot water states at hot water states are states at hot water states at hot water states are states at hot water states at hot water states are states at hot water states at hot water states are states at hot water states at hot water states are states at hot water	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  f of use (no 12.45  ang any so ank in dw er (this in	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 58.22  190 x Vd,i 68.74  r storage), 10.31  /WHRS enter 110 nstantar	erage = designed in designed i	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  10 (61)  11.1  ame ves:	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water head  (46)m= 15.83 13.84  Water storage loss: Storage volume (litres If community heating Otherwise if no stored Water storage loss: a) If manufacturer's of	rater usage hot water person per Mar er day for ea 65.98	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  for use (no 12.45  and any so ank in dw er (this in	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 58.22  190 x Vd,i 68.74  r storage), 10.31  /WHRS enter 110 nstantar	erage = designed in designed i	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  10 (61)  11.1  ame ves:	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84  Water storage loss: Storage volume (litres of the storage volume) If community heating of the storage loss: Water storage loss:	rater usage hot water reperson per Mar 65.98 65.98 95.23 fing at point 14.28 s) including and no tail hot water declared leads from Table	ge in litre usage by day (all w Apr ach month 63.39  culated me 83.02  for use (not 12.45  and any so ank in dw er (this in oss facto 2b	es per da 5% if the orater use, I May Vd,m = face 60.8  onthly = 4.  79.66  other water 11.95  olar or Water welling, encludes in the control of the control	ay Vd,av Iwelling is that and co  Jun ctor from 58.22  190 x Vd,i 68.74  r storage), 10.31  /WHRS enter 110 nstantar	erage = designed in designed i	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  11.1  ame vess  ers) ente	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)

Hot water stor	rage loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ay)					0		(51)
If community	•		on 4.3									1	
Volume factor			01							-	0		(52)
Temperature											0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or	. , .	ŕ									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m			_	
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	ns dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (an	nual) fro	m Table	3							0		(58)
Primary circui	t loss cal	culated f	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	y factor fr	om Tabl	le H5 if t	here is s	solar wat	ter 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	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 36.26	31.56	33.62	31.26	30.98	28.71	29.67	30.98	31.26	33.62	33.81	36.26		(61)
Total heat red	uired for	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 141.78		128.85	114.29	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45	]	(62)
Solar DHW input						<u> </u>	<u> </u>			<u> </u>		I	, ,
(add additiona									. commode	on to wate	or riodairig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ıater heat	ter				ļ				<u> </u>	<u> </u>		
	1 1												
(64)m=   141.78	123.84	128.85	114.29	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45		
(64)m= 141.78	123.84	128.85	114.29	110.65	97.45	93.37	l			127.91 r (annual) <sub>1</sub>	l .	1405.73	(64)
	<u> </u>					l	Outp	out from wa	ater heate	I r (annual)₁	12		(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	Outr + (61)m	out from wa	ater heater	I r (annual)₁ + (57)m	+ (59)m		<b>_</b>
Heat gains from (65)m= 44.15	om water	heating,	kWh/mo	onth 0.25	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 > 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	(64) (65)
Heat gains from (65)m= 44.15 include (57)	om water 38.57 om in calc	heating, 40.07 culation o	kWh/mo 35.42 of (65)m	onth 0.25 34.23 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 > 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)  5. Internal g	om water 38.57 om in calc ains (see	heating, 40.07 culation of	kWh/mo 35.42 of (65)m	onth 0.25 34.23 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 32.05	out from wa n] + 0.8 > 32.41	ater heater ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)  5. Internal g	om water 38.57 om in calc ains (see	heating, 40.07 culation of Table 5	kWh/mo 35.42 of (65)m 5 and 5a	34.23 only if c	5 ´ [0.85 30.03 ylinder i	× (45)m 28.6 s in the o	Outp + (61)m 32.05 dwelling	32.41 or hot w	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)  5. Internal grade Metabolic gain Jan	om water 38.57 om in calc ains (see ns (Table Feb	heating, 40.07 culation of Table 5 5), Watt	kWh/mo 35.42 of (65)m and 5a) ts Apr	onth 0.29 34.23 only if c	5 ´ [0.85 30.03 ylinder i	× (45)m 28.6 s in the o	Outp + (61)m 32.05 dwelling	out from wa n] + 0.8 > 32.41 or hot w	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74 oom com	+ (59)m 43.04 munity h	]	(65)
Heat gains from (65)m= 44.15 include (57)  5. Internal grade Metabolic gain Jan (66)m= 64.18	om water 38.57 om in calc ains (see ns (Table Feb 64.18	heating, 40.07 culation of Table 5 5), Wat Mar 64.18	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18	34.23 only if c : May	5 ´ [0.85 30.03 ylinder is Jun 64.18	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 64.18	out from wa a] + 0.8 > 32.41 or hot w Sep 64.18	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	<b>_</b>
Heat gains from (65)m= 44.15 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains	om water  38.57 om in calculate  38.67 om in calculate  38.67 om in calculate  4.18 om in calculate  6.4.18	heating, 40.07 culation of Table 5 5), Watter Mar 64.18 ted in Ap	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18	onth 0.25 34.23 only if c : May 64.18 L, equati	5 ´ [0.85 30.03 ylinder i Jun 64.18 ion L9 o	× (45)m  28.6 s in the c  Jul  64.18 r L9a), a	Outp + (61)m 32.05 dwelling Aug 64.18 lso see	sep 64.18 Table 5	ater heater ( [(46)m 37.07 ater is fr Oct 64.18	+ (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 44.15 include (57)  5. Internal grade Metabolic gain Jan (66)m= 64.18	om water 38.57 om in calc ains (see ns (Table Feb 64.18	heating, 40.07 culation of Table 5 5), Wat Mar 64.18	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18	34.23 only if c : May	5 ´ [0.85 30.03 ylinder is Jun 64.18	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 64.18	out from wa a] + 0.8 > 32.41 or hot w Sep 64.18	ater heater ( [(46)m 37.07 ater is fr	+ (57)m 39.74 oom com	+ (59)m 43.04 munity h	]	(65)
Heat gains from (65)m= 44.15 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 9.99  Appliances gains	om water  38.57 om in calculations (see  15 (Table  16 (Feb  16 (Calculations)  18 (See  18 (Calculations)  18 (Calculations)  18 (Calculations)  18 (Calculations)  18 (Calculations)	heating, 40.07 culation of Table 5 5), Wate Mar 64.18 ted in Apr 7.22 ulated in	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix I 5.46	onth 0.25 34.23 only if c  May 64.18 L, equati 4.08 dix L, equ	5 ´ [0.85 30.03 ylinder is Jun 64.18 ion L9 o	x (45)m  28.6 s in the o  Jul  64.18 r L9a), a  3.73 13 or L1	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84	sep 64.18 Sep 66.5	oter heater (46)m 37.07 atter is from Oct 64.18	+ (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 44.15 include (57)  5. Internal gradies Jan (66)m= 64.18  Lighting gains (67)m= 9.99	om water  38.57 om in calculations (see  15 (Table  16 (Feb  16 (Calculations)  18 (See  18 (Calculations)  18 (Calculations)  18 (Calculations)  18 (Calculations)  18 (Calculations)	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap	kWh/mo 35.42 of (65)m and 5a) ts Apr 64.18 opendix I	onth 0.28 34.23 only if c :  May 64.18 L, equati 4.08	5 ´ [0.85 30.03 ylinder is Jun 64.18 ion L9 o	x (45)m 28.6 s in the c  Jul 64.18 r L9a), a 3.73	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84	sep 64.18 Sep 66.5	oter heater (46)m 37.07 atter is from Oct 64.18	+ (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 44.15 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 9.99  Appliances gains	m water 38.57 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 1 5.46 Appendix 1 101.66	onth 0.25 34.23 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 o 3.45 uation L	x (45)m  28.6 s in the o  Jul  64.18 r L9a), a  3.73 13 or L1  81.91	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Ta 83.63	Oct 64.18  8.25  ble 5  89.73	(annual), + (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 44.15 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 9.99  Appliances gains  (68)m= 109.48	m water 38.57 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 1 5.46 Appendix 1 101.66	onth 0.25 34.23 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 o 3.45 uation L	x (45)m  28.6 s in the o  Jul  64.18 r L9a), a  3.73 13 or L1  81.91	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Ta 83.63	Oct 64.18  8.25  ble 5  89.73	(annual), + (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 44.15 include (57)  5. Internal gradies Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains	om water  38.57 om in calc  ains (see  ns (Table  Feb  64.18 s (calculat  8.87 ains (calculat  110.62 s (calculat  29.42	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix I 5.46 Append 101.66 opendix 29.42	onth 0.25 34.23 only if c  :  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 3.45 uation L 86.74	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 6.5 6.5 9 See Table	Oct 64.18  8.25 ble 5 89.73	(annual), + (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)  5. Internal gradies Jan (66)m= 64.18  Lighting gains (67)m= 9.99  Appliances gains (68)m= 109.48  Cooking gains (69)m= 29.42	om water  38.57 om in calc  ains (see  ns (Table  Feb  64.18 s (calculat  8.87 ains (calculat  110.62 s (calculat  29.42	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix I 5.46 Append 101.66 opendix 29.42	onth 0.25 34.23 only if c  :  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 3.45 uation L 86.74	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 6.5 6.5 9 See Table	Oct 64.18  8.25 ble 5 89.73	(annual), + (57)m 39.74 com com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)  5. Internal gram Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and far	om water  38.57 om in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ans gains 3	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 35.42 of (65)m and 5a) ts Apr 64.18 opendix I 5.46 Appendix 101.66 opendix 29.42 5a)	onth 0.25 34.23 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 ion L15 29.42	x (45)m  28.6 s in the o  Jul  64.18 r L9a), a  3.73 13 or L1  81.91 or L15a)  29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Ta 83.63 ee Table 29.42	Oct 64.18  8.25 ble 5 89.73 5 29.42	(annual), + (57)m 39.74 rom com Nov 64.18 9.63 97.42	+ (59)m 43.04 munity h  Dec 64.18  10.27	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)  5. Internal gradies Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 3	om water  38.57 om in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ans gains 3	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 35.42 of (65)m and 5a) ts Apr 64.18 opendix I 5.46 Appendix 101.66 opendix 29.42 5a)	onth 0.25 34.23 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 ion L15 29.42	x (45)m  28.6 s in the o  Jul  64.18 r L9a), a  3.73 13 or L1  81.91 or L15a)  29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Ta 83.63 ee Table 29.42	Oct 64.18  8.25 ble 5 89.73 5 29.42	(annual), + (57)m 39.74 rom com Nov 64.18 9.63 97.42	+ (59)m 43.04 munity h  Dec 64.18  10.27	]	(65) (66) (67) (68)
Heat gains from (65)m= 44.15 include (57)  5. Internal good Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and factorial factorial gains (70)m= 3 Losses e.g. expenses the same of th	m water  38.57 m in calculations (see the second of the se	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 3 n (negat	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix I 5.46 Appendix I 101.66 opendix 29.42 opendix 3	onth 0.25 34.23 only if co  May 64.18 L, equati 4.08 dix L, equati 93.97 L, equati 29.42  3 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 ion L15 29.42	× (45)m  28.6 s in the of  Jul  64.18 r L9a), a  3.73 13 or L1  81.91 or L15a)  29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 see Ta 83.63 ee Table 29.42	Oct 64.18  8.25 ble 5 89.73 5 29.42	(annual), + (57)m 39.74 com com Nov 64.18 9.63 97.42	+ (59)m 43.04 munity h  Dec 64.18  10.27  104.65	]	(65) (66) (67) (68) (69) (70)
Heat gains from (65)m= 44.15 include (57)  5. Internal gram Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 3 Losses e.g. et (71)m= -51.34	m water  38.57 m in calculations (see the second of the se	heating, 40.07 culation of Table 5 5), Watt Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 3 n (negat	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix I 5.46 Appendix I 101.66 opendix 29.42 opendix 3	onth 0.25 34.23 only if co  May 64.18 L, equati 4.08 dix L, equati 93.97 L, equati 29.42  3 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 ion L15 29.42	× (45)m  28.6 s in the of  Jul  64.18 r L9a), a  3.73 13 or L1  81.91 or L15a)  29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 see Ta 83.63 ee Table 29.42	Oct 64.18  8.25 ble 5 89.73 5 29.42	(annual), + (57)m 39.74 com com Nov 64.18 9.63 97.42	+ (59)m 43.04 munity h  Dec 64.18  10.27  104.65	]	(65) (66) (67) (68) (69) (70)

Total intern	al gaine -					(66)m + (67)n	n + (68	3)m + (69)m +	(70)m +	(71)m + (72)	)m		
(73)m= 224.0	<del>_</del>	214.08	201.57	189.32	1	77.15 169.32	173	, , , , , , , , , , , , , , , , , , ,	193.0	· , , , , ,	218.03		(73)
6. Solar ga				1					10000				` '
		using sola	r flux from	Table 6	a and	l associated equa	ations	to convert to th	ne applic	able orienta	tion.		
Orientation:	Access F Table 6d		Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	х	1.0	08	X	11.28	x	0.4	х	0.7	=	2.36	(75)
Northeast 0.9	0.77	X	0.3	32	x	11.28	X	0.4	X	0.7	<del>=</del> =	0.7	(75)
Northeast 0.9	0.77	X	1.0	08	x	22.97	j×	0.4	x	0.7	=	4.81	(75)
Northeast 0.9	0.77	х	0.3	32	x	22.97	x	0.4	х	0.7	=	1.43	(75)
Northeast 0.9	0.77	X	1.0	08	x	41.38	x	0.4	x	0.7	=	8.67	(75)
Northeast 0.9	0.77	X	0.3	32	x	41.38	x	0.4	X	0.7	=	2.57	(75)
Northeast 0.9	0.77	X	1.0	08	x	67.96	X	0.4	X	0.7	=	14.24	(75)
Northeast 0.9	0.77	X	0.3	32	X	67.96	X	0.4	X	0.7	=	4.22	(75)
Northeast 0.9	0.77	X	1.0	08	x	91.35	X	0.4	X	0.7	=	19.14	(75)
Northeast 0.9	0.77	X	0.3	32	x	91.35	X	0.4	X	0.7	=	5.67	(75)
Northeast 0.9	0.77	X	1.0	08	x	97.38	X	0.4	X	0.7	=	20.41	(75)
Northeast 0.9	0.77	X	0.3	32	x	97.38	X	0.4	X	0.7	=	6.05	(75)
Northeast 0.9	0.77	X	1.0	08	x	91.1	X	0.4	X	0.7	=	19.09	(75)
Northeast 0.9	0.77	X	0.0	32	x	91.1	X	0.4	X	0.7	=	5.66	(75)
Northeast 0.9	0.77	X	1.0	08	X	72.63	X	0.4	X	0.7	=	15.22	(75)
Northeast 0.9	0.77	X	0.3	32	X	72.63	X	0.4	X	0.7	=	4.51	(75)
Northeast 0.9	0.77	X	1.0	08	X	50.42	X	0.4	X	0.7	=	10.57	(75)
Northeast 0.9	0.77	X	0.3	32	X	50.42	X	0.4	X	0.7	=	3.13	(75)
Northeast 0.9	0.77	X	1.0	08	X	28.07	X	0.4	X	0.7	=	5.88	(75)
Northeast 0.9	0.77	X	0.3	32	X	28.07	X	0.4	Х	0.7	=	1.74	(75)
Northeast 0.9		X	1.0	08	X	14.2	X	0.4	X	0.7	=	2.98	(75)
Northeast 0.9		X	0.3	32	X	14.2	X	0.4	X	0.7	=	0.88	(75)
Northeast 0.9		Х	1.0	08	X	9.21	X	0.4	X	0.7	=	1.93	(75)
Northeast 0.9		X	0.3	32	X	9.21	X	0.4	X	0.7	=	0.57	(75)
Southeast 0.9	0.77	X	1.9	97	X	36.79	X	0.4	X	0.7	=	14.06	(77)
Southeast 0.9	0.77	Х	1.9	97	X	62.67	X	0.4	X	0.7	=	23.96	(77)
Southeast 0.9		X	1.9	97	X	85.75	X	0.4	X	0.7	=	32.78	(77)
Southeast 0.9		X	1.9	97	X	106.25	X	0.4	X	0.7	=	40.62	(77)
Southeast 0.9		X	1.9	97	X	119.01	x	0.4	X	0.7	=	45.49	(77)
Southeast 0.9		X	1.9	97	X	118.15	X	0.4	X	0.7	=	45.16	(77)
Southeast 0.9		Х	1.9	97	X	113.91	X	0.4	X	0.7	=	43.54	(77)
Southeast 0.9	• • • • • • • • • • • • • • • • • • • •	Х	1.9	97	X	104.39	X	0.4	х	0.7	=	39.9	(77)
Southeast 0.9	0.77	x	1.9	97	X	92.85	X	0.4	X	0.7	=	35.49	(77)

69.27

0.77

Southeast 0.9x

26.48

Southeast 0.9x	Southeast 0.9x         0.77           Southwest0.9x         0.77           Southw		1.97 1.42 1.45 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.45 1.42 1.45 1.45 1.42 1.45 1.45 1.42 1.45		x x x x x x x x x x x x x x x x x x x	33 33 33 66 66 88 88 10 11 11 11 11	1.49 6.79 6.79 2.67 2.67 5.75 5.75 06.25 19.01 19.01 18.15	] ]	0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x x x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7		12.04 10.14 10.35 17.27 17.63 23.63 24.13 29.28 29.89 32.79 33.48 32.55	(77) (79) (79) (79) (79) (79) (79) (79)
Southwesto as	Southwest0.9x         0.77           Southwest0.9x         0.77		1.42 1.45 1.42 1.45 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42		x x x x x x x x x x x x x x x x x x x	33 36 66 88 80 10 11 11 11 11 11	6.79 6.79 2.67 2.67 5.75 5.75 06.25 06.25 19.01 19.01 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x x x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7		10.14 10.35 17.27 17.63 23.63 24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79) (79) (79) (79)
Southwestq. 9x	Southwest0.9x         0.77           Southwest0.9x         0.77		1.45 1.42 1.45 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45		x x x x x x x x x x x x x x x x x x x	36 66 88 88 10 10 11 11 11 11	6.79 2.67 2.67 5.75 5.75 06.25 06.25 19.01 19.01 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x x x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7		10.35 17.27 17.63 23.63 24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79) (79) (79) (79)
Southwesto as	Southwest0.9x         0.77           Southwest0.9x         0.77		1.42 1.45 1.42 1.45 1.42 1.45 1.45 1.42 1.45 1.45 1.42 1.45 1.45 1.42 1.45 1.45		x x x x x x x x x x x x x x x x x x x	66 88 88 10 10 11 11 11 11 11	2.67 2.67 5.75 5.75 06.25 06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x x x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7		17.27 17.63 23.63 24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79) (79) (79) (79)
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77		1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45		x x x x x x x x x x x x x x x x x x x	68 88 10 10 11 11 11 11 11	2.67 5.75 5.75 06.25 06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7 0.7	= = = = = = = = = = = = = = = = = = = =	17.63 23.63 24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79) (79) (79)
Southwesto 9x	Southwest0.9x         0.77           Southwest0.9x         0.77		1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42 1.45		x x x x x x x x x x x x x x x x x x x	8 8 8 10 10 11 11 11 11 11 11 11 11 11 11 11	5.75 5.75 06.25 06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7	= = = = = = = = = = = = = = = = = = = =	23.63 24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79) (79)
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77		1.45 1.42 1.45 1.45 1.45 1.45 1.45 1.45 1.45 1.45	5 2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	x x x x x x x x x x x x x x x x x x x	8 10 10 11 11 11 11 11 11 11 11 11 11 11	5.75 06.25 06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4 0.4 0.4	x x x x x x	0.7 0.7 0.7 0.7 0.7 0.7	= = = = = = = = = = = = = = = = = = = =	24.13 29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79) (79)
Southwesto.9x	Southwest0.9x         0.77           Southwest0.9x         0.77		1.42 1.45 1.42 1.45 1.45 1.42 1.45 1.45 1.42 1.45 1.42 1.45	2 5 2 2 5 2 2 5 2 2	x x x x x x x x x x	10 10 11 11 11 11 11 11 11 11 11 11 11 1	06.25 06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4	x x x x x x	0.7 0.7 0.7 0.7 0.7	= = = = =	29.28 29.89 32.79 33.48 32.55	(79) (79) (79) (79)
Southwesto,9x	Southwest0.9x         0.77           Southwest0.9x         0.77	x x x x x x x x x x x x x x x x x x x	1.45 1.42 1.45 1.45 1.42 1.45 1.42 1.45 1.42 1.45 1.42	5 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	x x x x x x x x x x	10 11 11 11 11 11 11 11 11 11 11 11 11 1	06.25 19.01 19.01 18.15 18.15		0.4 0.4 0.4 0.4 0.4	x x x x	0.7 0.7 0.7 0.7	= = = =	29.89 32.79 33.48 32.55	(79) (79) (79)
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77	x x x x x x x x x x x x x x x x x x x	1.42 1.45 1.42 1.45 1.45 1.45 1.45 1.45 1.45 1.45	2 5 2 5 2 5 2 2 5 2	x x x x x x	111 111 111	19.01 19.01 18.15 18.15 13.91		0.4 0.4 0.4 0.4	x x x	0.7 0.7	= = =	32.79 33.48 32.55	(79)
Southwesto,9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77	x	1.45 1.42 1.45 1.45 1.45 1.45 1.42 1.45 1.45	5 2 5 2 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7	x x x x x	1.	19.01 18.15 18.15 13.91		0.4 0.4 0.4	×	0.7	= =	33.48 32.55	(79)
Southwesto,9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations in the content of the cont	x x x x x x x x x x x	1.42 1.45 1.42 1.45 1.42 1.45 1.42	5 2 5 2 2 5 5 2 2 2 2 2 2 2 2 2 2 2 2 2	x x x x	1.	18.15 18.15 13.91		0.4	×	0.7	=	32.55	== ` `
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations         0.77           Solar gains in watts, calculations         0.77           Solar gains in watts, calculations         0.77           Solar gains in watts, calculations         0.77           Solar gains in watts, calculations         0.77	x x x x x x x x x	1.45 1.42 1.45 1.45 1.42 1.45 1.45	5 2 2 5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	x x x	1.	18.15 13.91		0.4	<del></del>		=		(79)
Southwesto, sx	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations and calculations are internal and calculations.         (83)m=           37.62         65.1         9           Total gains — internal and calculations.         (84)m=         261.69         287.25         3	x x x x x x x	1.42 1.45 1.42 1.45 1.42 1.45	2 5 2 5	x x x	1′	13.91			X	0.7			
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations         0.77           Total gains — internal and (84)m=         261.69         287.25         3	x x x x x x x	1.45 1.42 1.45 1.42	5 5	x x	1			2.1				33.24	(79)
Southwesto, 9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations         65.1           (83)m=         37.62         65.1           Total gains – internal and (84)m=         261.69         287.25         3	x x x	1.42 1.45 1.42 1.45	5	x	<u> </u>	13.91	1	0.4	X	0.7	=	31.39	(79)
Southwesto,9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculations         65.1           (83)m=         37.62         65.1         9           Total gains — internal and (84)m=         261.69         287.25         3	x x x	1.45 1.42 1.45	5		10			0.4	Х	0.7	=	32.05	(79)
Southwesto,9x	Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Southwest0.9x         0.77           Total gains in watts, calculated and cal	x x	1.42	2	x		04.39		0.4	х	0.7	=	28.76	(79)
Southwest0,9x 0.77 x 1.45 x 92.85	Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Solar gains in watts, calculations         0.77           Solar gains in watts, calculations         0.77           Total gains – internal and calculations         0.84)m=           261.69         287.25         3	×	1.45			10	04.39		0.4	x	0.7	=	29.37	(79)
Southwest0, 9x	Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Solar gains in watts, calculations         (83)m=           37.62         65.1           Total gains – internal and (84)m=         261.69           287.25         3	=		-	X	9	2.85		0.4	x	0.7	_	25.58	(79)
Southwesto.9x	Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Solar gains in watts, calculations         (83)m=           37.62         65.1           Total gains – internal and (84)m=         261.69           287.25         3	×	4.40	5	X	9	2.85		0.4	x	0.7	_	26.12	(79)
Southwesto,9x	Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Southwest <sub>0.9x</sub> 0.77           Solar gains in watts, calculations         (83)m=           37.62         65.1           Total gains – internal and (84)m=         261.69           287.25         3	=	1.42	2	X	6	9.27		0.4	x	0.7		19.09	(79)
Southwesto.9x	Southwest0.9x       0.77         Southwest0.9x       0.77         Southwest0.9x       0.77         Solar gains in watts, calculations       0.77         Solar gains in watts, calculations       65.1         (83)m=       37.62       65.1         Total gains – internal and control (84)m=       261.69       287.25       3	X	1.45	5	X	6	9.27	ĺ	0.4	x	0.7		19.49	(79)
Southwest0.9x	Southwest <sub>0.9x</sub> 0.77  Southwest <sub>0.9x</sub> 0.77  Solar gains in watts, calce (83)m= 37.62 65.1 9  Total gains – internal and (84)m= 261.69 287.25 3	x	1.42	2	X	4	4.07		0.4	х	0.7	=	12.14	(79)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 37.62   65.1   91.78   118.25   136.58   137.42   131.73   117.77   100.9   72.68   45.25   32.08   (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 261.69   287.25   305.86   319.82   325.9   314.57   301.05   291.71   281.3   265.74   252.75   250.1   (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.95   0.94   0.91   0.87   0.79   0.68   0.55   0.58   0.74   0.87   0.93   0.95   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.49   18.72   19.13   19.68   20.21   20.64   20.85   20.82   20.51   19.84   19.08   18.44   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub> 0.77  Solar gains in watts, calce (83)m= 37.62 65.1 9  Total gains – internal and (84)m= 261.69 287.25 3	x	1.45	5	X	4	4.07		0.4	х	0.7	=	12.4	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 261.69 287.25 305.86 319.82 325.9 314.57 301.05 291.71 281.3 265.74 252.75 250.1 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Solar gains in watts, calcomes (83)m= 37.62 65.1 9  Total gains – internal and (84)m= 261.69 287.25 3	<b>=</b> x	1.42	2	X	3	1.49	j	0.4	x	0.7		8.68	(79)
(83)m= 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 261.69 287.25 305.86 319.82 325.9 314.57 301.05 291.71 281.3 265.74 252.75 250.1 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(83)m=     37.62     65.1     9       Total gains – internal and       (84)m=     261.69     287.25     3	<b>=</b> x	1.45	5	X	3	1.49	İ	0.4	х	0.7		8.86	(79)
(83)m= 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 261.69 287.25 305.86 319.82 325.9 314.57 301.05 291.71 281.3 265.74 252.75 250.1 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(83)m=     37.62     65.1     9       Total gains – internal and       (84)m=     261.69     287.25     3	_												<u> </u>
Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 261.69 287.25 305.86 319.82 325.9 314.57 301.05 291.71 281.3 265.74 252.75 250.1 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Total gains – internal and (84)m= 261.69 287.25 3	ulated	for each	month	1			(83)m	= Sum(74)r	n(82)n	1		_	
(84)m= 261.69 287.25 305.86 319.82 325.9 314.57 301.05 291.71 281.3 265.74 252.75 250.1 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(84)m= 261.69 287.25 3							117	.77 100.9	72.6	8 45.25	32.08		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		solar b	(84)m =	(73)m	+ (8	83)m	, watts					_	_	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.94 0.91 0.87 0.79 0.68 0.55 0.58 0.74 0.87 0.93 0.95  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	7. Mean internal temper	305.86	319.82	325.9	3	14.57	301.05	291	.71 281.3	265.7	4 252.75	250.1		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m=       0.95       0.94       0.91       0.87       0.79       0.68       0.55       0.58       0.74       0.87       0.93       0.95         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       18.49       18.72       19.13       19.68       20.21       20.64       20.85       20.82       20.51       19.84       19.08       18.44         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	- Into an into mai to mpor	rature	(heating s	seasor	า)									
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temperature during hea	ating p	eriods in	the livi	ing	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
(86)m= 0.95	Utilisation factor for gain	ns for I	iving area	a, h1,m	n (s	ее Та	ble 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Jan Feb	Mar	Apr	May		Jun	Jul	Αı	ug Ser	) Oc	t Nov	Dec		
(87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(86)m= 0.95 0.94	0.91	0.87	0.79	(	0.68	0.55	0.5	8 0.74	0.87	0.93	0.95		(86)
(87)m= 18.49 18.72 19.13 19.68 20.21 20.64 20.85 20.82 20.51 19.84 19.08 18.44 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Mean internal temperatu	ure in l	living area	a T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)				_	
	<del> </del>	ī			$\overline{}$					19.8	4 19.08	18.44	7	(87)
	Temperature during hea	ating n	eriods in	rest of	f dw	/elling	from Ta	hle (	Th2 (°C	`				
	· <del></del>	zurig P			_	Ť			-	<del></del>	5 19.84	19.84		(88)
Utilization factor for gains for root of dwalling h2 m (ass Table 0s)	· ·	19.83						<u> </u>					_	• •
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.94 0.93 0.9 0.84 0.75 0.6 0.44 0.47 0.68 0.85 0.92 0.95 (89)			00t of deep	renna.	_	,m (se <sub>0.6</sub>	e Table 0.44	<del>–</del>	7 0.68	0.85	0.92	0.95		(89)
	0.01		est of dw 0.84	0.75		5.5	3	L		1 5.50	1 0.02	1 5.55	_	(30)

Mean	internal	temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 1	7 in Tabl	e 9c)				
(90)m=	17.57	17.8	18.2	18.75	19.25	19.64	19.79	19.78	19.53	18.91	18.16	17.53		(90)
()				10110					<u> </u>	LA = Livin			0.68	(91)
Maan	امسماما	4		ماندر ممالا س	امیرام مام	II:a.\ f	I A <b>T</b> 4	. /4 - £1	Λ\ Το					
(92)m=	18.19	18.43	ature (fo	19.38	19.9	20.32	20.51	20.49	20.2	19.55	18.79	18.15		(92)
			he mean								10.79	10.13		(32)
(93)m=	18.19	18.43	18.84	19.38	19.9	20.32	20.51	20.49	20.2	19.55	18.79	18.15		(93)
			uirement		10.0	20.02	20.01	20.40	20.2	10.00	10.70	10.10		(00)
			ernal ter		re obtain	and at st	on 11 of	Table 0	n so tha	t Ti m=(	76)m an	d re-calc	ulato	
			or gains i			ieu ai sii	ер п ог	Table 3	J, 50 IIIa	t 11,111—(	r Ojiii aii	u re-caic	uiaie	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	,									
(94)m=	0.93	0.91	0.88	0.83	0.75	0.63	0.51	0.53	0.7	0.84	0.91	0.93		(94)
Usefu	ıl gains,	hmGm .	, W = (94	1)m x (84	4)m	ı					ı	ı		
(95)m=	242.92	261.49	269.72	266.22	245.62	199.43	152.04	155.53	197.01	222.93	229.13	233.69		(95)
Montl	nly avera	age exte	rnal tem	perature	from Ta	able 8		!					l	
(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 mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]	•	•	l	
(97)m=	641.13	622.79	566.51	475.61	371.25	255.71	174.83	182.33	273.82	404.8	531.49	637.58		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	/Vh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	296.26	242.79	220.81	150.76	93.47	0	0	0	0	135.31	217.7	300.49		
						•	•	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1657.6	(98)
Space	e heating	n require	omont in	1.14/1. /	.,									=,
			anneni in	KVVn/m <sup>2</sup>	/vear								47.2	<b>(99)</b>
00 En		•				votomo i	poludino	, mioro C	יווט/				47.2	(99)
	ergy req	uiremer	nts – Indi			ystems i	ncluding	ı micro-C	CHP)				47.2	(99)
Spac	ergy req e heatin	uiremer g:	nts – Indi	vidual h	eating sy				CHP)					
Spac Fracti	ergy req e heatin ion of sp	uiremer ig: ace hea	nts – Indi at from se	vidual h	eating sy				, , , , , , , , , , , , , , , , , , ,				0	(201)
Spac Fracti Fracti	ergy req e heating ion of sp ion of sp	uiremer ig: ace hea ace hea	nts – Indi at from se at from m	vidual h econdary	eating sy y/supple em(s)		system	(202) = 1	- (201) =	(202)			0	(201)
Spac Fracti Fracti Fracti	ergy requestion of spansion of spansion of total	uiremer  ig: ace hea ace hea ace hea al heatin	nts - Indi at from se at from m ng from i	vidual h econdary nain syst main sys	eating sy y/supple em(s) stem 1		system	(202) = 1	, , , , , , , , , , , , , , , , , , ,	(203)] =			0	(201) (202) (204)
Spac Fracti Fracti Fracti	ergy requestion of spansion of spansion of total	uiremer  ig: ace hea ace hea ace hea al heatin	nts – Indi at from se at from m	vidual h econdary nain syst main sys	eating sy y/supple em(s) stem 1		system	(202) = 1	- (201) =	(203)] =			0	(201)
Spac Fracti Fracti Fracti Efficie	ergy req e heating ion of sp ion of tot ency of r	uiremer ig: ace hea ace hea al heatii nain spa	nts - Indi at from se at from m ng from i	vidual h econdary nain syst main systen	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1	- (201) =	(203)] =			0 1 1	(201) (202) (204)
Spac Fracti Fracti Fracti Efficie	ergy req e heating ion of sp ion of tot ency of r	uiremer ig: ace hea ace hea al heatii nain spa	nts – Indi at from se at from m ng from i ace heati	vidual h econdary nain syst main systen	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1	- (201) =	(203)] =	Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)
Spac Fracti Fracti Efficie Efficie	ergy req e heating ion of sp ion of tot ency of rency of sency of s	uiremen  ig: ace hea ace hea cal heatin main spa seconda  Feb	at from se at from m at from m ag from it ace heati	vidual hecondary nain systemain systemain systementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)
Spac Fracti Fracti Efficie Efficie	ergy req e heating ion of sp ion of tot ency of rency of sency of s	uiremen  ig: ace hea ace hea cal heatin main spa seconda  Feb	at from se at from m at from m ace heati ry/supple	vidual hecondary nain systemain systemain systementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov 217.7	Dec 300.49	0 1 1 90.4	(201) (202) (204) (206) (208)
Space Fracti Fracti Efficie Efficie Space	ergy requirements on of spanion of total ency of rency of spanion of total ency of spanion of s	uiremen ig: ace hea ace hea al heatin main spa seconda Feb g require 242.79	at from set from many from the content of the conte	vidual hecondary nain systemain systementar Apr alculatee	eating syy/supple em(s) stem 1 em 1 y heating May d above; 93.47	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 - 1	Oct			0 1 1 90.4	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Efficie Space	ergy requirements on of spanion of total ency of rency of spanion of total ency of spanion of s	uiremen ig: ace hea ace hea al heatin main spa seconda Feb g require 242.79	at from set from ming from it ace heating ry/supplement (comment (comment)	vidual hecondary nain systemain systementar Apr alculatee	eating syy/supple em(s) stem 1 em 1 y heating May d above; 93.47	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 - 1	Oct			0 1 1 90.4	(201) (202) (204) (206) (208)
Space Fracti Fracti Efficie Efficie Space	ergy requestion of spanion of total ency of representation of the spanion of the	uiremer ag: ace hea ace hea al heatin main spa seconda Feb g require 242.79	at from set from many from the mace heating ry/supplement (c 220.81	vidual hecondary nain systemain systementar Apr alculated 150.76 00 ÷ (20	eating sylvalupple em(s) stem 1 em 1 May dabove; 93.47	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (	Oct 135.31 149.68	217.7	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Efficie Space (211)m	ergy req e heating ion of sp ion of tot ency of rency of se Jan e heating 296.26 n = {[(98)]	uiremen ace hea ace hea ace hea al heatin main spa seconda Feb g require 242.79 om x (20 268.58	at from set from many from the	vidual hecondary nain systemain systementar Apr alculatee 150.76 00 ÷ (20 166.77	eating sylvy/supple em(s) stem 1 em 1 y heating May d above; 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (	Oct 135.31 149.68	217.7	300.49	0 1 1 90.4	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m	ergy requirements of span of total ency of span of spa	uiremer ag: ace hea ace hea al heatin nain spa seconda Feb g require 242.79 am x (20 268.58	at from set from ming from it ace heating ry/supplement (compared to 220.81) } x 1 244.26	vidual hecondary nain systemain systemain systemantar Apr alculated 150.76 00 ÷ (20 166.77	eating sylvy/supple em(s) stem 1 em 1 y heating May d above; 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (	Oct 135.31 149.68	217.7	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m	ergy req e heating ion of sp ion of tot ency of rency of se Jan e heating 296.26 n = {[(98) 327.73	uiremer ag: ace hea ace hea al heatin nain spa seconda Feb g require 242.79 am x (20 268.58	at from set from many from the	vidual hecondary nain systemain systemain systemantar Apr alculated 150.76 00 ÷ (20 166.77	eating sylvy/supple em(s) stem 1 em 1 y heating May d above; 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (	Oct 135.31 149.68	217.7	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m	ergy req e heating ion of sp ion of tot ency of rency of se Jan e heating 296.26 n = {[(98) 327.73	uirement ace head ace	at from set from many from the	vidual hecondary nain systemain systematar Apr alculated 150.76 00 ÷ (20 166.77	eating syy/supple em(s) stem 1 em 1 y heating May d above; 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2  Aug  0  Tota	- (201) = 02) × [1 - 0] Sep 0 0 I (kWh/yea	Oct  135.31  149.68  ar) = Sum(2	217.7 240.82 211) <sub>15,1012</sub>	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear (211)
Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98 (215)m=	ergy req e heating ion of sp ion of tot ency of rency of se Jan e heating 296.26 n = {[(98) 327.73 e heating m x (20	uiremen  ace hea ace hea ace hea al heatin main spa seconda  Feb g require 242.79  m x (20 268.58  g fuel (se	at from set from many from the	vidual hecondary nain systemain systematar Apr alculated 150.76 00 ÷ (20 166.77	eating syy/supple em(s) stem 1 em 1 y heating May d above; 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2  Aug  0  Tota	- (201) = 02) × [1 - 0] Sep 0 0 I (kWh/yea	Oct  135.31  149.68  ar) = Sum(2	217.7 240.82 211) <sub>15,1012</sub>	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m Space (215)m=	ergy required enterprise enterprise ency of representation of the ency of representation ency of several ency	uiremer ag: ace hea ace hea al heatin nain spa seconda Feb g require 242.79 om x (20 268.58 g fuel (sc 1)] } x 1	at from set from many from the condary of the conda	vidual hecondary nain systemain systematrar Apr alculated 150.76 00 ÷ (20 166.77 y), kWh/8) 0	eating sylvy/supple em(s) stem 1 em 1 y heating May d above 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2  Aug  0  Tota	- (201) = 02) × [1 - 0] Sep 0 0 I (kWh/yea	Oct  135.31  149.68  ar) = Sum(2	217.7 240.82 211) <sub>15,1012</sub>	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m Space (215)m=	ergy required enterprise enterprise ency of representation of the ency of representation ency of several ency	uiremer ag: ace hea ace hea al heatin nain spa seconda Feb g require 242.79 om x (20 268.58 g fuel (sc 1)] } x 1	at from set from many from in the set of the	vidual hecondary nain systemain systematrar Apr alculated 150.76 00 ÷ (20 166.77 y), kWh/8) 0	eating sylvy/supple em(s) stem 1 em 1 y heating May d above 93.47 06) 103.4	g system Jun 0	y system	(202) = 1 · (204) = (2  Aug  0  Tota	- (201) = 02) × [1 - 0] Sep 0 0 I (kWh/yea	Oct  135.31  149.68  ar) = Sum(2	217.7 240.82 211) <sub>15,1012</sub>	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Fracti Efficie Efficie Space (211)m Space = {[(98 (215)m=	ergy required enterprise enterprise enterprise ency of representation of total ency of section	uiremer  ace hea ace hea ace hea al heatin main spa seconda  Feb g require 242.79 m x (20 268.58 g fuel (se 1)] } x 1 0	at from set at from many from in the set of	vidual hecondary nain systemain systematra Apr alculated 150.76 00 ÷ (20 166.77 y), kWh/ 8) 0	eating sylvy/supple em(s) stem 1 em 1 y heating May d above) 103.4 month 0	g system Jun 0	y system  n, %  Jul  0	(202) = 1 · (204) = (2  Aug  0  Tota  Tota	- (201) = 02) × [1 - (201) = 0	Oct  135.31  149.68  ar) = Sum(2	217.7 240.82 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	300.49	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear

								1	
(217)m= 86.86 86.72 86.4 85.75 84.63	80.3	80.3	80.3	80.3	85.36	86.38	86.95		(217)
Fuel for water heating, kWh/month									
$(219)$ m = $(64)$ m x $100 \div (217)$ m (219)m= $163.22$ $142.82$ $149.14$ $133.28$ $130.74$	121.36	116.27	129.62	131.05	140.38	148.08	159.22		
	<u>l</u>		Tota	= Sum(21	19a) <sub>112</sub> =		Į.	1665.19	(219)
Annual totals					k\	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1								1833.63	
Water heating fuel used								1665.19	
Electricity for pumps, fans and electric keep-hot									_
mechanical ventilation - balanced, extract or po	sitive in	put fron	n outside	)			139.02		(230a)
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			214.02	(231)
Electricity for lighting								176.43	(232)
12a. CO2 emissions – Individual heating syster	ns inclu	ding mi	cro-CHP						
	Ene	erav			Fmiss	ion fac	tor		
					LIIII		101	<b>Emissions</b>	
	kWl	n/year			kg CO			kg CO2/yea	ır
Space heating (main system 1)	(211)	n/year				2/kWh	=		ır ](261)
Space heating (main system 1) Space heating (secondary)		n/year			kg CO	2/kWh		kg CO2/yea	_
	(211)	n/year x			kg CO2	2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	(211) (215) (219)	n/year	+ (263) + (	264) =	0.2°	2/kWh	=	kg CO2/yea	(261)
Space heating (secondary) Water heating	(211) (215) (219)	n/year x x x + (262)	+ (263) + (	264) =	0.2°	2/kWh	=	kg CO2/yea 396.06 0 359.68	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) (215) (219) (261)	n/year	+ (263) + (	264) =	0.2°	2/kWh 16 19 16	= =	396.06 0 359.68 755.74	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) (215) (219) (261) (231)	n/year	+ (263) + (	,	0.2°	2/kWh 16 19 16	= = =	kg CO2/yea 396.06 0 359.68 755.74	(261) (263) (264) (265) (267)

El rating (section 14)

(274)

		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property A	Address	: Flat Ty	pe C En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			(1a) x	3	3.09	(2a) =	108.52	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 3	5.12	(4)			,		
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	108.52	(5)
2. Ventilation rate:	main seconda	181 Z	other		40401			m³ nor hou	•
	heating heating	, _	other		total		,	m³ per hou	_
Number of chimneys	0 + 0	+	0	_ = _	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				2	X	10 =	20	(7a)
Number of passive vents	3			Ī	0	X	10 =	0	(7b)
Number of flueless gas fi	ires			Ī	0	X -	40 =	0	(7c)
								_	
				_			Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+6$			[	20		÷ (5) =	0.18	(8)
Number of storeys in t	peen carried out or is intended, proce he dwelling (ns)	ed to (17), c	otherwise (	continue tr	om (9) to	(16)		0	(9)
Additional infiltration	no awaiiing (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 for	masoni	y constr	ruction	-		0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding	to the greate	er wall are	a (after			'		
deducting areas of openii	ngs);	).1 (seale	d). else	enter 0				0	(12)
If no draught lobby, en	,	(	/,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelope	area	5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.43	(18)
Number of sides sheltere	es if a pressurisation test has been do ad	one or a deg	gree air pe	rmeability	is being u	sea		0	(19)
Shelter factor	,u		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.43	(21)
Infiltration rate modified f	or monthly wind speed								
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	2)m <i>÷ 4</i>								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
. ,	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	L			<u> </u>		I	

0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51		
a <i>lcul<mark>ate effe</mark></i> If mechanic		-	rate for t	he appli	cable ca	se	•	•	•		•	•	
If exhaust air h			andiv N (2	13h) - (23	a) v Emv (e	aguation (	N5N othe	rwica (23h	n) = (23a)			(	
If balanced with									) = (23a)			(	
a) If balance		•	•	_					2h\m + (	23h) <b>√</b> [•	1 _ (23c)	± 1001	) (
a) II balarice	0	0	0	0	0	0	0	0	0	0	0		(
b) If balance	ed mech	anical ve	ļ	without	heat rec	overv (I	MV) (24h	l = (2)	2b)m + (	23b)		J	·
b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
c) If whole h if (22b)r				•	•				.5 × (23b	·)		I	
-c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)r	ventilation $n = 1$ , the								0.5]			ı	
d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	ld) in box	(25)	-		-	•	
)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Heat losse	es and he	eat loss	paramet	er:									
EMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K
ors Type 1					2.13	x	1	=	2.13				(
ors Type 2					0.72	X	1	=	0.72				(
ors Type 3													
					0.99	X	1	=	0.99				(
ors Type 4					0.99	=	1	= = = = = = = = = = = = = = = = = = = =	0.99				·
• •						×		_					(
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oors Type 4 pors Type 5 pors Type 6 indows Type	e 1				0.72	x x x x	1	= = = =	0.72				(
oors Type 5 oors Type 6 indows Type					0.72 0.72 0.63	x x x x x x1	1 1	= = = 0.04] =	0.72 0.72 0.63				(
oors Type 5 oors Type 6 ndows Type ndows Type	e 2				0.72 0.72 0.63 0.5	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	0.72 0.72 0.63 0.66				(
oors Type 5 oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
oors Type 5	e 2 e 3 e 4				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
pors Type 5 nors Type 6 indows Type indows Type indows Type indows Type indows Type	e 2 e 3 e 4	1	2.91		0.72 0.72 0.63 0.5 0.91 0.65	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89			<b>¬</b> г	
ors Type 5 ors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type ndows Type	e 2 e 3 e 4 e 5		2.91	=	0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89				
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type alls Type1	e 2 e 3 e 4 e 5	6			0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37				()
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type alls Type1 alls Type2	e 2 e 3 e 4 e 5 10.5	6 5	2.21		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4 e 5 10.5 8.06	6 5 3	0.91		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.5 8.00 19.4	6 5 3	2.21 0.91		0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35 1.45				

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.88

(33)

Heat capacity $Cm = S(A \times k)$ ((	((28)(30) + (32)	+ (32a)	(32e) =	316.08	(34)
	ndicative Value: I	Medium		250	(35)
For design assessments where the details of the construction are not known precisely the indicate can be used instead of a detailed calculation.	cative values of 7	TMP in Tab	ole 1f	200	(00)
Thermal bridges: S (L x Y) calculated using Appendix K			Г	4.58	(36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$			_		
Total fabric heat loss (3	(33) + (36) =			27.47	(37)
Ventilation heat loss calculated monthly (3	$(38)$ m = $0.33 \times (28)$	5)m x (5)			
Jan Feb Mar Apr May Jun Jul Aug S	Sep Oct	Nov	Dec		
(38)m= 23.4 23.18 22.97 21.99 21.81 20.95 20.95 20.8 21.	.28 21.81	22.18	22.57		(38)
Heat transfer coefficient, W/K (3	(39)m = (37) + (38	B)m			
(39)m= 50.86 50.65 50.44 49.46 49.28 48.42 48.42 48.26 48.	3.75 49.28	49.65	50.04		_
Heat loss parameter (HLP), W/m²K (4	Average = $\$$ (40)m = (39)m ÷ (		<sub>2</sub> /12=	49.46	(39)
(40)m= 1.45 1.44 1.44 1.41 1.4 1.38 1.38 1.37 1.3	.39 1.4	1.41	1.42		
Number of days in month (Table 1a)	Average = S	Sum(40) <sub>11</sub>	<sub>2</sub> /12=	1.41	(40)
Jan Feb Mar Apr May Jun Jul Aug S	Sep Oct	Nov	Dec		
(41)m= 31 28 31 30 31 30 31 31 30	30 31	30	31		(41)
		<u>!</u>			
4. Water heating energy requirement:			kWh/yea	r:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36 \times N$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water $N = N + 10 \times N$	· 6 [	1.2			(42)
not more that 125 litres per person per day (all water use, hot and cold)					
	Sep Oct	Nov	Dec		
Hot water usage in litres per day for each month $Vd,m = factor from Table 1c \times (43)$					
(44)m= 71.15 68.56 65.98 63.39 60.8 58.22 58.22 60.8 63.	3.39 65.98	68.56	71.15		_
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh	Total = Sum h/month (see Tab		, 1d)	776.21	(44)
(45)m= 105.52 92.29 95.23 83.02 79.66 68.74 63.7 73.1 73.1	86.21	94.1	102.19		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (6	Total = Sum	1(45) <sub>112</sub> =		1017.73	(45)
	· · · · · · · · ·	14.12	15.33		(46)
(46)m= 15.83 13.84 14.28 12.45 11.95 10.31 9.56 10.96 11. Water storage loss:	1.1 12.93	14.12	15.55		(40)
Storage volume (litres) including any solar or WWHRS storage within same	vessel	0			(47)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) Water storage loss:	enter '0' in (4	7)			
a) If manufacturer's declared loss factor is known (kWh/day):		0			(48)
Temperature factor from Table 2b		0			(49)
Energy lost from water storage, kWh/year (48) x (49) = b) If manufacturer's declared cylinder loss factor is not known:	Ī	0			(50)

Hot water stor	•			e 2 (kWl	h/litre/da	ay)					0		(51)
If community	_		on 4.3									i	
Volume factor Temperature			2h							_	0		(52)
•							(47) (54)	(50) (	<b>50</b> )		0		(53)
Energy lost fro		_	, KVVh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or	, , ,	,					((50) (	FF) (44).	_		0		(55)
Water storage							((56)m = (	55) × (41)ı	m <del>r                                      </del>	1	1	•	
(56)m= 0	0	0	0	0 (50)	0	0	0	0 (50)	0	0	0		(56)
If cylinder contain	ns dedicate	d solar sto	rage, (57)i	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)	m where (	H11) is tro	m Append	IX H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (an	nual) fro	m Table	3							0		(58)
Primary circui	t loss cal	culated f	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	y factor fi	rom Tab	le H5 if t	here is s	solar wat	ter 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	alculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m= 36.26	31.56	33.62	31.26	30.98	28.71	29.67	30.98	31.26	33.62	33.81	36.26		(61)
Total heat reg	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 141.78		128.85	114.29	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)		
(add additiona											3,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	vater hea	ter			<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u>!</u>	!	ı	
(64)m= 141.78		128.85	114.29	440.05	07.45				1			I	
	1	120.00	114.23	110.65	97.45	93.37	104.08	105.23	119.83	127.91	138.45		
	1.20.0	120.00	114.29	110.65	97.45	93.37				127.91 r (annual)₁	l .	1405.73	(64)
Heat gains fro					<u> </u>		Outp	out from wa	ater heate	I r (annual)₁	12		(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	Outr + (61)m	out from wa	ater heate	I r (annual)₁ + (57)m	+ (59)m		(64)
(65)m= 44.15	om water	heating,	kWh/mo	onth 0.29	5 ´ [0.85 30.03	× (45)m	Outr + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heate ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	], ,
(65)m= 44.15 include (57)	om water 38.57 )m in cald	heating, 40.07 culation o	kWh/mo 35.42 of (65)m	onth 0.25 34.23 only if c	5 ´ [0.85 30.03	× (45)m	Outr + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heate ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	], ,
(65)m= 44.15 include (57) 5. Internal g	om water 38.57 m in calc ains (see	heating, 40.07 culation of	kWh/mo 35.42 of (65)m	onth 0.25 34.23 only if c	5 ´ [0.85 30.03	× (45)m	Outr + (61)m 32.05	out from wa n] + 0.8 x 32.41	ater heate ( [(46)m 37.07	r (annual) <sub>1</sub> + (57)m 39.74	+ (59)m 43.04	]	], ,
(65)m= 44.15 include (57) 5. Internal g Metabolic gain	om water 38.57 )m in calc ains (see	heating, 40.07 culation of Table 5 25), Wat	kWh/mo 35.42 of (65)m 5 and 5a	34.23 only if c	5 ´ [0.85 30.03 ylinder i	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling	32.41 or hot w	ater heate ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	], ,
include (57) 5. Internal g Metabolic gain Jan	om water 38.57 m in calc ains (see ns (Table Feb	heating, 40.07 culation of Table 5 5), Wat Mar	kWh/mo 35.42 of (65)m and 5a ts Apr	onth 0.29 34.23 only if constant	5 ´ [0.85 30.03 ylinder i	× (45)m 28.6 s in the o	Outs + (61)m 32.05 dwelling	out from wa n] + 0.8 x 32.41 or hot w	ater heate ( [(46)m 37.07 ater is fr	+ (57)m 39.74 com com	+ (59)m 43.04 munity h	]	(65)
(65)m= 44.15 include (57) 5. Internal g Metabolic gain Jan (66)m= 64.18	om water 38.57 )m in calc ains (see ns (Table Feb 64.18	heating, 40.07 culation of Table 5 e 5), Wat Mar 64.18	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18	34.23 only if c	5 ´ [0.85 30.03 sylinder is Jun 64.18	× (45)m 28.6 s in the c	Outp + (61)m 32.05 dwelling Aug 64.18	out from wa a] + 0.8 x 32.41 or hot w Sep 64.18	ater heate ( [(46)m 37.07 ater is fr	+ (57)m 39.74	+ (59)m 43.04 munity h	]	], ,
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains	om water 38.57 om in calc ains (see reb 64.18 c (calcula	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap	kWh/mo 35.42 of (65)m 6 and 5a ts Apr 64.18	onth 0.29 34.23 only if constant of the consta	5 ´ [0.85 30.03 ylinder i Jun 64.18 ion L9 o	× (45)m  28.6 s in the c  Jul  64.18 r L9a), a	Outp + (61)m 32.05 dwelling Aug 64.18 lso see	sep 64.18 Table 5	ater heate ( [(46)m 37.07 ater is fr Oct 64.18	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h Dec 64.18	]	(65)
include (57) 5. Internal g Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 11.73	om water 38.57 om in calc ains (see ns (Table Feb 64.18 c (calcular 10.42	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap 8.47	kWh/mo 35.42 of (65)m 6 and 5a ts Apr 64.18 opendix 6.41	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79	5 ´ [0.85 30.03 ylinder is Jun 64.18 ion L9 o	x (45)m 28.6 s in the c  Jul 64.18 r L9a), a 4.37	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68	sep 64.18 Table 5 7.63	ott 64.18	+ (57)m 39.74 com com	+ (59)m 43.04 munity h	]	(65)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances ga	om water 38.57 om in calc ains (see Peb 64.18 c (calcula 10.42 ains (calc	heating, 40.07 culation of the Table 5 5), Wat Mar 64.18 ted in Ap 8.47 ulated in	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix 6.41	May 64.18 L, equati 4.79 dix L, eq	Jun 64.18 ion L9 o 4.05 uation L	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 4.37 13 or L1	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68	Sep 64.18 Table 5 7.63	ott 64.18	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
include (57) 5. Internal g Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 11.73	om water 38.57 om in calc ains (see Peb 64.18 c (calcula 10.42 ains (calc	heating, 40.07 culation of Table 5 5), Wat Mar 64.18 ted in Ap 8.47	kWh/mo 35.42 of (65)m 6 and 5a ts Apr 64.18 opendix 6.41	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79	5 ´ [0.85 30.03 ylinder is Jun 64.18 ion L9 o	x (45)m 28.6 s in the c  Jul 64.18 r L9a), a 4.37	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68	sep 64.18 Table 5 7.63	ott 64.18	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h Dec 64.18	]	(65)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances ga	m water 38.57 m in calc ains (see ns (Table Feb 64.18 c (calcular 10.42 ains (calc	heating, 40.07 culation of the Table 5 e 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76	kWh/mo 35.42 of (65)m 6 and 5a ts Apr 64.18 opendix 6.41 Appendix 101.66	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79 dix L, eq 93.97	Jun 64.18 ion L9 o 4.05 uation L	x (45)m 28.6 s in the c  Jul 64.18 r L9a), a 4.37 13 or L1 81.91	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77	Sep 64.18 Table 5 7.63 see Tal 83.63	oter heate ( [(46)m 37.07 ater is fr Oct 64.18 9.69 ble 5 89.73	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances gains  (68)m= 109.48	m water 38.57 m in calc ains (see ns (Table Feb 64.18 c (calcular 10.42 ains (calc	heating, 40.07 culation of the Table 5 e 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76	kWh/mo 35.42 of (65)m 6 and 5a ts Apr 64.18 opendix 6.41 Appendix 101.66	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79 dix L, eq 93.97	Jun 64.18 ion L9 o 4.05 uation L	x (45)m 28.6 s in the c  Jul 64.18 r L9a), a 4.37 13 or L1 81.91	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77	Sep 64.18 Table 5 7.63 see Tal 83.63	oter heate ( [(46)m 37.07 ater is fr Oct 64.18 9.69 ble 5 89.73	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18	]	(65) (66) (67)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances ga  (68)m= 109.48  Cooking gains	om water  38.57 om in calc  ains (see  ns (Table  Feb  64.18 s (calcula  10.42 ains (calc  110.62 s (calcula  29.42	heating, 40.07 culation of the Table 5 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76 tted in Ap 29.42	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix 6.41 101.66 opendix 29.42	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 4.05 uation L 86.74	x (45)m 28.6 s in the o Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a)	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77	Sep 64.18 Table 5 7.63 9 see Table 1 + 0.8 x 32.41 0 r hot w	oter heate ( [(46)m	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18  12.05	]	(65) (66) (67) (68)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances ga  (68)m= 109.48  Cooking gains  (69)m= 29.42	om water  38.57 om in calc  ains (see  ns (Table  Feb  64.18 s (calcula  10.42 ains (calc  110.62 s (calcula  29.42	heating, 40.07 culation of the Table 5 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76 tted in Ap 29.42	kWh/mo 35.42 of (65)m and 5a ts Apr 64.18 opendix 6.41 101.66 opendix 29.42	onth 0.29 34.23 only if c  May 64.18 L, equati 4.79 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 4.05 uation L 86.74	x (45)m 28.6 s in the o Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a)	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77	Sep 64.18 Table 5 7.63 9 see Table 1 + 0.8 x 32.41 0 r hot w	oter heate ( [(46)m	(annual), + (57)m 39.74 rom com Nov 64.18	+ (59)m 43.04 munity h  Dec 64.18  12.05	]	(65) (66) (67) (68)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances gains  (68)m= 109.48  Cooking gains  (69)m= 29.42  Pumps and fa	om water  38.57  om in calc  ains (see  ns (Table  Feb  64.18  c (calcula  10.42  ains (calc  110.62  s (calcula  29.42  ans gains  3	heating, 40.07 culation of the Table 5 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76 tted in Ap 29.42 (Table 5	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 101.66 opendix 29.42 5a) 3	onth 0.29 34.23 only if co  May 64.18 L, equati 4.79 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 4.05 uation L 86.74 tion L15 29.42	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 7.63 see Tale 29.42	oter heate ( [(46)m 37.07 ater is fr Oct 64.18 9.69 ble 5 89.73 5 29.42	r (annual), + (57)m 39.74 rom com Nov 64.18 11.31 97.42	+ (59)m 43.04 munity h  Dec 64.18  12.05  104.65	]	(65) (66) (67) (68) (69)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances ga  (68)m= 109.48  Cooking gains  (69)m= 29.42  Pumps and fa  (70)m= 3	om water  38.57  om in calc  ains (see  ns (Table  Feb  64.18  c (calcula  10.42  ains (calc  110.62  s (calcula  29.42  ans gains  3	heating, 40.07 culation of the Table 5 5), Wat Mar 64.18 ted in Ap 8.47 ulated in 107.76 tted in Ap 29.42 (Table 5	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 101.66 opendix 29.42 5a) 3	onth 0.29 34.23 only if co  May 64.18 L, equati 4.79 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 4.05 uation L 86.74 tion L15 29.42	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 7.63 see Tale 29.42	oter heate ( [(46)m 37.07 ater is fr Oct 64.18 9.69 ble 5 89.73 5 29.42	r (annual), + (57)m 39.74 rom com Nov 64.18 11.31 97.42	+ (59)m 43.04 munity h  Dec 64.18  12.05  104.65	]	(65) (66) (67) (68) (69)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances gains  (68)m= 109.48  Cooking gains  (69)m= 29.42  Pumps and fa  (70)m= 3  Losses e.g. ev  (71)m= -51.34	om water  38.57  om in calc  ains (see  ns (Table  Feb  64.18  c (calcula  10.42  ains (calc  110.62  s (calcula  29.42  ans gains  3  vaporatio  -51.34	heating, 40.07 culation of the Table 5 a 5), Wat Mar 64.18 ted in Ap 107.76 ulated in Ap 29.42 (Table 5 3 on (negating)	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 6.41 n Append 101.66 opendix 29.42 5a) 3	onth 0.29 34.23 only if co  May 64.18 L, equati 4.79 dix L, equ 93.97 L, equat 29.42  3 es) (Tab	Jun 64.18 ion L9 o 4.05 uation L 86.74 tion L15 29.42	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 7.63 see Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 39.74 rom com Nov 64.18 11.31 97.42	+ (59)m 43.04 munity h  Dec 64.18  12.05  104.65	]	(65) (66) (67) (68) (69) (70)
include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 11.73  Appliances gains  (68)m= 109.48  Cooking gains  (69)m= 29.42  Pumps and fain  (70)m= 3  Losses e.g. e	om water  38.57  om in calc  ains (see  ns (Table  Feb  64.18  c (calcula  10.42  ains (calc  110.62  s (calcula  29.42  ans gains  3  vaporatio  -51.34	heating, 40.07 culation of the Table 5 a 5), Wat Mar 64.18 ted in Ap 107.76 ulated in Ap 29.42 (Table 5 3 on (negating)	kWh/mo 35.42 of (65)m 5 and 5a ts Apr 64.18 opendix 6.41 n Append 101.66 opendix 29.42 5a) 3	onth 0.29 34.23 only if co  May 64.18 L, equati 4.79 dix L, equ 93.97 L, equat 29.42  3 es) (Tab	Jun 64.18 ion L9 o 4.05 uation L 86.74 tion L15 29.42	x (45)m 28.6 s in the o  Jul 64.18 r L9a), a 4.37 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 32.05 dwelling Aug 64.18 lso see 5.68 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 7.63 see Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 39.74 rom com Nov 64.18 11.31 97.42	+ (59)m 43.04 munity h  Dec 64.18  12.05  104.65	]	(65) (66) (67) (68) (69) (70)

Total	internal	l gains =					(66)	m + (67)m	n + (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	m		
(73)m=	225.81	223.69	215.34	202.52	190.03	17	77.75	169.97	174	.79	181.53	194.49	209.18	219.81		(73)
6. Sc	lar gain	s:			•											
Solar	gains are	calculated	using sola	r flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orient		Access F Table 6d	actor	Area m²	l		Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
Northe	ast <sub>0.9x</sub>	0.77	x	0.	5	X	1	1.28	x		0.63	X	0.7	=	1.72	(75)
Northe	ast <sub>0.9x</sub>	0.77	x	0.	15	X	1	1.28	x		0.63	X	0.7		0.52	(75)
Northe	ast <sub>0.9x</sub>	0.77	х	0.	5	X	2	2.97	x		0.63	X	0.7	=	3.51	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	X	2	2.97	X		0.63	X	0.7	=	1.05	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	4	1.38	X		0.63	X	0.7	=	6.32	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	4	1.38	X		0.63	X	0.7	=	1.9	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	6	7.96	X		0.63	X	0.7	=	10.38	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	6	7.96	X		0.63	×	0.7	=	3.12	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	9	1.35	X		0.63	x	0.7	=	13.96	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	9	1.35	X		0.63	x	0.7	=	4.19	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	9	7.38	x		0.63	x	0.7	=	14.88	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	g	7.38	x		0.63	x	0.7	=	4.46	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	,	91.1	X		0.63	x	0.7	=	13.92	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	,	91.1	x		0.63	x	0.7	=	4.18	(75)
Northe	ast <sub>0.9x</sub>	0.77	Х	0.	5	x	7	2.63	X		0.63	x	0.7	=	11.1	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	7	2.63	X		0.63	x	0.7	=	3.33	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	5	0.42	X		0.63	x	0.7	=	7.7	(75)
Northe	ast <sub>0.9x</sub>	0.77	х	0.	15	x	5	0.42	X		0.63	X	0.7	=	2.31	(75)
Northe	ast <sub>0.9x</sub>	0.77	х	0.	5	x	2	8.07	X		0.63	x	0.7	=	4.29	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	2	8.07	X		0.63	X	0.7	=	1.29	(75)
Northe	ast <sub>0.9x</sub>	0.77	Х	0.	5	x		14.2	X		0.63	x	0.7	=	2.17	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x		14.2	x		0.63	X	0.7	=	0.65	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	5	x	(	9.21	x		0.63	X	0.7	=	1.41	(75)
Northe	ast <sub>0.9x</sub>	0.77	X	0.	15	x	,	9.21	x		0.63	x	0.7	=	0.42	(75)
Southe	ast 0.9x	0.77	X	0.9	91	x	3	6.79	x		0.63	x	0.7	=	10.23	(77)
Southe	ast <sub>0.9x</sub>	0.77	Х	0.9	91	x	6	2.67	X		0.63	x	0.7	=	17.43	(77)
Southe	ast <sub>0.9x</sub>	0.77	Х	0.9	91	x	8	35.75	X		0.63	x	0.7	=	23.85	(77)
Southe	ast 0.9x	0.77	х	0.9	91	x	1	06.25	X		0.63	x	0.7	=	29.55	(77)
Southe	ast <sub>0.9x</sub>	0.77	X	0.9	91	x	1	19.01	X		0.63	x	0.7	=	33.1	(77)
Southe	ast <sub>0.9x</sub>	0.77	х	0.9	91	X	1	18.15	x		0.63	X	0.7	=	32.86	(77)
Southe	ast <sub>0.9x</sub>	0.77	X	0.9	91	X	1	13.91	x		0.63	X	0.7		31.68	(77)
Southe	ast <sub>0.9x</sub>	0.77	X	0.	91	X	1	04.39	x		0.63	x	0.7		29.03	(77)
Southe	ast <sub>0.9x</sub>	0.77	X	0.	91	х	9	2.85	x		0.63	x	0.7	<u> </u>	25.82	(77)
Southe	ast <sub>0.9x</sub>	0.77	х	0.	91	x	6	9.27	x		0.63	X	0.7	=	19.26	(77)

Southeast 0.9x
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Southwest 0.9x  0.77  x  0.65  x  106.25
Southwesto,9x 0.77 x 0.65 x 119.01 0.63 x 0.7 = 21.76 (79) Southwesto,9x 0.77 x 0.65 x 119.01 0.63 x 0.7 = 23.64 (79) Southwesto,9x 0.77 x 0.65 x 119.01 0.63 x 0.7 = 24.37 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 23.47 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 24.19 (79) Southwesto,9x 0.77 x 0.65 x 113.91 0.63 x 0.7 = 24.19 (79) Southwesto,9x 0.77 x 0.65 x 113.91 0.63 x 0.7 = 22.63 (79) Southwesto,9x 0.77 x 0.65 x 104.39 0.63 x 0.7 = 23.32 (79) Southwesto,9x 0.77 x 0.65 x 104.39 0.63 x 0.7 = 20.74 (79) Southwesto,9x 0.77 x 0.65 x 92.85 0.63 x 0.7 = 21.38 (79) Southwesto,9x 0.77 x 0.65 x 92.85 0.63 x 0.7 = 18.44 (79) Southwesto,9x 0.77 x 0.65 x 92.85 0.63 x 0.7 = 19.01 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.65 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79)
Southwesto,9x 0.77 x 0.65 x 119.01 0.63 x 0.7 = 23.64 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 24.37 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 24.19 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 24.19 (79) Southwesto,9x 0.77 x 0.65 x 118.15 0.63 x 0.7 = 24.19 (79) Southwesto,9x 0.77 x 0.65 x 113.91 0.63 x 0.7 = 22.63 (79) Southwesto,9x 0.77 x 0.65 x 113.91 0.63 x 0.7 = 23.32 (79) Southwesto,9x 0.77 x 0.65 x 104.39 0.63 x 0.7 = 20.74 (79) Southwesto,9x 0.77 x 0.65 x 104.39 0.63 x 0.7 = 21.38 (79) Southwesto,9x 0.77 x 0.65 x 92.85 0.63 x 0.7 = 21.38 (79) Southwesto,9x 0.77 x 0.65 x 92.85 0.63 x 0.7 = 18.44 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 19.01 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 113.76 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 69.27 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 14.18 (79) Southwesto,9x 0.77 x 0.65 x 44.07 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79) Southwesto,9x 0.77 x 0.66 x 31.49 0.63 x 0.7 = 6.26 (79)
Southwesto,9x
Southwesto.9x         0.77         x         0.65         x         118.15         0.63         x         0.7         =         23.47         (79)           Southwesto.9x         0.77         x         0.67         x         118.15         0.63         x         0.7         =         24.19         (79)           Southwesto.9x         0.77         x         0.65         x         113.91         0.63         x         0.7         =         22.63         (79)           Southwesto.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         23.32         (79)           Southwesto.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         20.74         (79)           Southwesto.9x         0.77         x         0.67         x         104.39         0.63         x         0.7         =         21.38         (79)           Southwesto.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwesto.9x         0.77         <
Southwesto.9x         0.77         x         0.67         x         118.15         0.63         x         0.7         =         24.19         (79)           Southwesto.9x         0.77         x         0.65         x         113.91         0.63         x         0.7         =         22.63         (79)           Southwesto.9x         0.77         x         0.67         x         113.91         0.63         x         0.7         =         23.32         (79)           Southwesto.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         20.74         (79)           Southwesto.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         21.38         (79)           Southwesto.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwesto.9x         0.77         x         0.65         x         69.27         0.63         x         0.7         =         13.76         (79)           Southwesto.9x         0.77 <t< td=""></t<>
Southwest0.9x         0.77         x         0.65         x         113.91         0.63         x         0.7         =         22.63         (79)           Southwest0.9x         0.77         x         0.67         x         113.91         0.63         x         0.7         =         23.32         (79)           Southwest0.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         20.74         (79)           Southwest0.9x         0.77         x         0.67         x         104.39         0.63         x         0.7         =         21.38         (79)           Southwest0.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwest0.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwest0.9x         0.77         x         0.65         x         69.27         0.63         x         0.7         =         14.18         (79)           Southwest0.9x         0.77 <td< td=""></td<>
Southwest0.9x         0.77         x         0.67         x         113.91         0.63         x         0.7         =         23.32         (79)           Southwest0.9x         0.77         x         0.65         x         104.39         0.63         x         0.7         =         20.74         (79)           Southwest0.9x         0.77         x         0.67         x         104.39         0.63         x         0.7         =         21.38         (79)           Southwest0.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwest0.9x         0.77         x         0.67         x         92.85         0.63         x         0.7         =         19.01         (79)           Southwest0.9x         0.77         x         0.65         x         69.27         0.63         x         0.7         =         13.76         (79)           Southwest0.9x         0.77         x         0.65         x         44.07         0.63         x         0.7         =         8.75         (79)           Southwest0.9x         0.77         x
Southwest0.9x       0.77       x       0.65       x       104.39       0.63       x       0.7       =       20.74       (79)         Southwest0.9x       0.77       x       0.67       x       104.39       0.63       x       0.7       =       21.38       (79)         Southwest0.9x       0.77       x       0.65       x       92.85       0.63       x       0.7       =       18.44       (79)         Southwest0.9x       0.77       x       0.67       x       92.85       0.63       x       0.7       =       19.01       (79)         Southwest0.9x       0.77       x       0.65       x       69.27       0.63       x       0.7       =       13.76       (79)         Southwest0.9x       0.77       x       0.65       x       69.27       0.63       x       0.7       =       14.18       (79)         Southwest0.9x       0.77       x       0.65       x       44.07       0.63       x       0.7       =       8.75       (79)         Southwest0.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26 <t< td=""></t<>
Southwesto.9x         0.77         x         0.67         x         104.39         0.63         x         0.7         =         21.38         (79)           Southwesto.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwesto.9x         0.77         x         0.67         x         92.85         0.63         x         0.7         =         19.01         (79)           Southwesto.9x         0.77         x         0.65         x         69.27         0.63         x         0.7         =         13.76         (79)           Southwesto.9x         0.77         x         0.67         x         69.27         0.63         x         0.7         =         14.18         (79)           Southwesto.9x         0.77         x         0.65         x         44.07         0.63         x         0.7         =         8.75         (79)           Southwesto.9x         0.77         x         0.65         x         31.49         0.63         x         0.7         =         6.26         (79)           Southwesto.9x         0.77         x
Southwest0.9x         0.77         x         0.65         x         92.85         0.63         x         0.7         =         18.44         (79)           Southwest0.9x         0.77         x         0.67         x         92.85         0.63         x         0.7         =         19.01         (79)           Southwest0.9x         0.77         x         0.65         x         69.27         0.63         x         0.7         =         13.76         (79)           Southwest0.9x         0.77         x         0.67         x         69.27         0.63         x         0.7         =         14.18         (79)           Southwest0.9x         0.77         x         0.65         x         44.07         0.63         x         0.7         =         8.75         (79)           Southwest0.9x         0.77         x         0.65         x         31.49         0.63         x         0.7         =         6.26         (79)           Southwest0.9x         0.77         x         0.65         x         31.49         0.63         x         0.7         =         6.26         (79)           Southwest0.9x         0.77         x
Southwest0.9x       0.77       x       0.67       x       92.85       0.63       x       0.7       =       19.01       (79)         Southwest0.9x       0.77       x       0.65       x       69.27       0.63       x       0.7       =       13.76       (79)         Southwest0.9x       0.77       x       0.67       x       69.27       0.63       x       0.7       =       14.18       (79)         Southwest0.9x       0.77       x       0.65       x       44.07       0.63       x       0.7       =       8.75       (79)         Southwest0.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26       (79)         Southwest0.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26       (79)         Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m=       27.32       47.28       66.66       85.91       99.25       99.87       95.73       85.57       73.3       52.78       32.85       23.29       (83)
Southwesto.9x       0.77       x       0.65       x       69.27       0.63       x       0.7       =       13.76       (79)         Southwesto.9x       0.77       x       0.67       x       69.27       0.63       x       0.7       =       14.18       (79)         Southwesto.9x       0.77       x       0.65       x       44.07       0.63       x       0.7       =       8.75       (79)         Southwesto.9x       0.77       x       0.67       x       44.07       0.63       x       0.7       =       9.02       (79)         Southwesto.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26       (79)         Southwesto.9x       0.77       x       0.67       x       31.49       0.63       x       0.7       =       6.26       (79)         Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m = 27.32       47.28       66.66       85.91       99.25       99.87       95.73       85.57       73.3       52.78       32.85       23.29       (83)
Southwest0.9x       0.77       x       0.67       x       69.27       0.63       x       0.7       =       14.18       (79)         Southwest0.9x       0.77       x       0.65       x       44.07       0.63       x       0.7       =       8.75       (79)         Southwest0.9x       0.77       x       0.67       x       44.07       0.63       x       0.7       =       9.02       (79)         Southwest0.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26       (79)         Southwest0.9x       0.77       x       0.67       x       31.49       0.63       x       0.7       =       6.26       (79)         Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m = 27.32       47.28       66.66       85.91       99.25       99.87       95.73       85.57       73.3       52.78       32.85       23.29       (83)
Southwesto.9x       0.77       x       0.65       x       44.07       0.63       x       0.7       =       8.75       (79)         Southwesto.9x       0.77       x       0.67       x       44.07       0.63       x       0.7       =       9.02       (79)         Southwesto.9x       0.77       x       0.65       x       31.49       0.63       x       0.7       =       6.26       (79)         Southwesto.9x       0.77       x       0.67       x       31.49       0.63       x       0.7       =       6.45       (79)         Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m=       27.32       47.28       66.66       85.91       99.25       99.87       95.73       85.57       73.3       52.78       32.85       23.29       (83)
Southwest <sub>0.9x</sub> $0.77$ $\times$ $0.67$ $\times$ $44.07$ $0.63$ $\times$ $0.7$ $= 9.02$ $(79)$ Southwest <sub>0.9x</sub> $0.77$ $\times$ $0.65$ $\times$ $31.49$ $0.63$ $\times$ $0.7$ $= 6.26$ $(79)$ Southwest <sub>0.9x</sub> $0.77$ $\times$ $0.67$ $\times$ $0.67$ $\times$ $0.67$ $\times$ $0.63$ $\times$ $0.7$ $= 6.26$ $(79)$ Southwest <sub>0.9x</sub> $0.77$ $\times$ $0.67$ $\times$ $0.67$ $\times$ $0.67$ $\times$ $0.63$ $\times$ $0.7$ $= 6.45$ $(79)$ Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$ $(83)m = 27.32$ $47.28$ $66.66$ $85.91$ $99.25$ $99.87$ $95.73$ $85.57$ $73.3$ $52.78$ $32.85$ $23.29$ $(83)$
Southwest <sub>0.9x</sub> 0.77 x 0.65 x 31.49 0.63 x 0.7 = 6.26 (79) Southwest <sub>0.9x</sub> 0.77 x 0.67 x 31.49 0.63 x 0.7 = 6.45 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 27.32 47.28 66.66 85.91 99.25 99.87 95.73 85.57 73.3 52.78 32.85 23.29 (83)
Southwest <sub>0.9x</sub> $0.77$ x $0.67$ x $31.49$ $0.63$ x $0.7$ = $6.45$ (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = $27.32$ 47.28 66.66 85.91 99.25 99.87 95.73 85.57 73.3 52.78 32.85 23.29 (83)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 27.32 47.28 66.66 85.91 99.25 99.87 95.73 85.57 73.3 52.78 32.85 23.29 (83)
(83)m= 27.32 47.28 66.66 85.91 99.25 99.87 95.73 85.57 73.3 52.78 32.85 23.29 (83)
(83)m= 27.32 47.28 66.66 85.91 99.25 99.87 95.73 85.57 73.3 52.78 32.85 23.29 (83)
Total gains – internal and solar (84)m = (73)m + (83)m, watts
(84)m= 253.12 270.97 282 288.44 289.28 277.62 265.7 260.36 254.83 247.28 242.03 243.1 (84)
7. Mean internal temperature (heating season)
Temperature during heating periods in the living area from Table 9, Th1 (°C)
Utilisation factor for gains for living area, h1,m (see Table 9a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(86)m= 1 0.99 0.99 0.98 0.94 0.86 0.71 0.74 0.91 0.98 0.99 1 (86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.48 19.61 19.85 20.19 20.53 20.81 20.94 20.93 20.73 20.31 19.85 19.48 (87)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.48 19.61 19.85 20.19 20.53 20.81 20.94 20.93 20.73 20.31 19.85 19.48 (87)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.48 19.61 19.85 20.19 20.53 20.81 20.94 20.93 20.73 20.31 19.85 19.48  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 19.73 19.73 19.74 19.76 19.76 19.78 19.78 19.78 19.77 19.76 19.75 19.74 (88)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.48 19.61 19.85 20.19 20.53 20.81 20.94 20.93 20.73 20.31 19.85 19.48  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

Mean interna	17.94	18.28	18.79	19.26	19.64	19.76	19.75	19.54	18.96	18.3	17.75		(90)
30)111-	17.04	10.20	10.70	10.20	10.04	10.70	10.70			g area ÷ (4	l	0.68	(91)
												0.00	
Mean interna	<del></del>	<del> </del>			<del></del>	r						1	(00)
92)m= 18.93	19.08	19.35	19.74	20.12	20.44	20.56	20.55	20.35	19.88	19.36	18.92		(92)
Apply adjust	1					i				1	1	1	
93)m= 18.93	19.08	19.35	19.74	20.12	20.44	20.56	20.55	20.35	19.88	19.36	18.92		(93)
8. Space hea													
Set Ti to the			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisation					lun	11	۸۰۰۰	Con	Oct	Nov	Doo		
Jan Utilisation for	Feb	Mar Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factors 0.99	0.99	0.98	0.97	0.92	0.82	0.66	0.69	0.88	0.97	0.99	0.99		(94)
′					0.82	0.00	0.09	0.00	0.91	0.99	0.99		(54)
Useful gains	1	0.00 = 0.00	, ·		227.84	176.21	180.88	223.56	238.87	239.18	244.62		(95)
95)m= 251.31	268.16	<u> </u>	278.74	267.51	<u> </u>	176.21	100.00	223.30	230.07	239.16	241.63		(93)
Monthly ave	T .					40.0	40.4		40.0			1	(06)
96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	1				·	<del>-``</del>	- ,			000.40	700.00	1	(07)
97)m= 744.09	718.08	648.14	536.33	415.07	282.73	191.84	200.35	304.69	457.19	608.49	736.68		(97)
Space heating	<del></del>				i			· ` i	· - `	r <del>i</del>	1		
98)m= 366.63	302.34	275.98	185.46	109.79	0	0	0	0	162.43	265.9	368.32		_
							Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2036.86	(98)
Space heatir	ng require	ement in	kWh/m²	/year								58	(99)
a. Energy re	guiremer	nts – Indi	vidual h	eating sy	vstems i	ncluding	maioro C						
Space heati						I COLLA COLLA COL		HP)					
	na:			. J	y otorno r	ricidaling	micro-C	CHP)					
•	•	nt from se	econdar				micro-C	HP)				0	(201
Fraction of s	pace hea		-	y/supple		system	(202) = 1 -	,					╡`
Fraction of s	pace hea	at from m	ain syst	y/supple em(s)		system	(202) = 1 -	- (201) =	(203)] -			1	(202
Fraction of s Fraction of s Fraction of to	pace hea pace hea otal heati	nt from m	ain syst main sys	y/supple em(s) stem 1		system	(202) = 1 -	,	(203)] =			1	(202
Fraction of s Fraction of s Fraction of to	pace hea pace hea otal heati	nt from m	ain syst main sys	y/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of	pace hea pace hea otal heatii main spa	at from m ng from r ace heati	ain syst main sys ng syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1	(202
Fraction of s Fraction of s Fraction of to Efficiency of	pace hea pace hea otal heatii main spa	at from m ng from r ace heati	ain syst	y/supple em(s) stem 1 em 1 y heating	mentary	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	(203)] =	Nov	Dec	1 1 93.4 0	(202 (204 (206 (208
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan	pace hea pace hea otal heatii main spa seconda	at from m ng from r ace heati ry/supple Mar	ain syst main sys ng syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 -	- (201) =		Nov	Dec	1 1 93.4	(202 (204 (206 (208
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of	pace hea pace hea otal heatii main spa seconda Feb ng require	at from m ng from r ace heati ry/supple Mar	ain syst main sys ng syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (		Nov 265.9	Dec 368.32	1 1 93.4 0	(202 (204 (206 (208
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatir 366.63	pace head pace head pace head pace head pace head main space seconda  Feb ng require 302.34	nt from ming from race heating ry/supplement (co. 275.98	ain systemain systemain systementary Apr alculated	y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system  1, %  Jul	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - (	Oct			1 1 93.4 0	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of  Jan Space heatir  366.63 211)m = {[(98	pace hea pace hea otal heatin main spa seconda Feb ng require 302.34	at from ming from race heating ry/supplement (colors, see the colors, see the	ain systemain systemain systementar: Apr Alculated 185.46	y/supple em(s) stem 1 em 1 y heating May d above) 109.79	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = 0	- (201) = 02) × [1 - (	Oct 162.43	265.9	368.32	1 1 93.4 0	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatir 366.63	pace hea pace hea otal heatin main spa seconda Feb ng require 302.34	nt from ming from race heating ry/supplement (co. 275.98	ain systemain systemain systementary Apr alculated	y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system  1, %  Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 162.43	265.9 284.69	368.32 394.34	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of  Jan Space heatir  366.63 211)m = {[(98	pace head pace head pace head pace head pace head pace head seconda.  Feb ng require 302.34  303.34  303.34	nt from ming from race heating ry/supplement (c. 275.98 4)] } x 1	ain systemain systemain systementary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 06)	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 162.43	265.9 284.69	368.32 394.34	1 1 93.4 0	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir  366.63  211)m = {[(98 392.54)}  Space heatir	pace head pace h	nt from ming from race heating ry/supplement (cale 275.98 and 195.48 argument supplement (cale 275.98 argument supplement	ain systemain systemain systemantary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 06)	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 162.43	265.9 284.69	368.32 394.34	1 1 93.4 0 kWh/ye	(202 (204 (208 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir  366.63  211)m = {[(98) 392.54}  Space heatir = {[(98)m x (2)	pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb agrequire 302.34 agree 333.71 agree fuel (\$01)] } x 1	mag from mage heating ry/supplement (c. 275.98 4)] } x 1 295.48 econdary 00 ÷ (200 m)	ain systemain systemain systematary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 16) 117.54	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0 Sep 0 I (kWh/yea	Oct 162.43 173.91 ar) =Sum(2	265.9 284.69 211) <sub>15,1012</sub>	368.32	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir  366.63  211)m = {[(98) 392.54}  Space heatir = {[(98)m x (2)	pace head pace h	nt from ming from race heating ry/supplement (cale 275.98 and 195.48 argument supplement (cale 275.98 argument supplement	ain systemain systemain systemantary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 06)	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct  162.43  173.91  ar) =Sum(2	265.9 284.69 211) <sub>15,1012</sub>	368.32	1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir  366.63  211)m = {[(98) 392.54}  Space heatir = {[(98)m x (2)	pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb agrequire 302.34 agree 333.71 agree fuel (\$01)] } x 1	mag from mage heating ry/supplement (c. 275.98 4)] } x 1 295.48 econdary 00 ÷ (200 m)	ain systemain systemain systematary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 16) 117.54	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0 Sep 0 I (kWh/yea	Oct  162.43  173.91  ar) =Sum(2	265.9 284.69 211) <sub>15,1012</sub>	368.32	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Efficiency of  Jan Space heatir  366.63 211)m = {[(98) 392.54  Space heatir = {[(98)m x (2 215)m= 0   Nater heating	pace head pace h	nt from ming from reace heating ry/supplement (called and part) and the condary on the condary o	ain systemain systemain systematary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 06) 117.54 month	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct  162.43  173.91  ar) =Sum(2	265.9 284.69 211) <sub>15,1012</sub>	368.32	1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir 366.63  211)m = {[(98) 392.54}  Space heatir = {[(98)m x (2) 215)m= 0   Nater heatin Dutput from w	pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb pag require 302.34 pag fuel (\$01)] } x 1 pag fuel (\$01)] } x	t from m ng from r ace heati ry/supple Mar ement (ca 275.98 4)] } x 1 295.48 econdary 00 ÷ (20) 0	ain systemain systemain systematary Apr alculated 185.46 00 ÷ (20 198.57 //), kWh/ 8) 0	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 16) 117.54 month 0	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - ( Sep 0 1 (kWh/yea	Oct  162.43  173.91  ar) = Sum(2	265.9 284.69 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	368.32	1 93.4 0 kWh/ye	(201 (202 (204 (208 (208 (211 (211)
Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir 366.63 211)m = {[(98) 392.54}  Space heatir = {[(98)m x (2)	pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb pag require 302.34 pag fuel (\$01)] } x 1 pag fuel (\$01)] } x	nt from ming from reace heating ry/supplement (called and part) and the condary on the condary o	ain systemain systemain systematary Apr alculated 185.46 00 ÷ (20 198.57	y/supple em(s) stem 1 em 1 y heating May d above) 109.79 06) 117.54 month	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct  162.43  173.91  ar) =Sum(2	265.9 284.69 211) <sub>15,1012</sub>	368.32	1 93.4 0 kWh/ye	

										1	
( ,	6.92 86.26	85.03	80.3	80.3	80.3	80.3	85.82	86.85	87.4		(217)
Fuel for water heating, kW											
$(219)$ m = $(64)$ m x $100 \div (219)$ m = $162.33$ $142$ $14$	8.24 132.48	130.13	121.36	116.27	129.62	131.05	139.63	147.28	158.41	1	
` '	!				Tota	I = Sum(2	19a) <sub>112</sub> =		<u> </u>	1658.81	(219)
Annual totals							k۱	Wh/yeaı	•	kWh/yea	` r
Space heating fuel used, r	main system	1						·		2180.79	
Water heating fuel used										1658.81	Ī
Electricity for pumps, fans	and electric	keep-ho	t								_
central heating pump:									30	]	(230c)
boiler with a fan-assisted	l flue								45	]	(230e)
Total electricity for the abo	ove, kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										207.11	(232)
12a. CO2 emissions – In	dividual heat	ing syste	ms inclu	uding mi	cro-CHP						
12a. CO2 emissions – In	dividual heat	ing syste			cro-CHP		Emiss	ion fac	tor	Emissions	
12a. CO2 emissions – In	dividual heat	ing syste	En	uding mi <b>ergy</b> /h/year	cro-CHP		Emiss kg CO2	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
12a. CO2 emissions – In		ing syste	<b>En</b> kW	ergy	cro-CHP			2/kWh	tor =		
	əm 1)	ing syste	<b>En</b> kW (211	<b>ergy</b> /h/year	cro-CHP		kg CO2	2/kWh		kg CO2/ye	ar
Space heating (main syste	əm 1)	ing syste	<b>En</b> kW (211	<b>ergy</b> /h/year	cro-CHP		kg CO2	2/kWh	=	kg CO2/ye	ar (261)
Space heating (main system Space heating (secondary	əm 1)	ing syste	En kW (211 (215	ergy /h/year () × (5) ×	cro-CHP + (263) + (		0.2°	2/kWh	=	kg CO2/ye	ar (261) (263)
Space heating (main system Space heating (secondary Water heating	em 1) /)		En kW (211 (215 (219 (261	ergy /h/year () × (5) ×			0.2°	2/kWh 16 19	=	kg CO2/ye 471.05 0 358.3	(261) (263) (264)
Space heating (main system of space heating (secondary Water heating Space and water heating space and water heating space space space and water heating space spa	em 1) /)		En kW (211 (215 (219 (261	ergy /h/year () x (5) x (9) x			0.2°	2/kWh 16 19 16	= = =	kg CO2/ye 471.05 0 358.3 829.35	(261) (263) (264) (265)
Space heating (main system of space heating (secondary Water heating Space and water heating Electricity for pumps, fans	em 1) /)		En kW (211 (215 (219 (261	ergy /h/year /) x /) x /) x /) + (262)		264) =	0.2° 0.5° 0.5°	2/kWh 16 19 16 19 19	= = =	kg CO2/ye 471.05 0 358.3 829.35 38.93	(261) (263) (264) (265) (267)
Space heating (main system of space heating (secondary Water heating Space and water heating Electricity for pumps, fans Electricity for lighting	em 1) /)		En kW (211 (215 (219 (261	ergy /h/year /) x /) x /) x /) + (262)		264) =	0.2° 0.5° 0.5° 0.5°	2/kWh 16 19 16 19 19	= = =	kg CO2/ye  471.05  0  358.3  829.35  38.93  107.49	(261) (263) (264) (265) (265) (267) (268)

TER =

(273)

27.78

#### **SAP Input**

Address:

**England** Located in: Region: Thames valley

**UPRN**:

07 November 2019 Date of assessment: Date of certificate: 12 May 2020

New dwelling design stage Assessment type:

New dwelling Transaction type: Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

PCDF Version: 460

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

25 m<sup>2</sup> 3.09 m Floor 0

21.1 m<sup>2</sup> (fraction 0.844) Living area:

West Front of dwelling faces:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D4_01	Manufacturer	Solid			Metal
Vent_04_02	Manufacturer	Solid			
Vont 04 04	Manufacturar	Calld			

Manufacturer Solid Vent\_04\_04 Manufacturer

Windows Window\_04\_01 low-E, En = 0.05, soft coat Yes Windows low-E, En = 0.05, soft coat Window\_04\_05 Manufacturer Yes Fanlight Manufacturer Windows low-E, En = 0.05, soft coat

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D4_01	mm	0	0	1	2.13	1
Vent_04_02	mm	0	0	1	0.35	1
Vent_04_04	mm	0	0	1	0.99	1
Window_04_01	6mm	0.7	0.4	1.2	0.7	1

Window\_04\_05 6mm 0.7 0.4 1.2 1.96 1 0.4 Fanlight 6mm 0.7 1.2 0.32 1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D4_01		4_01	West	0	0
Vent_04_02		4_01	West	0.295	1.2
Vent_04_04		4_05	East	0.6	1.65
Window_04_01		4_01	West	0.585	1.2
Window_04_05		4_05	East	1.185	1.65
Fanlight		4_01	West	1.01	0.315

Average or unknown Overshading:

Type: External Elemen	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
4_01	10.073	3.5	6.57	0.13	0	False	N/A
4_05	12.978	2.95	10.03	0.13	0	False	N/A
4_03	1.869	0	1.87	0.13	0	False	N/A
4_04	2.905	0	2.9	0.13	0	False	N/A

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

#### **SAP Input**

R4\_01 25 0 25 0.1 0 N/A

Internal Elements
Party Elements

Thermal bridges:

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Manufacturer Declaration

Manufacturer's data

Efficiency: 89.5% (SEDBUK2009)

Condensing combi with automatic ignition

Fuel Burning Type: Modulation

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature  $>45\,^{\circ}\text{C}$ 

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901 Fuel :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: None
Assess Zero Carbon Home: No

		User De	tails:						
Assessor Name:	Adam Ritchie			a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012	_		re Vei				n: 1.0.4.25	
	F	Property Ad	ddress:	Flat Ty	pe D En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		Area(		(10) ×		ight(m)	(2a) =	Volume(m³	<u>-</u>
	\	25		(1a) x	3	.09	(2a) =	77.25	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 2:	25	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	77.25	(5)
2. Ventilation rate:			41		4-4-1				_
	main seconda heating heating	ry o	ther	_	total			m³ per hou	r —
Number of chimneys	0 + 0	+	0	= _	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns			Г	0	х	10 =	0	(7a)
Number of passive vents				Ī	0	x	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)
				_					
							Air ch	nanges per ho	our
·	ys, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, procee	ed to (17), oth	herwise c	ontinue fr	om (9) to (	(16)			(9)
Additional infiltration	ie dweiling (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 for r	masonr	y constr	uction	,	•	0	(11)
•••	resent, use the value corresponding t	to the greater	wall area	a (after					
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (sealed	l) else	enter ()				0	(12)
If no draught lobby, en	,	,,, (ooa.oa	.,, 0.00	011101 0				0	(13)
• ,	s and doors draught stripped							0	(14)
Window infiltration		0.	.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(8	3) + (10) -	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
• • •	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	2.5	(17)
•	ity value, then $(18) = [(17) \div 20] +$				. , .	,		0.12	(18)
Number of sides sheltere	es if a pressurisation test has been do ad	ne or a degre	ee air per	теарину	is being u	sea		0	(19)
Shelter factor	, u	(2	20) = 1 - [	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor	(2	21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								_
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	eed 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	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
( )/	1 1111	1		•		<u> </u>		J	

1.16	Adjusted infiltra	tion rate (allo	wing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
If exchanical ventilation:	0.16	0.16 0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)    If balanced with heat recovery efficiency in % allowing for in-use factor (from Table 4h) =		-	e rate for t	he appli	cable ca	ise	•	•	•	•	•	, 	
It balanced with heat recovery efficiency in % allowing for in-use factor (from Table 4h) =			anandiy N. (3	12h) - (22a	a) v Emy (	nauation (	VEVV otho	muiaa (22h	n) - (22a)				===
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) + 100] (24a)m = 0.28			, ,	, ,	, (	. `	,, ,	`	i) = (23a)				==
(24a)			-	_					Ol- \	005) [	4 (00-)		(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·		_	<b>.</b>	1	<del>-                                    </del>	<del>- ^ `</del>	<del>í `</del>	<del>,                                    </del>	<del>,                                    </del>	<del>- `                                   </del>	i ÷ 100] I	(242)
C24b m	` '							L	L		0.27		(244)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  (24c)m	· -			i	1	<del>,                                    </del>	<del>- ^ `</del>	ŕ	<del>r ´     `</del>	<del></del>	Ι ,	1	(24h)
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)    (24d)m		ļ .		ļ	ļ		<u> </u>	<u> </u>				J	(240)
C24c ms	,								5 × (23h	n)			
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  (25)m = 0.28	<u> </u>		<del>`                                    </del>	ŕ	<del>, .</del>	· `	<del>r``</del>	ŕ	· ` `	ŕ	0	]	(24c)
The content of the	· · · ·	entilation or v	vhole hous	Lse positiv	ve input	ventilatio	on from	loft		ļ.		J	
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)    28	,			•					0.5]				
Casimate   Casimate	(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings area (m²)      Openings	Effective air o	change rate -	enter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)					
ELEMENT         Gross area (m²)         Openings m²         Net Area A , m²         U-value W/m2K         A X U (W/K)         k-value kJ/m²-K         A X k kJ/K           Doors Type 1         2.13         x         1         = 2.13         (26)           Doors Type 2         0.35         x         1         = 0.35         (26)           Doors Type 3         0.99         x         1         = 0.99         (26)           Windows Type 1         0.7         x1/[1/(1.2) + 0.04] = 0.8         (27)           Windows Type 2         1.96         x1/[1/(1.2) + 0.04] = 0.8         (27)           Windows Type 3         0.32         x1/[1/(1.2) + 0.04] = 0.37         (27)           Walls Type 1         10.07         3.5         6.57         x 0.13 = 0.85         (29)           Walls Type 2         12.98         2.95         10.03 x 0.13 = 0.34         (29)           Walls Type 3         1.87         0         1.87         x 0.13 = 0.24         (29)           Walls Type 4         2.9         0         2.9         x 0.13 = 0.38         (29)           Walls Type 4         2.9         0         2.9         x 0.13 = 0.38         (29)           Roof         25         0         25	(25)m= 0.28	0.28 0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
ELEMENT         Gross area (m²)         Openings m²         Net Area A , m²         U-value W/m2K         A X U (W/K)         k-value kJ/m²-K         A X k kJ/K           Doors Type 1         2.13         x         1         = 2.13         (26)           Doors Type 2         0.35         x         1         = 0.35         (26)           Doors Type 3         0.99         x         1         = 0.99         (26)           Windows Type 1         0.7         x1/[1/(1.2) + 0.04] = 0.8         (27)           Windows Type 2         1.96         x1/[1/(1.2) + 0.04] = 0.8         (27)           Windows Type 3         0.32         x1/[1/(1.2) + 0.04] = 0.37         (27)           Walls Type 1         10.07         3.5         6.57         x 0.13 = 0.85         (29)           Walls Type 2         12.98         2.95         10.03 x 0.13 = 0.34         (29)           Walls Type 3         1.87         0         1.87         x 0.13 = 0.24         (29)           Walls Type 4         2.9         0         2.9         x 0.13 = 0.38         (29)           Walls Type 4         2.9         0         2.9         x 0.13 = 0.38         (29)           Roof         25         0         25	3 Heat losses	and heat los	s paramet	er.									
Doors Type 1		Gross	Openin	gs									
Doors Type 2	Doors Type 1	( /				_			`	$\stackrel{\prime}{\Box}$			
Doors Type 3	• •					=		<b>=</b>		$\exists$			, ,
Windows Type 1  0.7	• •					=	1	<b>=</b>		$\exists$			(26)
Windows Type 2    1.96		1								=			, ,
Windows Type 3    0.32   x1/[1/(1.2)+0.04]   =   0.37   (27)	•					<del>_</del>				$\dashv$			, ,
Walls Type1	•					=				=			, ,
Walls Type2	•		2.5	$\neg$		=				륵 ,			
Walls Type3	• • • • • • • • • • • • • • • • • • • •			<u> </u>		=		=		믁 ¦		╡	=
Walls Type4 2.9 0 2.9 x 0.13 = 0.38 (29) Roof 25 0 25 x 0.1 = 2.5 (30) Total area of elements, $m^2$ 52.82 (31) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 12.16 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 225 (34) Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K						=		_		믁 ¦		┥	=
Roof 25 0 25 x 0.1 = 2.5 (30)  Total area of elements, $m^2$ 52.82 (31)  * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 12.16 (33)  Heat capacity $Cm = S(A \times K)$ ((28)(30) + (32) + (32a)(32e) = 225 (34)  Thermal mass parameter (TMP = $Cm \div TFA$ ) in kJ/m²K Indicative Value: Low 100 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K	• • • • • • • • • • • • • • • • • • • •			_	1.87	X	0.13	=	0.24	亅 ¦		_	=
Total area of elements, m²  52.82  **for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  **include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  (26)(30) + (32) =  (12.16 (33)  (34)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  Indicative Value: Low  100 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K	• •	2.9	0	_	2.9	X	0.13	=	0.38	ᆜ !		┥	=
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 12.16 (33)  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 225 (34)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K			0		25	X	0.1	=	2.5				(30)
** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 12.16 (33)  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 225 (34)  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K Indicative Value: Low 100 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K 7.92 (36)													(31)
Heat capacity $Cm = S(A \times K)$	** include the areas	s on both sides o	f internal wal			lated using			ie)+0.04] <i>&amp;</i>	as given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K Indicative Value: Low 100 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K 7.92 (36)	Fabric heat loss	s, W/K = S (A)	x U)				(26)(30	) + (32) =				12.16	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K  7.92 (36)		•							, , ,	, , ,	(32e) =	225	(34)
can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K  7.92  (36)		,		,								100	(35)
Thermal bridges : S (L x Y) calculated using Appendix K 7.92 (36)	· ·			construct	tion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
				using Ar	pendix I	K						7.92	(36)
	•	` ,		• .	•							1.02	(/

													_
Total fabric h								. ,	(36) =	,,		20.08	(37)
Ventilation he	1	1	1	í			Ι			25)m x (5)		1	
(38)m= 7.17	7.09	Mar 7.01	Apr 6.61	May 6.53	Jun 6.13	Jul 6.13	Aug 6.05	Sep 6.29	Oct 6.53	Nov 6.69	Dec 6.85		(38)
` ′		L	0.01	0.55	0.13	0.13	0.03				0.03		(00)
Heat transfer (39)m= 27.25	27.17	nt, W/K 27.09	26.69	26.61	26.22	26.22	26.14	(39)m 26.37	= (37) + (3 26.61	26.77	26.93		
(39)111= 27.23	27.17	27.09	20.09	20.01	20.22	20.22	20.14			Sum(39) <sub>1</sub> .		26.67	(39)
Heat loss par	ameter (I	HLP), W	/m²K						$= (39)m \div$		127 12—	20.07	(22)
(40)m= 1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of da	ays in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.07	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•												
4. Water hea	ating ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occ	runancy	NI									00	l	(42)
if TFA > 13			(1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		09		(42)
if TFA £ 13	•		in litur		\/al a		(OF NI)	. 20				I	(10)
Annual avera Reduce the annu									se target o		.05		(43)
not more that 12	5 litres per	person pe	r day (all v	/ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					•	
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		<b>-</b>
Energy content of	of hot water	used - cal	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		720.62	(44)
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
<u></u>									Γotal = Su	m(45) <sub>112</sub> =		944.85	(45)
If instantaneous		· ·		1		,	1 '	, ,				ı	(40)
(46)m= 14.69 Water storage	12.85 e loss:	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Storage volum		) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ank in dv	velling, e	nter 110	litres in	(47)					l	
Otherwise if r		hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
Water storage		الممسمام	ana fant	معامات	/1.\^/1	- /-l -> -\ .						1	(40)
a) If manufac				OI IS KIIO	WII (KVVI	i/uay).					0		(48)
Temperature Energy lost fr				oor			(48) x (49)				0		(49)
b) If manufac		_	-		or is not		(40) X (49)	-			0		(50)
Hot water sto			-							(	0		(51)
If community	_		on 4.3									l	
Volume facto Temperature			2h								0		(52) (53)
Energy lost fr				ear			(47) x (51)	x (52) v (	53) –		0	[ 	, ,
Enter (50) or		_	, KVVII/Y	cai			( <del>7</del> 1)	, ^ (UE) X (	JJ) –	-	0		(54) (55)
` ,	. , \	•										I	

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 0 0 0 0 0 0 0 0 0 0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	1
(57)m= 0 0 0 0 0 0 0 0 0 0 0	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 0 0 0 0 0 0 0 0 0 0 0	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m	
(61)m= 33.66 29.3 31.21 29.02 28.77 26.65 27.54 28.77 29.02 31.21 31.39 33.66	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (59)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (50)m  9)m + (61)m	
(62)m= 131.62 114.98 119.63 106.1 102.72 90.47 86.68 96.63 97.7 111.25 118.75 128.53	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 131.62 114.98 119.63 106.1 102.72 90.47 86.68 96.63 97.7 111.25 118.75 128.53	
Output from water heater (annual) <sub>112</sub>	1305.07 (64)
Heat gains from water heating, kWh/month $0.25 (0.85 \times (45)) + (61) + 0.8 \times [(46)) + (57) + (59) = 100$	
(65)m= 40.99 35.81 37.2 32.88 31.78 27.88 26.55 29.76 30.09 34.41 36.9 39.96	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heati	iting
5. Internal gains (see Table 5 and 5a):	ting
	iting
5. Internal gains (see Table 5 and 5a):	iting
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	ting (66)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       65.31       65.31       65.31       65.31       65.31       65.31       65.31       65.31       65.31       65.31       65.31       65.31	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(66)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(66)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68) (69) (70) (71)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 65.31 65	(66) (67) (68) (69) (70) (71)

 $Solar\ gains\ are\ calculated\ using\ solar\ flux\ from\ Table\ 6a\ and\ associated\ equations\ to\ convert\ to\ the\ applicable\ orientation.$ 

Orientat	ion:	Access Facto Table 6d	r	Area m²			Flux Table	e 6a		g_ Table 6	Sb	_	FF Table 6c			Gains (W)	
East	0.9x	0.77	x	1.96	3	X	19.6	64	x	0.4		x	0.7		=	7.47	(76)
East	0.9x	0.77	x	1.96	3	x	38.4	42	x	0.4		x [	0.7		=	14.61	(76)
East	0.9x	0.77	x	1.96	3	x	63.2	27	x	0.4		x [	0.7		=	24.06	(76)
East	0.9x	0.77	x	1.96	5	x	92.2	28	x	0.4		x [	0.7		=	35.1	(76)
East	0.9x	0.77	x	1.96	5	x	113.	.09	x	0.4		x [	0.7		=	43.01	(76)
East	0.9x	0.77	X	1.96	3	x	115.	.77	x	0.4		x [	0.7		=	44.03	(76)
East	0.9x	0.77	X	1.96	3	x	110.	.22	x	0.4		x [	0.7		=	41.92	(76)
East	0.9x	0.77	X	1.96	6	x	94.6	68	x	0.4		x [	0.7		=	36.01	(76)
East	0.9x	0.77	X	1.96	3	x	73.5	59	x	0.4		x [	0.7		=	27.99	(76)
East	0.9x	0.77	X	1.96	6	x	45.5	59	x	0.4		<b>x</b> [	0.7		=	17.34	(76)
East	0.9x	0.77	X	1.96	6	x	24.4	49	x	0.4	:	x [	0.7		=	9.31	(76)
East	0.9x	0.77	X	1.96	6	x	16.1	15	x	0.4		x [	0.7		=	6.14	(76)
West	0.9x	0.77	X	0.7		x	19.6	64	x	0.4		x [	0.7		=	2.67	(80)
West	0.9x	0.77	X	0.32	2	X	19.6	64	x	0.4		x [	0.7		= [	1.22	(80)
West	0.9x	0.77	X	0.7		x	38.4	42	x	0.4	:	x [	0.7		= [	5.22	(80)
West	0.9x	0.77	X	0.32	2	x	38.4	42	x	0.4	:	x	0.7		=	2.39	(80)
West	0.9x	0.77	X	0.7		X	63.2	27	x	0.4		x [	0.7		= [	8.59	(80)
West	0.9x	0.77	X	0.32	2	X	63.2	27	x	0.4		x [	0.7		= [	3.93	(80)
West	0.9x	0.77	X	0.7		X	92.2	28	x	0.4		x	0.7		=	12.53	(80)
West	0.9x	0.77	X	0.32	2	x	92.2	28	x	0.4		<b>x</b> [	0.7		=	5.73	(80)
West	0.9x	0.77	X	0.7		x	113.	.09	x	0.4	:	x [	0.7		=	15.36	(80)
West	0.9x	0.77	X	0.32	2	X	113.	.09	x	0.4		x	0.7		=	7.02	(80)
West	0.9x	0.77	X	0.7		X	115.	.77	x	0.4		x [	0.7		=	15.72	(80)
West	0.9x	0.77	X	0.32	2	X	115.	.77	x	0.4		x [	0.7		= [	7.19	(80)
West	0.9x	0.77	X	0.7		X	110.	22	X	0.4		x [	0.7		=	14.97	(80)
West	0.9x	0.77	X	0.32	2	X	110.	22	x	0.4		x [	0.7		=	6.84	(80)
West	0.9x	0.77	X	0.7		X	94.6	68	x	0.4		x [	0.7		=	12.86	(80)
West	0.9x	0.77	X	0.32	2	X	94.6	68	x	0.4		x [	0.7		=	5.88	(80)
West	0.9x	0.77	X	0.7		X	73.5	59	x	0.4	:	x [	0.7		= [	10	(80)
West	0.9x	0.77	X	0.32	2	X	73.5	59	x	0.4		x [	0.7		=	4.57	(80)
West	0.9x	0.77	X	0.7		X	45.5	59	X	0.4		x [	0.7		= [	6.19	(80)
West	0.9x	0.77	X	0.32	2	X	45.5	59	X	0.4	:	<b>x</b> [	0.7		= [	2.83	(80)
West	0.9x	0.77	X	0.7		X	24.4	49	x	0.4		x [	0.7		=	3.33	(80)
West	0.9x	0.77	X	0.32	2	X	24.4	49	x	0.4		x [	0.7		= [	1.52	(80)
West	0.9x	0.77	X	0.7		X	16.1	15	x	0.4		x [	0.7		= [	2.19	(80)
West	0.9x	0.77	X	0.32	2	X	16.1	15	X	0.4		x [	0.7		=	1	(80)
<b>—</b>		watts, calcul	$\overline{}$			_	I			1 = Sum(74)r			1 4440 1				(00)
` ' L	11.36	internal and s		53.36 (84)m =	65.39 (73)m			63.73 vatts	54.	75 42.55	26	.36	14.16	9.3	4		(83)
	284.09			297.76	294.83	Ť	<del></del>	271.17	267	.55 264.0	8 263	3 20	268.09	275.	61		(84)
(04)111=	204.08	7 292.09 290		231.10	234.03	1 2	۷۷.۵۱ /	-11.11	207	.00   204.0	203	J. Z B	200.09	۷۱۵.	υı		( <del>U-f)</del>

7 Me	ean inter	nal temr	perature	(heating	season	)								
				·	n the livii	•	from Tab	ole 9 Th	1 (°C)				21	(85)
		ŭ	٠.		ea, h1,m	J		J.O O, 111	. ( 0)					
Otino	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.87	0.86	0.82	0.76	0.67	0.53	0.4	0.42	0.59	0.75	0.84	0.88		(86)
Mear	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.49	19.63	19.91	20.29	20.62	20.86	20.95	20.94	20.8	20.42	19.92	19.46		(87)
Temp	erature	durina h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9. T	h2 (°C)			•		
(88)m=	20.01	20.01	20.01	20.03	20.03	20.04	20.04	20.05	20.04	20.03	20.02	20.02		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)		•	•	•		
(89)m=	0.86	0.84	0.8	0.73	0.62	0.46	0.32	0.34	0.53	0.71	0.82	0.87		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)	•	•		
(90)m=	18.66	18.8	19.07	19.44	19.75	19.96	20.02	20.02	19.91	19.57	19.09	18.64		(90)
			!	!	!		!		f	fLA = Livin	g area ÷ (	4) =	0.84	(91)
Mear	n interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=		19.5	19.78	20.16	20.49	20.72	20.81	20.8	20.66	20.28	19.79	19.33		(92)
Apply	/ adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	ļ	ļ.		
(93)m=	19.36	19.5	19.78	20.16	20.49	20.72	20.81	20.8	20.66	20.28	19.79	19.33		(93)
8. Sp	ace hea	ting requ	uirement									•		
	i to the r tilisation					ned at sto	ep 11 of	Table 9l	b, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
uio u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac							19						
(94)m=	0.85	0.83	0.8	0.74	0.64	0.51	0.39	0.41	0.57	0.72	0.81	0.85		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	240.51	242.47	236.07	219.04	189.61	143.99	104.66	108.4	149.66	190.82	217.58	235.43		(95)
Mont	hly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				1	erature,		1				ı			
(97)m=	410.37	396.76	359.8	300.55	233.83	160.44	110.28	114.99	173.06	257.75	339.7	407.56		(97)
-					nonth, k\	i –		T		<del></del>	r – –	400.07		
(98)m=	126.38	103.69	92.05	58.69	32.9	0	0	0 	0	49.79	87.92	128.07	670.40	(98)
								lota	ll per year	(kwn/year	r) = Sum(9	8)15,912 =	679.49	=
Spac	e heatin	g require	ement in	kWh/m²	²/year								27.18	(99)
			nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heating	_	at from s	econdar	y/supple	mentary	svstem						0	(201)
	ion of sp					·	•	(202) = 1 -	- (201) =				1	(202)
	ion of to			•	` '			(204) = (2	02) <b>×</b> [1 –	(203)] =			1	(204)
			•	•										<b>—</b>
Efficie	ency or r	naın spa	ace neat	ing syste	em 1								90.4	(206)
	-	•		•	em 1 y heating	g system	ո, %						90.4	(208)

Jan Feb Mar Apr										
Jan 1 Co I Mai Api	· May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	] kWh/yea	ır
Space heating requirement (calcula	<del>-                                    </del>				ı				1	
126.38   103.69   92.05   58.69	32.9	0	0	0	0	49.79	87.92	128.07	]	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div ($								l	1	(211)
139.8 114.7 101.83 64.92	36.4	0	0	0 Tota	0 (k\\\\b\\\\a	55.08 ar) =Sum(2	97.26	141.67	754.05	7(244)
Space heating fuel (secondary) killing	h/month			Tota	ii (KVVII/ yCe	ar) =0am(2	11,5,1012	2	751.65	(211)
Space heating fuel (secondary), kW = $\{[(98)\text{m x }(201)]\} \times 100 \div (208)$	11/111011111									
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0	]	
	•			Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water heating										_
Output from water heater (calculated 131.62 114.98 119.63 106.1		90.47	86.68	96.63	97.7	111.25	118.75	128.53	1	
Efficiency of water heater	102.72	30.47	00.00	90.03	37.7	111.25	110.73	120.00	80.3	(216)
(217)m= 84.95 84.79 84.4 83.63	82.54	80.3	80.3	80.3	80.3	83.17	84.31	85.04	00.0	(217)
Fuel for water heating, kWh/month						l				
$(219)$ m = $(64)$ m x $100 \div (217)$ m	7   404 40	440.07	107.05	100.04	104.00	100.75	1 10 00	1.54.44	1	
(219)m= 154.94   135.6   141.73   126.8	7 124.46	112.67	107.95	120.34	121.66 Il = Sum(2	133.75	140.86	151.14	1571.00	7(240)
Annual totals				7010	ii – Guiii(L		Nh/year	•	1571.98 <b>kWh/year</b>	(219)
Space heating fuel used, main system	m 1						iii you		751.65	]
Water heating fuel used									1571.98	ĺ
Electricity for pumps, fans and electri	c keep-hot								L	J
	•									
mechanical ventilation - balanced, e	extract or po	sitive ir	nput fron	n outside	Э			98.96	]	(230a)
mechanical ventilation - balanced, e	extract or po	sitive ir	nput fron	n outside	Э			98.96	]	(230a) (230c)
mechanical ventilation - balanced, e central heating pump: boiler with a fan-assisted flue	extract or po	sitive ir	nput fron	n outside	е				] ] ]	,
central heating pump: boiler with a fan-assisted flue	·	sitive ir	nput fron			(230g) =		30	173.96	(230c) (230e)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye	·	sitive ir	nput fron			(230g) =		30	173.96 151.5	(230c) (230e) (231)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting	ear	sitive ir	nput fron			(230g) =		30		(230c) (230e)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye	ear						wi.a.a	30	151.5	(230c) (230e) (231)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting	ear	Fu	el			Fuel P		30	151.5	(230c) (230e) (231)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting	ear	Fu kW				Fuel P (Table	12)	30	151.5  Fuel Cost £/year	(230c) (230e) (231) (232)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating	ear	Fu kW (211	<b>el</b> /h/year			Fuel P	12)	30 45	151.5	(230c) (230e) (231) (232) (240)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating Space heating - main system 1	ear	Fu kW (211	<b>el</b> /h/year			Fuel P (Table	12)	30 45 × 0.01 =	Fuel Cost £/year	(230c) (230e) (231) (232)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating Space heating - main system 1 Space heating - main system 2	ear	Fu kW (211	el /h/year  ) ×  3) ×			Fuel P (Table	12)	30 45 × 0.01 = × 0.01 =	151.5  Fuel Cost £/year  26.16	(230c) (230e) (231) (232) (240) (241)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating Space heating - main system 1 Space heating - main system 2 Space heating - secondary	ear	Fu kW (211 (213	el /h/year  ) ×  3) ×  5) ×			Fuel P (Table 3.4	12) 8 19	30 45 × 0.01 = × 0.01 = × 0.01 =	151.5  Fuel Cost £/year  26.16  0	(230c) (230e) (231) (232) (242) (244) (242)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating: Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to	ear systems:	Fu: kW (211 (213 (215 (219 (231	el /h/year /) × // × // × // × // × // × // × // ×	sum	of (230a).	Fuel P (Table  3.4  0  13.4  13.4  fuel prid	12) 8 19 8 19 ce accor	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  Fuel Cost £/year  26.16  0  54.7  22.94  Table 12a	(230c) (230e) (231) (232) (240) (241) (242) (247) (249)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting	ear systems:	Fu kW (211 (213 (218 (219 (231	el /h/year /) × // × // × // × // × // × // × // ×	sum	of (230a).	Fuel P (Table 3.4 0 13.4 13.4 13.4 13.4 13.4 13.4 13.4 13.4	12) 8 19 8 19 ce accor	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  Fuel Cost £/year  26.16  0  54.7  22.94  Table 12a  19.98	(230c) (230e) (231) (232) (240) (241) (242) (247) (249)
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/ye Electricity for lighting 10a. Fuel costs - individual heating: Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to	ear systems:	Fu: kW (211 (213 (215 (219 (231	el /h/year /) × // × // × // × // × // × // × // ×	sum	of (230a).	Fuel P (Table  3.4  0  13.4  13.4  fuel prid	12) 8 19 8 19 ce accor	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  Fuel Cost £/year  26.16  0  54.7  22.94  Table 12a	(230c) (230e) (231) (232) (240) (241) (242) (247) (249)

11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(255) x (25	[66]] ÷ [(4) + 45.0] =		1.46	(257)
SAP rating (Section 12)			79.59	(258)
12a. CO2 emissions – Individual heating systems	s including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	r
Space heating (main system 1)	(211) x	0.216 =	162.36	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	339.55	(264)
Space and water heating	(261) + (262) + (263) + (264)	) =	501.9	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	90.28	(267)
Electricity for lighting	(232) x	0.519 =	78.63	(268)
Total CO2, kg/year		sum of (265)(271) =	670.81	(272)
CO2 emissions per m²		(272) ÷ (4) =	26.83	(273)
El rating (section 14)			87	(274)
13a. Primary Energy				
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	917.01	(261)
Space heating (secondary)	(215) x	3.07	0	(263)
Energy for water heating	(219) x	1.22	1917.81	(264)
Space and water heating	(261) + (262) + (263) + (264)	) =	2834.83	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	534.05	(267)
Electricity for lighting	(232) x	0 =	465.09	(268)

sum of (265)...(271) =

 $(272) \div (4) =$ 

'Total Primary Energy

Primary energy kWh/m²/year

(272)

(273)

3833.96

153.36

		l lear I	Details:						
Assessor Name:	Adam Ritchie	USGI^L	Strom	a Num	hor:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	Flat Ty	pe D En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				(1a) x		3.09	(2a) =	77.25	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	25	(4)			_		
Dwelling volume		· L			)+(3c)+(3c	d)+(3e)+	(3n) =	77.25	(5)
2. Ventilation rate:								77.20	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>   +	0	j = [	0	x	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	0	x ·	10 =	0	(7a)
Number of passive vents				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+( een carried out or is intended, proce			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in the		ou to (11),	ouror wide t	onunae n	om (0) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
it both types of wall are pl deducting areas of openii	resent, use the value corresponding angs); if equal user 0.35	o tne grea	ter wall are	a (atter					
•	floor, enter 0.2 (unsealed) or (	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Percentage of windows Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) -		0	(15)
	q50, expressed in cubic metr	es ner h					area	0	(16)
•	ity value, then $(18) = [(17) \div 20] +$		•	•	cuc or c	лисюрс	arca	2.5 0.12	(17)
· ·	es if a pressurisation test has been do				is being u	sed		****	` ′
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		[9)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	<del>- 1                                   </del>	1		0.5.7	0-4	Navi	Data	1	
Jan Feb	Mar   Apr   May   Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0   4.3   3.6	3.0	3.7		4.3	4.0	4.7	J	
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4				1	<del>,                                      </del>		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		

Adjusted infiltr	ration rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	= (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	ise	•			!	•	• -	<del></del>
If mechanic			and the NI (O	10l-) (00·	-) <b>- -</b> (	C (	NEW - de-		) (00-)			0.5	(238
If exhaust air h									)) = (23a)			0.5	(23)
If balanced wit		-	-	_								75.65	(230
a) If balance	1	i	1	i —	1		<del></del>	<del></del>	<del> </del>	<del> </del>	<del> </del>	) ÷ 100] 1	(0.4)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(24
b) If balance	1	1		ı —	1	<del>,                                    </del>	<del>1 ^ `                                    </del>	<del>í `</del>	<del>r ´       `</del>	<del>– ´ –</del>	1 .	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole h									E (22k	.)			
(24c)m = 0	0.57	0	0	0 = (231)	0	0	$\frac{\text{lc}) = (22)}{1}$	0	0	0	0	1	(24
` '												J	(2.1
d) If natural if (22b)r							on from 0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	1d) in bo	x (25)				1	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
0 11								1				7	
3. Heat losse	es and ne Gro				Net Ar		U-val		AXU		k-value	•	ΑΧk
ELEMENT		(m²)	Openin m		A,r		W/m2		(W/	K)	kJ/m².		kJ/K
Doors Type 1					2.13	X	1	=	2.13				(26)
Doors Type 2					0.35	x	1	<del>-</del>	0.35	=			(26)
Doors Type 3					0.99	X	1	<u> </u>	0.99				(26)
Windows Type	e 1				0.7	x1	  /[1/( 1.2 )+	0.04] =	0.8	一			(27)
Windows Type					1.96	x1	I/[1/( 1.2 )+	0.04] =	2.24	=			(27)
Windows Type					0.32	=	·  /[1/( 1.2 )+		0.37	=			(27)
Walls Type1	10.0	77	3.5	$\neg$	6.57		0.13		0.85	╡ ,			(29)
Walls Type1				<u> </u>				=				_	==
	12.9		2.95		10.03	=	0.13	=	1.3	믁 ¦			(29)
Walls Type3	1.8		0	<b>=</b>	1.87		0.13	=	0.24	닠 ¦		$\exists$ $\vdash$	(29)
Walls Type4	2.9	9	0	_	2.9	×	0.13	=	0.38	ᆜ !			(29)
Roof	25		0		25	X	0.1	=	2.5				(30)
Total area of e					52.82								(31)
* for windows and ** include the are						lated usin	g formula 1	!/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	
Fabric heat los				io aira par			(26)(30	) + (32) =				12.16	(33)
Heat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	225	(34)
Thermal mass		` ,	⊃ = Cm ÷	: TFA) ir	n kJ/m²K				itive Value			100	(35)
For design asses can be used inste	sments wh	nere the de	tails of the	,			recisely the	e indicative	e values of	TMP in T	able 1f		\```
Thermal bridg	es : S (L	x Y) cal	culated i	using Ap	pendix l	K						7.92	(36)

Total fabric he	eat loss							(33) +	(36) =		ı	20.08	(37)
Ventilation hea		alculated	l monthl	V						25)m x (5)		20.06	(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 7.17	7.09	7.01	6.61	6.53	6.13	6.13	6.05	6.29	6.53	6.69	6.85		(38)
Heat transfer	coefficie	nt, W/K		I				(39)m	= (37) + (37)	38)m		l	
(39)m= 27.25	27.17	27.09	26.69	26.61	26.22	26.22	26.14	26.37	26.61	26.77	26.93		
Heat loss para	ameter (H	HLP), W	m²K	•	•	•	•		Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	26.67	(39)
(40)m= 1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of day	ys in mo	nth (Tab	le 1a)	•	•	•	•	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.07	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
				ı						Į.		l	
4. Water hea	tina ene	rav reau	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.			[1 - exn	( <u>-</u> 0 0003	849 v (TF	-Δ -13 Q	1211 + 0 (	0013 x (	ΓFΔ -13		09		(42)
if TFA £ 13.		1 1.70 X	i cxp	( 0.0000	75 X (11	A 10.5	/2/] 1 0.0	) X 010 X (	11 / 10.	3)			
Annual averag											.05		(43)
Reduce the annuance that 125	_				_	_	to achieve	a water us	se target o	f			
	1	•		<u> </u>	<del>.</del>	•	1 4	0	0.1	NI.			
Jan Hot water usage i	Feb	Mar day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		
(44)111= 00.00	00.00	01.20	30.03	30.43	04.00	04.00	30.43			m(44) <sub>112</sub> =		720.62	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600					0.0_	` ′
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
									Γotal = Su	m(45) <sub>112</sub> =		944.85	(45)
If instantaneous v	vater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,	) to (61)		Г	ı	ı	
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage Storage volum		) includir	na anv si	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,		•			_		arric voo	501		0		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (	47)			
Water storage			`					,	`	,			
a) If manufact	turer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	factor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
b) If manufact			-									1	(= A)
Hot water stor If community h	-			ie Z (KVV	n/iitre/da	ay)					0		(51)
Volume factor	•		011 4.0								0		(52)
Temperature f			2b								0		(53)
Energy lost fro	om water	storage	, kWh/y	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or		_	Í								0		(55)

Water	storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primai	ry circuit	loss (an	nual) fro	m Table	3							0		(58)
Prima	ry circuit	loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fr	om Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Comb	i loss ca	lculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	33.66	29.3	31.21	29.02	28.77	26.65	27.54	28.77	29.02	31.21	31.39	33.66		(61)
Total h	neat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	: 0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	131.62	114.98	119.63	106.1	102.72	90.47	86.68	96.63	97.7	111.25	118.75	128.53		(62)
Solar D	HW input of	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	vwhrs	applies	, see Ap	pendix (	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter						•					
(64)m=	131.62	114.98	119.63	106.1	102.72	90.47	86.68	96.63	97.7	111.25	118.75	128.53		
								Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	1305.07	(64)
Heat g	gains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m	]	_
(65)m=	40.99	35.81	37.2	32.88	31.78	27.88	26.55	29.76	30.09	34.41	36.9	39.96		(65)
inclu	Ide (57)			l		L								
	144 (J. 1)	m in caid	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5 In					•	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
	ternal ga	ains (see	Table 5	and 5a	•	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	ternal ga	ains (see s (Table	Table 5	and 5a	):		ı		r	ı	ı		eating	
Metab	ternal ga olic gain Jan	ains (see s (Table Feb	Table 5 5), Wat Mar	and 5a ts Apr	): May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	eating	(66)
Metab (66)m=	olic gain Jan 54.43	s (Table Feb 54.43	Table 5 5), Wat Mar 54.43	ts Apr 54.43	May 54.43	Jun 54.43	Jul 54.43	Aug 54.43	Sep 54.43	ı	ı		eating	(66)
Metab (66)m= Lightin	olic gain Jan 54.43	s (Table Feb 54.43 (calculat	Table 5 5), Wat Mar 54.43 ted in Ap	ts Apr 54.43 ppendix	May 54.43 L, equat	Jun 54.43 ion L9 o	Jul 54.43 r L9a), a	Aug 54.43 Iso see	Sep 54.43 Table 5	Oct 54.43	Nov 54.43	Dec 54.43	eating	, ,
Metab (66)m= Lightir (67)m=	olic gain Jan 54.43 ng gains 8.58	s (Table Feb 54.43 (calculat	Mar 54.43 ted in Ap	ts Apr 54.43 ppendix 4.69	May 54.43 L, equat 3.51	Jun 54.43 ion L9 o 2.96	Jul 54.43 r L9a), a	Aug 54.43 Iso see 4.16	Sep 54.43 Table 5 5.58	Oct 54.43	Nov	Dec	eating	(66) (67)
Metab (66)m= Lightir (67)m= Applia	olic gain Jan 54.43 ng gains 8.58 nces ga	s (Table Feb 54.43 (calculat 7.62	Mar 54.43 ted in Ap 6.2	ts Apr 54.43 ppendix 4.69 Append	May 54.43 L, equat 3.51 dix L, eq	Jun 54.43 ion L9 o 2.96 uation L	Jul 54.43 r L9a), a 3.2 13 or L1	Aug 54.43 lso see 4.16 3a), also	Sep 54.43 Table 5 5.58 see Ta	Oct 54.43 7.09 ble 5	Nov 54.43 8.27	Dec 54.43	eating	(67)
Metab (66)m= Lightir (67)m= Applia (68)m=	olic gain Jan 54.43 ng gains 8.58 nces ga 86.3	s (Table Feb 54.43 (calculat 7.62 ins (calculate 87.2	Mar 54.43 ted in Ap 6.2 ulated in 84.94	ts Apr 54.43 ppendix 4.69 Appendix 80.14	May 54.43 L, equat 3.51 dix L, eq 74.07	Jun 54.43 ion L9 o 2.96 uation L 68.37	Jul 54.43 r L9a), a 3.2 13 or L1 64.56	Aug 54.43 Iso see 4.16 3a), also 63.67	Sep 54.43 Table 5 5.58 Since Ta 65.93	Oct 54.43 7.09 ble 5 70.73	Nov 54.43	Dec 54.43	eating	,
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calcula	Mar 54.43 ted in Ap 6.2 ulated in Ap ted in Ap	Apr 54.43 opendix 4.69 Appendix 80.14 opendix	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat	Jun 54.43 ion L9 o 2.96 uation L 68.37	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a	Aug 54.43 Iso see 4.16 3a), also 63.67	Sep 54.43 Table 5 5.58 See Ta 65.93	Oct 54.43  7.09 ble 5  70.73	Nov 54.43 8.27 76.8	Dec 54.43 8.82 82.5	eating	(67) (68)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m=	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3 ng gains	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calculat 28.44	Mar 54.43 ted in Ap 6.2 ulated in 84.94 ted in Ap	ts Apr 54.43 ppendix 4.69 Append 80.14 ppendix 28.44	May 54.43 L, equat 3.51 dix L, eq 74.07	Jun 54.43 ion L9 o 2.96 uation L 68.37	Jul 54.43 r L9a), a 3.2 13 or L1 64.56	Aug 54.43 lso see 4.16 3a), also 63.67	Sep 54.43 Table 5 5.58 Since Ta 65.93	Oct 54.43 7.09 ble 5 70.73	Nov 54.43 8.27	Dec 54.43	eating	(67)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps	olic gain Jan 54.43 ng gains 8.58 nces ga 86.3 ng gains 28.44 s and far	s (Table Feb 54.43 (calculat 7.62 ins (calc 87.2 (calcula	Table 5 S), Wat Mar 54.43 ted in Ap 6.2 ulated in 84.94 ted in A 28.44 (Table 5	Apr 54.43 ppendix 4.69 Appendix 90.14 ppendix 28.44	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a 28.44	Aug 54.43 Iso see 4.16 3a), also 63.67 ), also se 28.44	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44	Oct 54.43  7.09 ble 5  70.73  5  28.44	Nov 54.43 8.27 76.8	Dec 54.43 8.82 82.5	eating	(67) (68) (69)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m=	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3 ng gains 28.44 s and far	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calculat 28.44 ns gains	Mar 54.43 ted in Ap 6.2 ulated in 84.94 ted in Ap 28.44 (Table 5	5 and 5a ts Apr 54.43 opendix 4.69 Appendix 80.14 opendix 28.44 5a)	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a	Aug 54.43 Iso see 4.16 3a), also 63.67	Sep 54.43 Table 5 5.58 See Ta 65.93	Oct 54.43  7.09 ble 5  70.73	Nov 54.43 8.27 76.8	Dec 54.43 8.82 82.5	eating	(67) (68)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses	olic gain Jan 54.43 ng gains 8.58 nces ga 86.3 ng gains 28.44 s and far 3 s e.g. ev	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calcula 28.44 ns gains 3	ted in Ap  ted in Ap  6.2  ulated in 84.94  ted in Ap  (Table 5	ts Apr 54.43 ppendix 4.69 Appendix 80.14 ppendix 28.44 5a) 3 tive valu	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44  3 es) (Tab	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.16 3a), also 63.67 ), also se 28.44	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44	Oct 54.43  7.09 ble 5  70.73  5  28.44	Nov 54.43 8.27 76.8 28.44	Dec 54.43 8.82 82.5 28.44	eating	(67) (68) (69) (70)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 54.43 ng gains 8.58 nces ga 86.3 ng gains 28.44 s and far 3 s e.g. ev	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calcula 28.44 ns gains 3 raporatio -43.54	ted in Ap ated in Ap a	5 and 5a ts Apr 54.43 opendix 4.69 Appendix 80.14 opendix 28.44 5a)	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a 28.44	Aug 54.43 Iso see 4.16 3a), also 63.67 ), also se 28.44	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44	Oct 54.43  7.09 ble 5  70.73  5  28.44	Nov 54.43 8.27 76.8	Dec 54.43 8.82 82.5	eating	(67) (68) (69)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	olic gain Jan 54.43 ag gains 8.58 ances ga 86.3 ang gains 28.44 s and far 3 s e.g. ev -43.54 heating	s (Table Feb 54.43 (calculat 7.62 ins (calculat 28.44 ns gains 3 aporatio -43.54 gains (T	ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  ted in Ap  184.94  Table 5  Table 5	ts Apr 54.43 ppendix 4.69 Appendix 80.14 ppendix 28.44 5a) 3 tive valu -43.54	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44 3 es) (Tab	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44 3 ole 5)	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a 28.44	Aug 54.43 lso see 4.16 3a), also 63.67 ), also se 28.44	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44	Oct 54.43  7.09 ble 5  70.73  5  28.44	Nov 54.43 8.27 76.8 28.44 3	Dec 54.43 8.82 82.5 28.44 3	eating	(67) (68) (69) (70) (71)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3 ng gains 28.44 s and far 3 s e.g. ev -43.54 heating 55.09	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calculat 28.44 ns gains 3 aporatio -43.54 gains (T	ETable 5  E 5), Wat  Mar  54.43  ted in Ap  6.2  ulated in  84.94  ted in Ap  28.44  (Table 5  3  In (negation of the companion ts Apr 54.43 ppendix 4.69 Appendix 80.14 ppendix 28.44 5a) 3 tive valu	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44  3 es) (Tab	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44 3 ole 5) -43.54	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.16 3a), also 63.67 ), also se 28.44 3 3 -43.54	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44  3 -43.54	Oct 54.43  7.09 ble 5  70.73  5  28.44  3  -43.54	Nov 54.43 8.27 76.8 28.44 3 -43.54	Dec 54.43 8.82 82.5 28.44 3 -43.54	eating	(67) (68) (69) (70)	
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3 ng gains 28.44 s and far 3 s e.g. ev -43.54 heating 55.09	s (Table Feb 54.43 (calculat 7.62 ins (calculat 87.2 (calcula 28.44 ns gains 3 aporatio -43.54 gains (T 53.29  gains =	ETable 5  5), Wat Mar 54.43  ted in Ap 6.2  ulated in 84.94  ted in Ap 28.44  (Table 5 3  on (negation of the context) 50	s and 5a ts Apr 54.43 opendix 4.69 Appendix 28.44 opendix 28.44 5a) 3 tive valu -43.54	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44 3 es) (Tab -43.54	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44 3 ole 5) -43.54	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a 28.44 3 -43.54 35.68	Aug 54.43 lso see 4.16 3a), also 63.67 ), also se 28.44 3 3 -43.54 39.99 n + (68)m -	Sep 54.43 Table 5 5.58 See Ta 65.93 See Table 28.44  3 -43.54 41.79 + (69)m +	Oct 54.43  7.09 ble 5  70.73  5  28.44  3  -43.54  46.26  (70)m + (7	Nov 54.43 8.27 76.8 28.44 3 -43.54 51.24 1)m + (72)	Dec 54.43 8.82 82.5 28.44 3 -43.54 53.71	eating	(67) (68) (69) (70) (71) (72)
Metab  (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total (73)m=	olic gain Jan 54.43 ng gains 8.58 nces gains 86.3 ng gains 28.44 s and far 3 s e.g. ev -43.54 heating 55.09	s (Table Feb 54.43 (calculat 7.62 ins (calculat 28.44 ins gains 3 raporatio -43.54 gains (T 53.29 gains = 190.44	ETable 5  E 5), Wat  Mar  54.43  ted in Ap  6.2  ulated in  84.94  ted in Ap  28.44  (Table 5  3  In (negation of the companion ts Apr 54.43 ppendix 4.69 Appendix 80.14 ppendix 28.44 5a) 3 tive valu -43.54	May 54.43 L, equat 3.51 dix L, eq 74.07 L, equat 28.44 3 es) (Tab	Jun 54.43 ion L9 o 2.96 uation L 68.37 tion L15 28.44 3 ole 5) -43.54	Jul 54.43 r L9a), a 3.2 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.16 3a), also 63.67 ), also se 28.44 3 3 -43.54	Sep 54.43 Table 5 5.58 See Ta 65.93 ee Table 28.44  3 -43.54	Oct 54.43  7.09 ble 5  70.73  5  28.44  3  -43.54	Nov 54.43 8.27 76.8 28.44 3 -43.54	Dec 54.43 8.82 82.5 28.44 3 -43.54	eating	(67) (68) (69) (70) (71)	

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orienta		Access Facto Table 6d	r	Area m²			Flux Fable 6a		g_ Table	6b	-	FF Table 6c			Gains (W)	
East	0.9x	0.77	x	1.96		x	19.64	x	0.4		x	0.7		= [	7.47	(76)
East	0.9x	0.77	x	1.96		x =	38.42	x	0.4		x	0.7		=	14.61	(76)
East	0.9x	0.77	x	1.96		x	63.27	x	0.4		x [	0.7		= [	24.06	(76)
East	0.9x	0.77	x	1.96		x	92.28	x	0.4		x [	0.7		= [	35.1	(76)
East	0.9x	0.77	x	1.96		x	113.09	X	0.4		x	0.7		= [	43.01	(76)
East	0.9x	0.77	X	1.96		x	115.77	X	0.4		x	0.7		= [	44.03	(76)
East	0.9x	0.77	X	1.96		x	110.22	X	0.4		x	0.7		= [	41.92	(76)
East	0.9x	0.77	X	1.96		x $\Box$	94.68	X	0.4		x	0.7		=	36.01	(76)
East	0.9x	0.77	X	1.96		x	73.59	X	0.4		x	0.7		= [	27.99	(76)
East	0.9x	0.77	x	1.96		x	45.59	X	0.4		<b>x</b> [	0.7		= [	17.34	(76)
East	0.9x	0.77	x	1.96		x	24.49	X	0.4		x	0.7		= [	9.31	(76)
East	0.9x	0.77	x	1.96		x	16.15	X	0.4		x	0.7		= [	6.14	(76)
West	0.9x	0.77	x	0.7		x	19.64	X	0.4		<b>x</b> [	0.7		= [	2.67	(80)
West	0.9x	0.77	x	0.32		x	19.64	X	0.4		x	0.7		= [	1.22	(80)
West	0.9x	0.77	x	0.7		x	38.42	X	0.4		x	0.7		= [	5.22	(80)
West	0.9x	0.77	x	0.32		x	38.42	X	0.4		x	0.7		= [	2.39	(80)
West	0.9x	0.77	x	0.7		x	63.27	X	0.4		x	0.7		= [	8.59	(80)
West	0.9x	0.77	X	0.32		x	63.27	X	0.4		x	0.7		= [	3.93	(80)
West	0.9x	0.77	x	0.7		x	92.28	X	0.4		<b>x</b> [	0.7		= [	12.53	(80)
West	0.9x	0.77	x	0.32		x	92.28	X	0.4		x	0.7		= [	5.73	(80)
West	0.9x	0.77	X	0.7		x	113.09	X	0.4		x [	0.7		= [	15.36	(80)
West	0.9x	0.77	X	0.32		x	113.09	X	0.4		x	0.7		= [	7.02	(80)
West	0.9x	0.77	X	0.7		x	115.77	X	0.4		x	0.7		= [	15.72	(80)
West	0.9x	0.77	X	0.32		x	115.77	X	0.4		x	0.7		= [	7.19	(80)
West	0.9x	0.77	X	0.7		x	110.22	X	0.4		x [	0.7		= [	14.97	(80)
West	0.9x	0.77	X	0.32		x	110.22	X	0.4		x	0.7		= [	6.84	(80)
West	0.9x	0.77	X	0.7		x	94.68	X	0.4		x [	0.7		= [	12.86	(80)
West	0.9x	0.77	X	0.32		x	94.68	X	0.4		x [	0.7		= [	5.88	(80)
West	0.9x	0.77	X	0.7		x	73.59	X	0.4		x	0.7		= [	10	(80)
West	0.9x	0.77	X	0.32		x	73.59	X	0.4		x	0.7		= [	4.57	(80)
West	0.9x	0.77	X	0.7		x	45.59	X	0.4		x	0.7		= [	6.19	(80)
West	0.9x	0.77	X	0.32		x	45.59	X	0.4		x	0.7		= [	2.83	(80)
West	0.9x	0.77	X	0.7		x	24.49	X	0.4		x [	0.7		= [	3.33	(80)
West	0.9x	0.77	X	0.32		x	24.49	X	0.4		x [	0.7		= [	1.52	(80)
West	0.9x	0.77	X	0.7		x	16.15	X	0.4		x	0.7		= [	2.19	(80)
West	0.9x	0.77	X	0.32		x	16.15	X	0.4		x	0.7		= [	1	(80)
٦		watts, calcul	_					<del></del>	n = Sum(74)			<del>, , , , , , , , , , , , , , , , , , , </del>				
(83)m=	11.36	22.22 36			5.39	66.94		54.	75 42.5	55 26	36	14.16	9.34	1		(83)
Ĭ		internal and s		<u>`                                    </u>				1 00	00 1 :25	40 1 45	0 =-	1 400 5	400			(0.4)
(84)m=	203.66	212.65 220	.05	226.19 22	8.02	219.3	3 209.51	204	.89 198.	18   192	2.76	192.8	196.6	59		(84)

7. Me	an inter	nal temp	erature	(heating	season	)								
				·		•	from Tal	ole 9, Th	1 (°C)				21	(85)
•		tor for g	•			•			` ,					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.93	0.92	0.9	0.85	0.76	0.63	0.5	0.52	0.7	0.85	0.91	0.94		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.07	19.24	19.57	20.03	20.46	20.78	20.92	20.9	20.68	20.17	19.56	19.04		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.01	20.01	20.01	20.03	20.03	20.04	20.04	20.05	20.04	20.03	20.02	20.02		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)	-	-	-			
(89)m=	0.92	0.91	0.88	0.82	0.72	0.56	0.41	0.43	0.64	0.82	0.9	0.93		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m=	18.26	18.43	18.76	19.21	19.61	19.9	20	20	19.82	19.35	18.76	18.24		(90)
						!	!	•	f	fLA = Livin	g area ÷ (4	1) =	0.84	(91)
Mean	interna	l temper	ature (fc	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) × T2			'		
(92)m=	18.94	19.11	19.44	19.9	20.32	20.64	20.78	20.76	20.55	20.04	19.43	18.91		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate	!			
(93)m=	18.94	19.11	19.44	19.9	20.32	20.64	20.78	20.76	20.55	20.04	19.43	18.91		(93)
8. Spa	ace hea	ting requ	uirement											
		mean int factor fo		•		ned at sto	ep 11 of	Table 9	b, so tha	ıt Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	):	· ·	I.	I.		· ·	I.	l			
(94)m=	0.91	0.9	0.87	0.82	0.74	0.61	0.48	0.5	0.68	0.82	0.89	0.92		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (8	4)m			,						
(95)m=	185.95	191.26	191.84	185.33	167.6	133.11	99.95	102.81	133.85	158.21	171.45	180.76		(95)
		age exte		i	i e	l	100	1 40 4		100		4.0		(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)m=	398.97	386.09	350.64	293.74	229.53	Lm , vv =	=[(39)m 109.45	x [(93)m 114	- (96)m	251.18	330.19	396.22		(97)
								ļ	)m – (95			330.ZZ		(0.)
(98)m=	158.49	130.93	118.14	78.05	46.08	0	0	0	0	69.16	114.29	160.31		
•					<u> </u>	I	I	Tota	l per year				875.45	(98)
Space	e heatin	g require	ement in	kWh/m²	²/vear				-	-	·		35.02	(99)
·		•				vetome i	ncluding	micro-C	'UD/				00.02	` ′
	e heatir	•	its – iriu	ividual II	calling s	ysterns i	ricidaling	, micro-c	) IF )					
Fracti	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	າ, %						0	(208)
												!		

							_		
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	r
Space heating requirement (calculated above)  158.49   130.93   118.14   78.05   46.08	0	0	0	0	69.16	114.29	160.31	1	
	0	U	0	U	09.10	114.29	100.31		(044)
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 175.32  144.83  130.69  86.34  50.97 $	0	0	0	0	76.51	126.43	177.33		(211)
						211),5,1012		968.42	(211)
Space heating fuel (secondary), kWh/month									J
= {[(98)m x (201)] } x 100 ÷ (208)						,		ı	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0	0	0	_	1,045)
Metaubacting			Tota	i (kvvn/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>.</b>	0	(215)
Water heating Output from water heater (calculated above)									
	90.47	86.68	96.63	97.7	111.25	118.75	128.53		
Efficiency of water heater								80.3	(216)
` '	80.3	80.3	80.3	80.3	83.89	84.95	85.61		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
, ,	112.67	107.95	120.34	121.66	132.61	139.78	150.14		
	•		Tota	I = Sum(2	19a) <sub>112</sub> =			1563.8	(219)
Annual totals					k'	Wh/year	•	kWh/year	1
Space heating fuel used, main system 1								968.42	_
Water heating fuel used								1563.8	]
Electricity for pumps, fans and electric keep-hot									
mechanical ventilation - balanced, extract or pos	sitive in	put fron	n outside	)			98.96		(230a)
	sitive in	put fron	n outside	)			98.96		(230a) (230c)
mechanical ventilation - balanced, extract or pos	sitive in	put fron	n outside	)					,
mechanical ventilation - balanced, extract or poscentral heating pump:	sitive in	put fron		<b>e</b> of (230a).	(230g) =		30	173.96	(230c)
mechanical ventilation - balanced, extract or poscentral heating pump: boiler with a fan-assisted flue	sitive in	put fron			(230g) =		30	173.96 151.5	(230c) (230e)
mechanical ventilation - balanced, extract or poscentral heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			sum	of (230a).	(230g) =		30		(230c) (230e) (231)
mechanical ventilation - balanced, extract or poscentral heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ding mid	sum	of (230a).		ion fac	30 45		(230c) (230e) (231)
mechanical ventilation - balanced, extract or poscentral heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu		sum	of (230a).		ion fac	30 45	151.5	(230c) (230e) (231) (232)
mechanical ventilation - balanced, extract or poscentral heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ding mid e <b>rgy</b> h/year	sum	of (230a).	Emiss	ion fac 2/kWh	30 45	151.5 Emissions	(230c) (230e) (231) (232)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system	ns inclu Ene kWl	ding mid ergy h/year	sum	of (230a).	Emiss kg CO	ion fac 2/kWh	30 45 <b>tor</b>	Emissions kg CO2/yea	(230c) (230e) (231) (232)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene kWI (211)	ding mid ergy h/year ) ×	sum	of (230a).	Emiss kg CO	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b>	Emissions kg CO2/yea	(230c) (230e) (231) (232) r
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary)	Ene kWI (211) (215) (219)	ding mid ergy h/year ) × ) ×	sum	of (230a).	Emiss kg CO	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> =	Emissions kg CO2/yea	(230c) (230e) (231) (232)  r (261) (263)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	Ene kWI (211) (215) (219)	ding mid ergy h/year ) × ) × ) ×	sum	of (230a).	Emiss kg CO	ion fac 2/kWh 16 19 16	30 45 <b>tor</b> =	151.5  Emissions kg CO2/yea 209.18 0 337.78	(230c) (230e) (231) (232)  r (261) (263) (264)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kWI (211) (215) (219) (261)	ding mid ergy h/year ) x ) x ) x ) + (262) -	sum	of (230a).	Emiss kg CO 0.2 0.5 0.2	ion fac 2/kWh 16 19	30 45 <b>tor</b> = =	151.5  Emissions kg CO2/yea 209.18 0 337.78 546.96	(230c) (230e) (231) (231) (232)  r (261) (263) (264)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	Ene kWl (211) (215) (219) (261) (231)	ding mid ergy h/year ) x ) x ) x ) + (262) -	sum	of (230a).	Emiss kg CO	ion fac 2/kWh 16 19 16	30 45 <b>tor</b> = = =	151.5  Emissions kg CO2/yea 209.18  0 337.78 546.96 90.28	(230c) (230e) (231) (232)  (261) (263) (264) (265) (267)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Ene kWl (211) (215) (219) (261) (231)	ding mid ergy h/year ) x ) x ) x ) + (262) -	sum	of (230a). 264) = sum o	Emiss kg CO	ion fac 2/kWh 16 19 16	30 45 <b>tor</b> = = =	151.5  Emissions kg CO2/yea 209.18  0 337.78 546.96 90.28 78.63	(230c) (230e) (231) (232)  r (261) (263) (264) (265) (267) (268)
mechanical ventilation - balanced, extract or post central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year	Ene kWl (211) (215) (219) (261) (231)	ding mid ergy h/year ) x ) x ) x ) + (262) -	sum	of (230a). 264) = sum o	Emiss kg CO  0.2  0.5  0.5  0.5  0.6  0.7  0.7  0.7  0.8	ion fac 2/kWh 16 19 16	30 45 <b>tor</b> = = =	151.5  Emissions kg CO2/yea  209.18  0  337.78  546.96  90.28  78.63  715.87	(230c) (230e) (231) (231) (232)  r (261) (263) (264) (265) (267) (268) (272)

		l lear I	Details:						
A N	Adam Ditaki-	– USer L		- 1	I		OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Hame.		Property	Address			nergy Eff		71. 1.0.4.20	
Address :		, ,		,		<u> </u>			
1. Overall dwelling dime	ensions:								
Ground floor		Are	a(m²)	l/4->		eight(m)	<b>1</b> (0-)	Volume(m	<u> </u>
			25	(1a) x	3	3.09	(2a) =	77.25	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	25	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	77.25	(5)
2. Ventilation rate:	main seconda	P1.7	other		total			m³ nor hou	
	heating heating	<u> </u>	other		lotai			m³ per hou	,ıı
Number of chimneys	0 + 0	+	0	_ = _	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0	=	0	X :	20 =	0	(6b)
Number of intermittent fa	ins				2	X	10 =	20	(7a)
Number of passive vents	<b>;</b>				0	X	10 =	0	(7b)
Number of flueless gas fi	ires			Ī	0	χ.	40 =	0	(7c)
				_					_
				_			Air ch	nanges per h	our —
	ys, flues and fans = (6a)+(6b)+			aantinua fi	20		÷ (5) =	0.26	(8)
Number of storeys in the	peen carried out or is intended, proce he dwelling (ns)	ea 10 (17),	otrierwise	conunue ii	om (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding	to the grea	ter wall are	ea (after					_
deducting areas of openia	ngs);	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	,	(	,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr		•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] +$				ia haina u	and .		0.51	(18)
Number of sides sheltere	es if a pressurisation test has been do ed	rie or a de	gree air pe	тпеавшу	is being u	sea		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	) x (20) =				0.51	(21)
Infiltration rate modified f	or monthly wind speed							_	<u> </u>
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	2)m ∸ 4								
<u> </u>	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
· ′		1	1	1		1		J	

Adjusted infiltr	ation rate (allo	wing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.65	0.64 0.62	0.56	0.55	0.48	0.48	0.47	0.51	0.55	0.57	0.6	]	
	ctive air change	e rate for t	he appli	cable ca	ise					!		
	al ventilation:	manadir N. (C	ah) (00.	· \ / ·		\  <b> </b>		(00-)			0	(23a)
	eat pump using Ap n heat recovery: ef							i) = (23a)			0	(23b)
	•	•	ŭ		`		,	Ola ) (	001-) [	4 (00)	0	(23c)
	ed mechanical o	ventilation	with he	at recov	ery (MV)	HR) (248	$\frac{a)m = (2)}{0}$	2b)m + (	23b) × [	$\frac{1 - (23c)}{0}$	) ÷ 100] ]	(24a)
			_							"	]	(244)
(24b)m= 0	ed mechanical o	ventilation 0	without	neat red		0 (240 0	)m = (22   0	20)m + (.   0	230)	0	1	(24b)
	<u> </u>										J	(240)
	$n < 0.5 \times (23b)$		-	-				.5 × (23h	o)			
(24c)m = 0	0 0	0	0	0	0	0	0	0	0	0	1	(24c)
	ventilation or w	hole hous	e positiv	ve input	ventilati	on from	loft	<u> </u>	<u> </u>		1	
,	n = 1, then (24		•	•				0.5]				
(24d)m= 0.71	0.7 0.69	0.66	0.65	0.62	0.62	0.61	0.63	0.65	0.66	0.68		(24d)
Effective air	change rate -	enter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.71	0.7 0.69	0.66	0.65	0.62	0.62	0.61	0.63	0.65	0.66	0.68	]	(25)
3. Heat losse	s and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doors Type 1				2.13	х	1	=	2.13				(26)
Doors Type 2				0.35	X	1	<del>-</del>	0.35	$\equiv$			(26)
Doors Type 3				0.99	X	1	<u> </u>	0.99	$\equiv$			(26)
Windows Type	e 1			0.65	x1	/[1/( 1.4 )+	0.04] =	0.86	$\equiv$			(27)
Windows Type	e 2			1.83	x1	/[1/( 1.4 )+	0.04] =	2.43				(27)
Windows Type	e 3			0.3	x1	/[1/( 1.4 )+	0.04] =	0.4	=			(27)
Walls Type1	10.07	3.43		6.64	. x	0.18	i	1.2			$\neg$	(29)
Walls Type2	12.98	2.82		10.16	5 x	0.18	<del>-</del>	1.83	F i			(29)
Walls Type3	1.87	0		1.87	. x	0.18	= :	0.34	<b>=</b>			(29)
Walls Type4	2.9	0	=	2.9	x	0.18	<b>=</b>	0.52	<b>=</b>		<b>-</b>	(29)
Roof	25	0	_	25	x	0.13	= :	3.25	<b>=</b>		╡┝	(30)
Total area of e				52.82	=	0.10		0.20				(31)
	roof windows, use	e effective wi	ndow U-va			n formula 1	/[(1/U-valu	ue)+0.041 a	as aiven in	n paragrapl	h 3.2	(01)
	as on both sides of					,		., , .	3	7		
Fabric heat los	ss, $W/K = S (A)$	x U)				(26)(30	) + (32) =				14.29	(33)
Heat capacity	Cm = S(A x k)						((28).	(30) + (32	2) + (32a)	(32e) =	225	(34)
Thermal mass	parameter (TN	/IP = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
· ·	sments where the o		construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in T	able 1f		
	es : S (L x Y) c		usina Ar	pendix I	K						2.64	(36)
-	al bridging are not		•	-	•						2.04	(30)
		(55)		,								

Total fabric heat loss	(22) - (26)	(07)
	(33) + (36) = $(38)m = 0.33 \times (25)m \times (5)$	16.93 (37)
Ventilation heat loss calculated monthly  Jan Feb Mar Apr May Jun Jul	<del> </del>	J
Jan         Feb         Mar         Apr         May         Jun         Jul           (38)m=         18.11         17.9         17.7         16.74         16.56         15.73         15.73	Aug         Sep         Oct         Nov         Dec           15.57         16.05         16.56         16.92         17.3	(38)
Heat transfer coefficient, W/K	(39)m = (37) + (38)m	
(39)m= 35.04 34.83 34.63 33.67 33.49 32.66 32.66	32.5 32.98 33.49 33.85 34.23	
	Average = Sum(39) <sub>112</sub> /12=	33.67 (39)
Heat loss parameter (HLP), W/m²K	(40)m = $(39)$ m ÷ $(4)$	
(40)m= 1.4 1.39 1.39 1.35 1.34 1.31 1.31	1.3 1.32 1.34 1.35 1.37	
Number of days in month (Table 1a)	Average = Sum(40) <sub>112</sub> /12=	1.35 (40)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	;
(41)m= 31 28 31 30 31 30 31	31 30 31 30 31	(41)
		_
4. Water heating energy requirement:	kWh	/year:
Appropriate N		¬
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - $exp(-0.000349 \times (TFA - 13.9))]$	9)2)] + 0.0013 x (TFA -13.9)	(42)
if TFA £ 13.9, N = 1	<u> </u>	<u></u>
Annual average hot water usage in litres per day Vd,average = Reduce the annual average hot water usage by 5% if the dwelling is designed	,	(43)
not more that 125 litres per person per day (all water use, hot and cold)	to defineve a water use target of	
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c	1 9 1 1	
(44)m= 66.06 63.66 61.25 58.85 56.45 54.05 54.05	56.45 58.85 61.25 63.66 66.06	
	Total = Sum(44) <sub>112</sub> =	720.62 (44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x	DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)	
(45)m= 97.96 85.68 88.41 77.08 73.96 63.82 59.14	67.86 68.67 80.03 87.36 94.87	<del> </del>
If instantaneous water heating at point of use (no hot water storage), enter 0 i	Total = $Sum(45)_{112}$ = n boxes (46) to (61)	944.85 (45)
(46)m= 14.69 12.85 13.26 11.56 11.09 9.57 8.87	10.18 10.3 12 13.1 14.23	(46)
Water storage loss:		_
Storage volume (litres) including any solar or WWHRS storage	e within same vessel 0	(47)
If community heating and no tank in dwelling, enter 110 litres i	` '	
Otherwise if no stored hot water (this includes instantaneous o	combi boilers) enter '0' in (47)	
Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):	0	(48)
Temperature factor from Table 2b	0	(49)
Energy lost from water storage, kWh/year	$(48) \times (49) = 0$	(50)
b) If manufacturer's declared cylinder loss factor is not known		(00)
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
If community heating see section 4.3		<b>-</b>
Volume factor from Table 2a Temperature factor from Table 2b	0	(52)
Energy lost from water storage, kWh/year	$(47) \times (51) \times (52) \times (53) = 0$	
Enter (50) or (54) in (55)	$(47) \times (51) \times (52) \times (53) = 0$	(54) (55)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d		r	Area m²			Flux Table 6a			g_ Table 6b		FF Table 6c			Gains (W)			
East	0.9x	0.77	x	1.83	3	X	19	.64	x	0.63	,	x [	0.7		=	10.98	(76)
East	0.9x	0.77	x	1.83	3	x	38	.42	x	0.63	<u> </u>	× [	0.7		=	21.49	(76)
East	0.9x	0.77	x	1.83	3	x	63	.27	x	0.63	;	× Ī	0.7		=	35.39	(76)
East	0.9x	0.77	x	1.83	3	x	92	.28	x	0.63	<u> </u>	× [	0.7		=	51.61	(76)
East	0.9x	0.77	x	1.83	3	x	113	3.09	x	0.63		× [	0.7		=	63.25	(76)
East	0.9x	0.77	x	1.83	3	X	118	5.77	x	0.63		× [	0.7		=	64.75	(76)
East	0.9x	0.77	x	1.83	3	X	110	).22	x	0.63		× [	0.7		=	61.64	(76)
East	0.9x	0.77	x	1.83	3	X	94	.68	x	0.63		× [	0.7		=	52.95	(76)
East	0.9x	0.77	x	1.83	3	X	73	.59	x	0.63		× [	0.7		=	41.16	(76)
East	0.9x	0.77	x	1.83	3	X	45	.59	x	0.63	;	× [	0.7		=	25.5	(76)
East	0.9x	0.77	x	1.83	3	X	24	.49	x	0.63		× [	0.7		=	13.7	(76)
East	0.9x	0.77	x	1.83	3	X	16	.15	x	0.63	;	× [	0.7		=	9.03	(76)
West	0.9x	0.77	x	0.65	5	X	19	.64	x	0.63		× [	0.7		=	3.9	(80)
West	0.9x	0.77	x	0.3		X	19	.64	x	0.63	;	× [	0.7		=	1.8	(80)
West	0.9x	0.77	x	0.65	5	X	38	.42	x	0.63		× [	0.7		=	7.63	(80)
West	0.9x	0.77	x	0.3		X	38	.42	x	0.63		× [	0.7		=	3.52	(80)
West	0.9x	0.77	x	0.65	5	X	63	.27	x	0.63	;	× [	0.7		=	12.57	(80)
West	0.9x	0.77	x	0.3		X	63	.27	x	0.63		× [	0.7		=	5.8	(80)
West	0.9x	0.77	X	0.65	5	X	92	.28	X	0.63		x [	0.7		=	18.33	(80)
West	0.9x	0.77	x	0.3		X	92	.28	x	0.63	;	× [	0.7		=	8.46	(80)
West	0.9x	0.77	x	0.65	5	X	113	3.09	x	0.63		× [	0.7		=	22.47	(80)
West	0.9x	0.77	X	0.3		X	113	3.09	x	0.63		× [	0.7		=	10.37	(80)
West	0.9x	0.77	x	0.65	5	X	115	5.77	x	0.63	;	× [	0.7		=	23	(80)
West	0.9x	0.77	x	0.3		X	11	5.77	X	0.63	;	× [	0.7		=	10.61	(80)
West	0.9x	0.77	x	0.65	5	X	110	0.22	X	0.63	;	× [	0.7		= [	21.89	(80)
West	0.9x	0.77	X	0.3		X	110	).22	X	0.63	;	× [	0.7		=	10.11	(80)
West	0.9x	0.77	X	0.65	5	X	94	.68	X	0.63	;	× [	0.7		=	18.81	(80)
West	0.9x	0.77	X	0.3		X	94	.68	X	0.63	;	× [	0.7		=	8.68	(80)
West	0.9x	0.77	X	0.65	0.65		73	.59	X	0.63		× [	0.7		=	14.62	(80)
West	0.9x	0.77	X	0.3		X	73	.59	X	0.63	;	× [	0.7		=	6.75	(80)
West	0.9x	0.77	x	0.65	0.65		45	.59	X	0.63		× [	0.7		=	9.06	(80)
West	0.9x	0.77	X	0.3		X	45	.59	X	0.63	;	× [	0.7		=	4.18	(80)
West	0.9x	0.77	x	0.65	5	X	24.49		X	0.63		× [	0.7		=	4.86	(80)
West	0.9x	0.77	x	0.3		X	24.49		X	0.63	;	× [	0.7		=	2.25	(80)
West	0.9x	0.77	x	0.65	5	X	16	.15	X	0.63		× [	0.7		=	3.21	(80)
West	0.9x	0.77	X	0.3		X	x 16.15		X	0.63		× L	0.7		=	1.48	(80)
<b>—</b>	ins ir 16.69	1 watts, calculated 32.64 53.	$\overline{}$	for each	96.08	$\overline{}$	8.36	93.64	( <mark>83)m</mark> 80.4	= Sum(74)n 44 62.52	_		20.81	13.7	72		(83)
` ' <u> </u>										02.02	1 30.	., 0		10.7			(55)
Total gains – internal and solar $(84)$ m = $(73)$ m + $(83)$ m , watts $(84)$ m= $209.09$ $223.17$ $237.3$ $251.29$ $258.75$ $250.78$ $239.46$ $239.46$ $230.64$ $218.22$ $205.22$ $199.55$ $201.18$ $(84)$ m=													(84)				
` ′ 🗀		1 1						-					1				•

7 Me	an inter	nal temr	perature	(heating	season	)								
				· ·	n the livir	•	from Tal	ole 9 Th	1 (°C)				21	(85)
		•	٠.		ea, h1,m	Ū		JIC 0, 111	. ( 0)				21	(00)
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.98	0.95	0.88	0.74	0.58	0.61	0.84	0.96	0.99	0.99		(86)
. ,			<u> </u>				<u> </u>	<u> </u>						, ,
(87)m=	19.64	19.78	20.03	20.39	ea T1 (fo	20.91	20.98	20.97	e 9c) 20.83	20.45	20.01	19.64		(87)
			l				l	<u> </u>		20.43	20.01	19.04		(01)
-			<del></del>		rest of		r	r					1	(00)
(88)m=	20.3	20.3	20.31	20.33	20.33	20.35	20.35	20.35	20.34	20.33	20.32	20.32		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)					I	
(89)m=	0.99	0.99	0.98	0.94	0.86	0.69	0.5	0.54	0.79	0.95	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.03	19.17	19.42	19.79	20.09	20.29	20.34	20.34	20.22	19.85	19.41	19.04		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.84	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			'		
(92)m=		19.68	19.93	20.3	20.6	20.82	20.88	20.87	20.74	20.36	19.92	19.55		(92)
Apply	/ adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate	<u> </u>			
(93)m=	19.55	19.68	19.93	20.3	20.6	20.82	20.88	20.87	20.74	20.36	19.92	19.55		(93)
8. Sp	ace hea	ting requ	uirement											
					re obtain	ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the ut	tilisation	factor fo	or gains	using Ta	ble 9a	ı				ı		г	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	1				I					1	(0.4)
(94)m=	0.99	0.98	0.97	0.94	0.87	0.72	0.56	0.6	0.82	0.95	0.98	0.99		(94)
(95)m=	206.83	219.73	W = (94)	4)m x (8- 236.56	4)m 225	181.54	134.41	138.25	178.91	194.79	196.01	199.32		(95)
,			l		e from Ta		134.41	130.23	170.91	194.79	190.01	199.32		(90)
(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)
					erature,	<u> </u>					'	7.2		(55)
(97)m=	534.31	514.89	465.19	383.72	298.2	202.97	139.7	145.33	218.95	326.77	433.87	525.52		(97)
					nonth, k\		th = 0.02				L 1)m			
(98)m=	243.65	198.35	174.34	105.95	54.46	0	0	0	0	98.19	171.26	242.69		
			ļ.				<u> </u>	Tota	l per year	ı (kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	1288.89	(98)
Spac	e heatin	a require	ement in	k\/\/h/m²	²/vear								51.56	(99)
•		• •						:	VIID)				01.00	
	ergy rec e heatir		πs – Indi	viduai <sup>-</sup> h	eating sy	ystems i	nciuaing	micro-C	HP)					
-		_	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) <b>=</b>				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)

								_	
Jan Feb Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated abov	<del>-i</del>							1	
243.65   198.35   174.34   105.95   54.46	0	0	0	0	98.19	171.26	242.69		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	<u> </u>	T -	<del></del>	<u> </u>	T		T	1	(211)
260.87 212.36 186.65 113.44 58.31	0	0	O Tota	0	105.13 ar) =Sum(2	183.36	259.84		7(044)
Charachaetine fivel (accorden) 130/h/manth			TOLA	ii (KVVII/yea	ai) =3uiii(2	211) <sub>15,1012</sub>		1379.97	(211)
Space heating fuel (secondary), kWh/month = $\{[(98)\text{m x}(201)]\} \times 100 \div (208)$									
(215)m =	0	0	0	0	0	0	0		
			Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water heating									
Output from water heater (calculated above)	_	1		1	1	1	1	1	
131.62 114.98 119.63 106.1 102.72	90.47	86.68	96.63	97.7	111.25	118.75	128.53		7
Efficiency of water heater	1 00 0	l 00 0	T 00 0	00.0	04.74	05.07	00.00	80.3	(216)
(217)m= 86.58 86.41 86 85.05 83.53	80.3	80.3	80.3	80.3	84.74	85.97	86.63		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 152.02 133.06 139.1 124.76 122.97	112.67	107.95	120.34	121.66	131.28	138.13	148.37		
			Tota	I = Sum(2	19a) <sub>112</sub> =			1552.32	(219)
Annual totals					k\	Wh/year	ſ	kWh/year	٦
Space heating fuel used, main system 1								1379.97	_
Water heating fuel used								1552.32	
Electricity for pumps, fans and electric keep-h	ot								
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								153.37	(232)
12a. CO2 emissions – Individual heating sys	tems incl	uding mi	cro-CHF	)					
	Fn	ergy			Fmiss	ion fac	tor	Emissions	
		/h/year			kg CO		.01	kg CO2/yea	
Space heating (main system 1)	(21	1) x			0.2	16	=	298.07	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(219	9) x			0.2	16	=	335.3	(264)
Space and water heating	(26	1) + (262)	+ (263) + (	(264) =				633.37	(265)
Electricity for pumps, fans and electric keep-h	ot (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	2) x			0.5	19	=	79.6	(268)
Total CO2, kg/year				sum o	of (265)(2	271) =		751.9	(272)
									_
TER =								30.08	(273)

#### Property Details: Flat Type E Energy Eff only

Address:

Located in: Wales

Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 49.68 m<sup>2</sup> 3.09 m

Living area: 24.05 m<sup>2</sup> (fraction 0.484)

Front of dwelling faces: South

- ( )	$n \cap n$	Ina -	†\ /	naci
U	DELL		ιv	pes:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D9_01	Manufacturer	Solid			
Vent_09_01	Manufacturer	Solid			
Vent_09_09	Manufacturer	Solid			
Vent_09_04	Manufacturer	Solid			
Vent_09_10	Manufacturer	Solid			
Window_09_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_03	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_11	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_07	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	

Name:	Gap:	Frame Factor	r: g-value:	U-value:	Area:	No. of Openings:
D9_01	mm	0	0	1	2.13	1
Vent_09_01	mm	0	0	1	0.7	1
Vent_09_09	mm	0	0	1	0.96	1
Vent_09_04	mm	0	0	1	0.7	1
Vent_09_10	mm	0	0	1	0.7	1
Window_09_02	6mm	0.7	0.4	1.2	1.1	1
Window_09_03	6mm	0.7	0.4	1.2	0.19	1
Window_09_05	6mm	0.7	0.4	1.2	2.01	1
Window_09_11	6mm	0.7	0.4	1.2	1.46	1
Window_09_07	6mm	0.7	0.4	1.2	1.46	1
Window_09_08	6mm	0.7	0.4	1.2	0.99	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name: Type-Name: Location: Orient: Width: Height: D9\_01 9\_01 South 0 n 9\_01 0.58 Vent\_09\_01 South 1.2

Vent_09_09	9_09	East	0.58	1.65
Vent_09_04	9_06	North	1.2	0.58
Vent_09_10	9_07	North	0.58	1.2
Window_09_02	9_01	South	0.92	1.2
Window_09_03	9_01	South	0	0
Window_09_05	9_06	North	1.22	1.65
Window_09_11	9_07	North	1.22	1.2
Window_09_07	9_08	North	1.22	1.2
Window_09_08	9_09	East	0.6	1.65
Fanlight	9_01	South	1.01	0.315

Overshading: Average or unknown

Opaqui	o Elements.						
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
9_01	12.36	4.44	7.92	0.13	0	False	N/A
9_02	5.871	0	5.87	0.13	0	False	N/A
9_03	5.84	0	5.84	0.13	0	False	N/A
9_04	2.812	0	2.81	0.13	0	False	N/A
9_06	8.498	2.71	5.79	0.13	0	False	N/A
9_07	8.019	2.16	5.86	0.13	0	False	N/A
9_08	10.521	1.46	9.06	0.13	0	False	N/A
9_09	19.467	1.95	17.52	0.13	0	False	N/A
R9_01	49.68	0	49.68	0.1	0		N/A

Internal Elements
Party Elements

Onaque Flements

TL				
Ther	mai	- nr	rete	<b>ДС</b> .
	mai	$\sim$ 1	uu	

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

#### Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

Approved Installation Scheme: False

#### Main heating system

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Manufacturer Declaration

Manufacturer's data

Efficiency: 89.5% (SEDBUK2009)

Condensing combi with automatic ignition

Fuel Burning Type: Modulation

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed

Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :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: None
Assess Zero Carbon Home: No

		l lear-l	Details:						
Assessor Name:	Adam Ritchie	<u> </u>	Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	Flat Ty	pe E En	ergy Eff	only		
Address :									
1. Overall dwelling dime	nsions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				(1a) x		.09	(2a) =	153.51	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	49.68	(4)			<b>.</b>		
Dwelling volume		´ <u></u>			)+(3c)+(3c	d)+(3e)+	.(3n) =	153.51	(5)
2. Ventilation rate:								100.01	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>   +	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	0	x .	10 =	0	(7a)
Number of passive vents				Ē	0	x .	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
				_					
				_			Air ch	anges per ho	our —
•	ys, flues and fans = (6a)+(6b)+( een carried out or is intended, proced			continue fr	0 om (9) to 1		÷ (5) =	0	(8)
Number of storeys in the		od 10 (11),	ouror wide c	orianae n	0111 (0) 10 (	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openir	resent, use the value corresponding t ngs); if equal user 0.35	o tne grea	ter wall are	a (anter					
·	loor, enter 0.2 (unsealed) or 0	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	2.5	(17)
•	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Air permeability value applie  Number of sides sheltere	s if a pressurisation test has been do d	ne or a de	gree air pe	rmeability	is being u	sed		0	(19)
Shelter factor	u		(20) = 1 -	[0.0 <b>75</b> x (1	9)] =			1	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18	x (20) =				0.12	(21)
Infiltration rate modified for	or monthly wind speed							1	<del>_</del>
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1			T		1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m $	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 infiltration rate (allowing for shelter ar	nd wind speed) :	= (21a) x (22a)m					
0.16 0.16 0.15 0.14 0.13	0.12 0.12	0.12 0.12	0.13	0.14	0.15		
Calculate effective air change rate for the appli	cable case	ļ ļ					_
If mechanical ventilation:	-) Fa (a aatia.a.	(NIC)\ _athamiia = (22	h) (22-)		[	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a			b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing			201.) (6	201.) [4	(00.)	73.95	(23c)
a) If balanced mechanical ventilation with he	<del> </del>	<del>1 ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '</del>	<del> </del>		<del>`</del>	÷ 100]	(24a)
(24a)m= 0.29   0.29   0.28   0.27   0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(24a)
b) If balanced mechanical ventilation without	<del> </del>	<del></del>	<del>T ` `</del>				(24b)
` '	<u> </u>	0 0	0	0	0		(240)
c) If whole house extract ventilation or positive if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•		) 5 × (23h)	١			
(24c)m= 0 0 0 0 0 0	0 0		0	0	0		(24c)
d) If natural ventilation or whole house positi	ve input ventilat	ion from loft	_				
if (22b)m = 1, then (24d)m = (22b)m other	•		( 0.5]				
(24d)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	o) or (24c) or (2	4d) in box (25)					
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(25)
3. Heat losses and heat loss parameter:							
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-value W/m2K	A X U (W/k	()	k-value kJ/m²-k		X k /K
Doors Type 1	2.13 ×	1 =	2.13				(26)
Doors Type 1 Doors Type 2	2.13 x		2.13				(26) (26)
• •		1 =					
Doors Type 2	0.7 ×	1 =	0.7				(26)
Doors Type 2 Doors Type 3	0.7 × 0.96 ×	1 =	0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 x 0.96 x 0.7 x 0.7 x	1 =	0.7 0.96 0.7 0.7				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x	1 = 1 = 1 = 1 = 1	0.7 0.96 0.7 0.7 1.26				(26) (26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 x 0.96 x 0.7 x 0.7 x 1.1 x 0.19 x	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04]	0.7 0.96 0.7 0.7 1.26 0.22				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x 0.19 x 2.01 x	1 = 1	0.7 0.96 0.7 0.7 1.26 0.22 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x 0.19 x 2.01 x 1.46 x	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 0.13 = 0.13 = 0.13	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81 0 Walls Type5 8.5 2.71	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.03 0.76 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Aug Sep Oct Nov Dec Apr May Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day):  Composition of the properture factor from Table 2b  Energy lost from water storage, kWh/year  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  If community heating see section 4.3  Energy lost from water storage, kWh/year  If community lost from trope does not storage, kWh/year  If community lost from trope does not storage, kWh/year  If community lost from trope does not storage, kWh/year  If community lost from trope does not storage, kWh/year  If community lost from trope does not storage, kWh/year  If community lost
Energy lost from water storage, kWh/year
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  O  (53)  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  O  (54)  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Hot water storage loss factor from Table 2 (kWh/litre/day)
Solume   S
Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Temperature factor from Table 2b
Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (41)m  (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Enter (50) or (54) in (55)
Water storage loss calculated for each month  ((56)m = (55) × (41)m)  (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H  (57)m=
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H  (57)m=
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m  (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  (59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  (59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) $(59)m = 0  0  0  0  0  0  0  0  0  0$
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (41)m (61)m = 41.55   36.16   38.52   35.82   35.5   32.9   33.99   35.5   35.82   38.52   38.74   41.55   (61) Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 162.45   141.9   147.64   130.95   126.78   111.66   106.98   119.26   120.58   137.3   146.57   158.63 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (63) Output from water heater
(61)m= 41.55 36.16 38.52 35.82 35.5 32.9 33.99 35.5 35.82 38.52 38.74 41.55 (61)  Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m= 162.45 141.9 147.64 130.95 126.78 111.66 106.98 119.26 120.58 137.3 146.57 158.63 (62)  Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (63)  Output from water heater
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ $(62)m = 162.45  141.9  147.64  130.95  126.78  111.66  106.98  119.26  120.58  137.3  146.57  158.63$ $(62)$ Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) $(add \ additional \ lines \ if \ FGHRS \ and/or \ WWHRS \ applies, \ see \ Appendix \ G)$ $(63)m = 0  0  0  0  0  0  0  0  0  0$
(62)m= 162.45 141.9 147.64 130.95 126.78 111.66 106.98 119.26 120.58 137.3 146.57 158.63 (62)  Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)  (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (63)  Output from water heater
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater
(64)m= 162.45 141.9 147.64 130.95 126.78 111.66 106.98 119.26 120.58 137.3 146.57 158.63
Output from water heater (annual) <sub>112</sub> 1610.71 (64)
Heat gains from water heating, kWh/month $0.25 (0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$
(65)m= 50.59 44.2 45.91 40.59 39.23 34.41 32.77 36.73 37.14 42.47 45.54 49.32 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating
5. Internal gains (see Table 5 and 5a):
Metabolic gains (Table 5), Watts
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 34.46 30.6 24.89 18.84 14.08 11.89 12.85 16.7 22.42 28.46 33.22 35.41 (67)
(67)m= 34.46 30.6 24.89 18.84 14.08 11.89 12.85 16.7 22.42 28.46 33.22 35.41 (67)  Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 218.51 220.78 215.07 202.9 187.55 173.11 163.47 161.21 166.92 179.08 194.44 208.87 (68)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 218.51 220.78 215.07 202.9 187.55 173.11 163.47 161.21 166.92 179.08 194.44 208.87  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)
Water	heating	gains (T	able 5)										
(72)m=	67.99	65.77	61.71	56.37	52.72	47.8	44.04	49.36	51.58	57.09	63.25	66.29	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$													
(73)m=	404.34	400.53	385.04	361.49	337.73	316.18	303.74	310.65	324.29	348.01	374.28	393.95	(73)
6. Solar gains:													

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

	tion:	Access Facto Table 6d		Area m²	a aa	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	] =	4.15	(74)
North	0.9x	0.77	X	1.46	x	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	x	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	x	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	] =	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	] =	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	] =	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	x	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	x	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	x	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	x	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	x	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	X	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	x	2.01	x	24.19	X	0.4	x	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	X	24.19	X	0.4	X	0.7	=	6.85	(74)

North			7		1		1		ı		ı		7
North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	= 	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East -	0.9x	0.77	X	0.99	X	38.42	X	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	X	63.27	X	0.4	X	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	X	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	X	113.09	Х	0.4	X	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	X	115.77	X	0.4	X	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	X	110.22	X	0.4	X	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	X	94.68	X	0.4	X	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	X	73.59	X	0.4	X	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	X	45.59	X	0.4	X	0.7	=	8.76	(76)
East	0.9x	0.77	X	0.99	X	24.49	х	0.4	X	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	X	16.15	X	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	X	46.75	x	0.4	X	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	X	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	X	0.32	X	46.75	x	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	X	0.7	=	16.34	(78)
South	0.9x	0.77	X	0.19	X	76.57	X	0.4	X	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	X	76.57	x	0.4	X	0.7	=	4.75	(78)
South	0.9x	0.77	X	1.1	X	97.53	X	0.4	X	0.7	=	20.82	(78)
South	0.9x	0.77	X	0.19	X	97.53	X	0.4	X	0.7	=	3.6	(78)
South	0.9x	0.77	X	0.32	X	97.53	X	0.4	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	X	0.7	=	23.53	(78)
South	0.9x	0.77	X	0.19	X	110.23	x	0.4	X	0.7	=	4.06	(78)
South	0.9x	0.77	X	0.32	X	110.23	X	0.4	X	0.7	=	6.84	(78)
South	0.9x	0.77	X	1.1	X	114.87	X	0.4	X	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	X	114.87	X	0.4	X	0.7	=	4.24	(78)
South	0.9x	0.77	X	0.32	X	114.87	x	0.4	X	0.7	=	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	=	23.6	(78)
South	0.9x	0.77	X	0.19	X	110.55	x	0.4	x	0.7	=	4.08	(78)
South	0.9x	0.77	X	0.32	x	110.55	x	0.4	x	0.7	=	6.86	(78)
South	0.9x	0.77	X	1.1	×	108.01	x	0.4	x	0.7	=	23.05	(78)
South	0.9x	0.77	X	0.19	x	108.01	x	0.4	x	0.7	=	3.98	(78)
South	0.9x	0.77	X	0.32	x	108.01	x	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	×	1.1	x	104.89	x	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	x	0.19	x	104.89	x	0.4	x	0.7	=	3.87	(78)

South	0.9x	0.77	х	0.3	32	X	10	04.89	X		0.4	x	0.7	=	6.51	(78)
South	0.9x	0.77	Х	1.	1	X	10	01.89	X		0.4	x	0.7	=	21.75	(78)
South	0.9x	0.77	Х	0.1	9	X	10	01.89	X		0.4	x	0.7	=	3.76	(78)
South	0.9x	0.77	х	0.3	32	X	10	01.89	X		0.4	x	0.7	=	6.33	(78)
South	0.9x	0.77	Х	1.	1	X	8	2.59	X		0.4	x	0.7	=	17.63	(78)
South	0.9x	0.77	х	0.1	9	X	8	2.59	X		0.4	x	0.7	=	3.04	(78)
South	0.9x	0.77	х	0.3	32	X	8	2.59	X		0.4	x	0.7	=	5.13	(78)
South	0.9x	0.77	х	1.	1	X	5	5.42	x		0.4	x	0.7	=	11.83	(78)
South	0.9x	0.77	х	0.1	9	X	5	5.42	X		0.4	x	0.7	=	2.04	(78)
South	0.9x	0.77	х	0.3	32	X	5	5.42	X		0.4	x	0.7	=	3.44	(78)
South	0.9x	0.77	Х	1.	1	X		40.4	X		0.4	x	0.7	=	8.62	(78)
South	0.9x	0.77	х	0.1	9	X		40.4	X		0.4	x	0.7	=	1.49	(78)
South	0.9x	0.77	х	0.3	32	X		40.4	X		0.4	x	0.7	=	2.51	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	= Su	ım(74)m .	(82)m			_	
(83)m=	28.55	50.74	75.66	105.22	129.09	1:	33.29	126.35	107.	.63	85.68	57.7	34.57	24.2		(83)
Total g	ains – ii	nternal a	nd sola	r (84)m =	= (73)m	+ (8	83)m	, watts							-	
(84)m=	432.89	451.27	460.7	466.71	466.82	4	49.47	430.09	418.	.28	409.97	405.71	408.85	418.15		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)										
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area f	from Tal	ole 9,	Th1	l (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,n	า (ร	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m=	0.93	0.92	0.89	0.85	0.77	(	0.65	0.52	0.5	5	0.71	0.85	0.91	0.93		(86)
Mean	interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)					
(87)m=	18.89	19.07	19.41	19.88	20.35	2	0.72	20.89	20.8	87	20.61	20.06	19.41	18.86		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9	), Th	2 (°C)					
(88)m=	19.92	19.92	19.92	19.93	19.94	т —	9.95	19.95	19.9	-	19.95	19.94	19.93	19.93	]	(88)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina	h2	m (se	e Table	9a)				•	!	•	
(89)m=	0.92	0.9	0.88	0.83	0.73	<del>_</del>	0.58	0.42	0.4	5	0.65	0.82	0.89	0.92	]	(89)
Moon	intorna	Ltompor	atura in	the rest	of dwol	lina	T2 (f	ollow etc	nc 2	+o 7	in Tabl	0 00)	1		1	
(90)m=	18.02	18.2	18.53	19	19.44	ΤŬ	9.77	19.9	19.8		19.68	19.17	18.55	18	1	(90)
(00)=	10.02	10.2	10.00		10.11	Τ.	0	10.0	10.0				ng area ÷ (		0.48	(91)
													<b>J</b> (	,	0.40	(0.)
r			<u>`</u>	r the wh	i —	_	<u> </u>	i — —	<u> </u>			40.0	1 40 07	10.40	1	(02)
(92)m=	18.44	18.62	18.95	19.43	19.88		20.23	20.38	20.3		20.13	19.6	18.97	18.42		(92)
(93)m=	18.44	18.62	18.95	interna 19.43	19.88	1	0.23	20.38	20.3		20.13	19.6	18.97	18.42	1	(93)
		ting requ			13.00		.0.25	20.00	20.		20.10	13.0	10.57	10.42		(00)
					re obtai	ned	at ste	en 11 of	Tabl	e 9h	so tha	t Ti m=	(76)m an	d re-cal	culate	
				using Ta							, 55 and				_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	1:	1	_									1	
(94)m=	0.9	0.89	0.86	0.81	0.73		0.6	0.46	0.4	9	0.66	0.81	0.88	0.91	]	(94)
Ī				4)m x (8	<del></del>	_				<u> </u>		25-	T	l	1	(05)
(95)m=	390.32	400.53	396.9	378.89	340.29	1 20	68.68	197.89	203.	.99	271.53	327.16	358.38	379.68	]	(95)

Montl	nlv aver	age exte	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	ļ.			
(97)m=	845.84	818.19	740.77	617.94	478.62	325.17	218.15	228.22	350.32	526.76	698.26	841.06		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m=	338.91	280.66	255.84	172.12	102.92	0	0	0	0	148.5	244.71	343.26		
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1886.92	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								37.98	(99)
9a. En	ergy red	quiremer	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	HP)					
-	e heatir	_										-		_
Fracti	on of sp	ace hea	at from so	econdar	y/supple	mentary	system					Ţ	0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								90.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	າ, %					Ī	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	<del></del> ar
Space	e heatin	g require	ement (c	alculate	d above)									
	338.91	280.66	255.84	172.12	102.92	0	0	0	0	148.5	244.71	343.26		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	374.9	310.47	283.01	190.4	113.85	0	0	0	0	164.27	270.7	379.72		_
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	2087.3	(211)
•		• ,	econdar	• •	month									
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0 Tota	0 L(k\\/b/yea	0 er) =Sum(3	0 215) <sub>15.1012</sub>	0		7(245)
Watan	l 4!	_						Tota	i (KVVII/ yCc	ar) =00111(2	10)15,1012		0	(215)
	heating		ter (calc	ulated al	hove)									
Output	162.45	141.9	147.64	130.95	126.78	111.66	106.98	119.26	120.58	137.3	146.57	158.63		
Efficie	ncy of w	ater hea	ıter							<u> </u>	<u>l</u>		80.3	(216)
(217)m=	86.86	86.74	86.42	85.74	84.53	80.3	80.3	80.3	80.3	85.25	86.33	86.94		(217)
		•	kWh/mo											
, ,		1	) ÷ (217)		440.00	100.00	400.00	4 40 50	450.40	104.00	100 77	400.40		
(219)m=	187.02	163.6	170.84	152.73	149.98	139.06	133.23	148.52	150.16	161.06	169.77	182.46		7,,,,
<b>A</b>								TUld	I = Sum(2		AII. 6	L	1908.42	(219)
	I <b>l totals</b> heating		ed, main	system	1					K	Wh/year	Г	kWh/yeai 2087.3	
-	_			oyotom:								L T		=
	•	fuel use		-1								Ĺ	1908.42	
		•	ans and		·									
mech	anical v	entilatio	n - balan	iced, ext	ract or p	ositive ir	nput fron	n outside	Э			215		(230a)
centra	al heatin	ig pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)

				_
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	290	(231)
Electricity for lighting			243.4	(232)
10a. Fuel costs - individual heating systems:				
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	3.48 x 0.01 =	72.64	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	66.41	(247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	38.25	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applicable and app (232)	oly fuel price according to $13.19   x   0.01 =$	Table 12a 32.1	(250)
Additional standing charges (Table 12)			120	(251)
Appendix Q items: repeat lines (253) and (254) as	s needed			
Total energy cost (245)(247)	7) + (250)(254) =		329.41	(255)
11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(255) x (25	56)] ÷ [(4) + 45.0] =		1.46	(257)
SAP rating (Section 12)			79.62	(258)
12a. CO2 emissions – Individual heating system	s including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	r
Space heating (main system 1)	(211) x			
		0.216	450.86	(261)
Space heating (secondary)	(215) x	0.216 =	450.86	
Space heating (secondary) Water heating	(215) x (219) x	0.210		(261)
		0.519 =	0	(261) (263)
Water heating	(219) x	0.519 =	0 412.22	(261) (263) (264)
Water heating Space and water heating	(219) x (261) + (262) + (263) + (264) =	0.519 = 0.216 =	0 412.22 863.08	(261) (263) (264) (265)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.519 = 0.519 = 0.519 =	0 412.22 863.08 150.51	(261) (263) (264) (265) (267)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	(219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.519 = 0.519 = 0.519 = 0.519	0 412.22 863.08 150.51 126.33	(261) (263) (264) (265) (267) (268)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year	(219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	0 412.22 863.08 150.51 126.33 1139.91 22.95	(261) (263) (264) (265) (267) (268) (272)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year CO2 emissions per m²	(219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	0 412.22 863.08 150.51 126.33 1139.91 22.95	(261) (263) (264) (265) (267) (268) (272) (273)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year CO2 emissions per m <sup>2</sup> El rating (section 14)	(219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.519 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	0 412.22 863.08 150.51 126.33 1139.91 22.95	(261) (263) (264) (265) (267) (268) (272) (273)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year CO2 emissions per m <sup>2</sup> El rating (section 14)	(219) x (261) + (262) + (263) + (264) = (231) x (232) x sum (272)	0.519 = 0.519	0 412.22 863.08 150.51 126.33 1139.91 22.95 84  P. Energy	(261) (263) (264) (265) (267) (268) (272) (273)

Energy for water heating	(219) x	1.22	=	2328.28	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4874.79	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	890.31	(267)
Electricity for lighting	(232) x	0	=	747.25	(268)
'Total Primary Energy	sum	of (265)(271) =		6512.34	(272)
Primary energy kWh/m²/year	(272)	) ÷ (4) =		131.09	(273)

		l lear-l	Details:						
Assessor Name:	Adam Ritchie	<u> </u>	Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	Flat Ty	pe E En	ergy Eff	only		
Address :									
1. Overall dwelling dime	nsions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				(1a) x		.09	(2a) =	153.51	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	49.68	(4)			<b>.</b>		
Dwelling volume		´ <u></u>			)+(3c)+(3c	d)+(3e)+	.(3n) =	153.51	(5)
2. Ventilation rate:								100.01	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>   +	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	0	x .	10 =	0	(7a)
Number of passive vents				Ē	0	x .	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
				_					_
				_			Air ch	anges per ho	our —
•	ys, flues and fans = (6a)+(6b)+( een carried out or is intended, proced			continue fr	0 om (9) to 1		÷ (5) =	0	(8)
Number of storeys in the		od 10 (11),	ouror wide c	orianae n	om (0) to (	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openir	resent, use the value corresponding t ngs); if equal user 0.35	o tne grea	ter wall are	a (anter					
·	loor, enter 0.2 (unsealed) or 0	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	2.5	(17)
•	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Air permeability value applie  Number of sides sheltere	s if a pressurisation test has been do d	ne or a de	gree air pe	rmeability	is being u	sed		0	(19)
Shelter factor	u		(20) = 1 -	[0.0 <b>75</b> x (1	9)] =			1	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18	x (20) =				0.12	(21)
Infiltration rate modified for	or monthly wind speed							1	<del>_</del>
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1	1			T		1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m $	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 infiltration rate (allowing for shelter ar	nd wind speed) = (21a) :	( (22a)m		
0.16 0.16 0.15 0.14 0.13	0.12 0.12 0.12	0.12 0.13	0.14 0.15	
Calculate effective air change rate for the appl	icable case		<b>'</b>	(
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23)	a) × Emy (aguation (NE)) ath	orwico (23h) – (23a)		0.5 (23a)
If balanced with heat recovery: efficiency in % allowing				0.5 (23b)
a) If balanced mechanical ventilation with he			22h) + [1 (22a)	73.95 (23c)
(24a)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	$0.26 \qquad 0.26$	$\frac{230) \times [1 - (230)}{0.27}$	(24a)
b) If balanced mechanical ventilation without	<del>                                     </del>			1
(24b)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24b)
c) If whole house extract ventilation or positi	ve input ventilation from	outside	I	I
if (22b)m < 0.5 x (23b), then (24c) = (23	•		)	
(24c)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other				
(24d)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (24d) in be	ox (25)	!	1
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	0.26 0.26	0.27 0.28	(25)
3. Heat losses and heat loss parameter:			·	
<b>ELEMENT</b> Gross Openings area (m²) m²	Net Area U-va A ,m² W/m		k-value () kJ/m²-l	
• •			<u>^</u>	
Doors Type 1	2.13 X 1	= 2.13		(26)
Doors Type 2	2.13 X 1	= 2.13		(26) (26)
• •				
Doors Type 2	0.7 × 1	= 0.7		(26)
Doors Type 2 Doors Type 3	0.7 x 1 0.96 x 1	= 0.7		(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 x 1 0.96 x 1 0.7 x 1	= 0.7 = 0.96 = 0.7 = 0.7		(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7	$ \begin{array}{cccc}  & = & 0.7 \\  & = & 0.96 \\  & = & 0.7 \\  & = & 0.7 \\  & + 0.04 & = & 1.26 \end{array} $		(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$ $+ 0.04] = 2.3$		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7     x     1       0.96     x     1       0.7     x     1       0.7     x     1       1.1     x1/[1/(1.2)       0.19     x1/[1/(1.2)       2.01     x1/[1/(1.2)       1.46     x1/[1/(1.2)       0.99     x1/[1/(1.2)       0.32     x1/[1/(1.2)       7.92     x     0.1       5.87     x     0.1       2.81     x     0.1	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 0.22 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.75		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5	0.7       x       1         0.96       x       1         0.7       x       1         0.7       x       1         1.1       x1/[1/(1.2)         0.19       x1/[1/(1.2)         2.01       x1/[1/(1.2)         1.46       x1/[1/(1.2)         0.99       x1/[1/(1.2)         0.32       x1/[1/(1.2)         7.92       x         0.1       5.87         5.84       x         0.1       5.79	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 2.3 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.76		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.2 1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage los				(1.14/1							I	
a) If manufacture			or is kno	wn (Kvvr	n/day):					0		(48)
Temperature fact			oor			(48) x (49	\ _			0		(49)
Energy lost from b) If manufacture	_	-		or is not		(40) X (49	) =			0		(50)
Hot water storage		•								0		(51)
If community hear	-	on 4.3										
Volume factor from Temperature factors		. 2h							-	0		(52)
·						(47) v (E4	\ v ( <b>E</b> 2) v (	E3) _		0		(53)
Energy lost from the Enter (50) or (54)	•	e, KVVII/y	ear			(47) X (51	) x (52) x (	oo) =	-	0		(54) (55)
Water storage los	, ,	for each	month			((56)m = (	55) × (41)	m		0		(00)
(56)m= 0	0 0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains de											l ix H	, ,
(57)m= 0	0 0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit los	s (appual) fr	om Tabl	. 2	l			<u> </u>			0		(58)
Primary circuit los	` ,			59)m = (	(58) ÷ 36	65 × (41)	m					(/
(modified by fac			,			, ,		r thermo	stat)			
(59)m= 0	0 0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcul	ated for each	n month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m= 41.55 3	6.16 38.52	35.82	35.5	32.9	33.99	35.5	35.82	38.52	38.74	41.55		(61)
Total heat require	d for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 162.45 1	147.64	130.95	126.78	111.66	106.98	119.26	120.58	137.3	146.57	158.63		(62)
Solar DHW input calc	ulated using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional lin	es if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)			1	ı	
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
Output from wate		1	ı		i						l	
(64)m= 162.45 1	147.64	130.95	126.78	111.66	106.98	119.26	120.58	137.3	146.57	158.63		٦٫٫۰
		1.140.7		- /	(4=)		out from wa				1610.71	(64)
Heat gains from v		·	·		<del>- ` ´</del>	<del>``</del>	<del>-</del>		<del>``</del>	<u> </u>	]	(GE)
` '	4.2 45.91	40.59	39.23	34.41	32.77	36.73	37.14	42.47	45.54	49.32		(65)
include (57)m ii				ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains	•		):									
Metabolic gains (			Mari	1	11	<b>Ι</b> Δα	Con	0-4	Nov	Daa		
<del></del>	Feb Mar 4.03 84.03	Apr 84.03	May 84.03	Jun 84.03	Jul 84.03	Aug 84.03	Sep 84.03	Oct 84.03	Nov 84.03	Dec 84.03		(66)
Lighting gains (ca		<u> </u>	<u> </u>		<u> </u>	ļ		04.00	04.03	04.00		(00)
	2.24 9.96	7.54	5.63	4.76	5.14	6.68	8.97	11.39	13.29	14.17		(67)
Appliances gains	!	!	<u> </u>		<u> </u>	<u> </u>	<u> </u>		10.20			(- /
	7.92 144.09	135.94	125.66	115.99	109.53	108.01	111.84	119.99	130.27	139.94		(68)
Cooking gains (ca	!		<u> </u>						I	1		. ,
	1.4 31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4		(69)
Pumps and fans		<u>l</u>	I	<u> </u>	<u> </u>	<u> </u>	I	<u> </u>	I	<u> </u>		•
(70)m= 3	3 3	3	3	3	3	3	3	3	3	3		(70)
	!	<u> </u>	L	ь	ь	ь	L	L	<u> </u>		l	

Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)
Water	heating	gains (T	able 5)										
(72)m=	67.99	65.77	61.71	56.37	52.72	47.8	44.04	49.36	51.58	57.09	63.25	66.29	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	70)m + (7	1)m + (72)	m	
(73)m=	279.39	277.15	266.97	251.06	235.22	219.75	209.92	215.26	223.59	239.67	258.02	271.61	(73)
6. Sol	ar gains	s:											

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

		Access Facto Table 6d		Area m²	a arra	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	=	4.15	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	X	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	X	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	X	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	=	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	=	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	X	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	X	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	X	2.01	X	24.19	x	0.4	X	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	x	24.19	x	0.4	X	0.7	=	6.85	(74)

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North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	=	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East	0.9x	0.77	X	0.99	x	38.42	x	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	x	63.27	X	0.4	x	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	x	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	x	113.09	x	0.4	x	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	x	115.77	X	0.4	x	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	x	110.22	x	0.4	x	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	x	94.68	x	0.4	x	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	x	73.59	x	0.4	x	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	x	45.59	X	0.4	x	0.7	=	8.76	(76)
East	0.9x	0.77	x	0.99	x	24.49	X	0.4	X	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	x	16.15	x	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	x	46.75	X	0.4	x	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	x	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	x	0.32	x	46.75	X	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	x	0.7	] =	16.34	(78)
South	0.9x	0.77	x	0.19	x	76.57	x	0.4	x	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	x	76.57	x	0.4	x	0.7	] =	4.75	(78)
South	0.9x	0.77	х	1.1	x	97.53	x	0.4	x	0.7	=	20.82	(78)
South	0.9x	0.77	х	0.19	x	97.53	x	0.4	x	0.7	] =	3.6	(78)
South	0.9x	0.77	X	0.32	x	97.53	x	0.4	x	0.7	] =	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	x	0.7	] =	23.53	(78)
South	0.9x	0.77	X	0.19	x	110.23	x	0.4	x	0.7	] =	4.06	(78)
South	0.9x	0.77	X	0.32	x	110.23	x	0.4	x	0.7	j =	6.84	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.4	x	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	x	114.87	X	0.4	x	0.7	j =	4.24	(78)
South	0.9x	0.77	x	0.32	x	114.87	x	0.4	x	0.7	j =	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	j =	23.6	(78)
South	0.9x	0.77	j x	0.19	x	110.55	x	0.4	x	0.7	j =	4.08	(78)
South	0.9x	0.77	j x	0.32	×	110.55	x	0.4	x	0.7	j =	6.86	(78)
South	0.9x	0.77	×	1.1	x	108.01	x	0.4	x	0.7	j =	23.05	(78)
South	0.9x	0.77	×	0.19	x	108.01	x	0.4	x	0.7	i =	3.98	(78)
South	0.9x	0.77	i x	0.32	x	108.01	X	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	X	1.1	x	104.89	X	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	i x	0.19	x	104.89	X	0.4	X	0.7	=	3.87	(78)
	L		_		1				ı				

South															
South	0.9x	0.77	X	0.3	32	x	10	)4.89	х	0.4	x	0.7	=	6.51	(78)
South	0.9x	0.77	X	1.	1	x	10	)1.89	х	0.4	x	0.7	=	21.75	(78)
South	0.9x	0.77	X	0.1	9	x	10	1.89	х	0.4	x	0.7	=	3.76	(78)
South	0.9x	0.77	Х	0.3	32	x	10	)1.89	X	0.4	X	0.7	=	6.33	(78)
South	0.9x	0.77	х	1.	1	x	8	2.59	х	0.4	X	0.7	=	17.63	(78)
South	0.9x	0.77	X	0.1	9	x [	8:	2.59	х	0.4	x	0.7		3.04	(78)
South	0.9x	0.77	X	0.3	32	x [	8:	2.59	х	0.4	×	0.7	<del>-</del>	5.13	(78)
South	0.9x	0.77	x	1.	1	×	5	5.42	х	0.4	×	0.7		11.83	(78)
South	0.9x	0.77	X	0.1	9	x [	5	5.42	х	0.4	x	0.7		2.04	(78)
South	0.9x	0.77	x	0.3	32	x [	5	5.42	х	0.4	X	0.7	=	3.44	(78)
South	0.9x	0.77	х	1.	1	x	4	0.4	х	0.4	X	0.7	=	8.62	(78)
South	0.9x	0.77	х	0.1	9	x [	4	0.4	х	0.4	X	0.7	=	1.49	(78)
South	0.9x	0.77	X	0.3	32	x [	4	0.4	х	0.4	x	0.7	_	2.51	(78)
									_						
Solar	gains in	watts, ca	alculated	for eac	h month				(83)m	= Sum(74)m	(82)m			-	
(83)m=	28.55	50.74	75.66	105.22	129.09		3.29	126.35	107.	63 85.68	57.7	34.57	24.2		(83)
Total g	gains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	3)m ,	watts			,			1	
(84)m=	307.94	327.89	342.63	356.28	364.31	35	3.04	336.27	322.	89 309.27	297.3	7 292.58	295.81		(84)
7. Me	an inter	nal temp	erature	(heating	season	)									
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	irea f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	ı (se	e Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	ļ	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(86)m=	0.96	0.96	0.94	0.91	0.85	0	.74	0.61	0.6	5 0.81	0.91	0.95	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollov	v ster	os 3 to 7	' in Ta	able 9c)					
(87)m=	18.52	18.71	19.09	19.62	20.16	20	).61	20.83	20.	3 20.46	19.8	19.08	18.49		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwe	ellina	from Ta	ble 9	•	•	•	•	•	
(88)m=	19.92	19.92			1100101	<u> </u>				Th2 (°C)					
		19.92	19.92	19.93	19.94	19	9.95	19.95	19.9	, Th2 (°C)	19.94	19.93	19.93		(88)
I Itilie	ation fac				<u> </u>				19.9		19.94	19.93	19.93		(88)
		tor for g	ains for r	est of d	welling,	h2,r	n (se	e Table	19.9 9a)	19.95	<u> </u>		<u> </u>		, ,
(89)m=	0.96	tor for g	ains for 1	est of d	welling, 0.81	h2,r	n (se	e Table 0.51	19.9 9a) 0.59	5 0.75	0.89	19.93	19.93		(88)
(89)m= Mean	0.96 interna	tor for g 0.95	ains for r 0.93 ature in	est of d 0.89 the rest	welling, 0.81 of dwell	h2,r 0	n (se .67	e Table 0.51 ollow ste	19.9 9a) 0.59 ps 3	19.95 5 0.75 to 7 in Tab	0.89 le 9c)	0.94	0.96		(89)
(89)m=	0.96	tor for g	ains for 1	est of d	welling, 0.81	h2,r 0	n (se	e Table 0.51	19.9 9a) 0.59	19.95 5 0.75 to 7 in Tab 15 19.57	0.89 le 9c)	0.94	0.96	0.49	(89)
(89)m= Mean (90)m=	0.96 n interna 17.66	o.95 l temper	ains for r 0.93 ature in 1 18.23	0.89 the rest	welling, 0.81 of dwell 19.27	h2,r 0 ing	n (se .67 T2 (fo	e Table 0.51 bllow ste 19.87	19.9 9a) 0.58 eps 3	19.95 5 0.75 to 7 in Tab 5 19.57	0.89 le 9c) 18.94 fLA = Li	0.94	0.96	0.48	(89)
(89)m=  Mean (90)m=	0.96 interna 17.66	o.95 I temper 17.85 I temper	ains for r 0.93 ature in 18.23 ature (fo	rest of d 0.89 the rest 18.76	welling, 0.81 of dwell 19.27	h2,r 0 ing 19	m (se .67 T2 (fc 9.69	e Table 0.51  bllow ste 19.87  A × T1	19.9 9a) 0.56 ps 3 19.8	19.95 5 0.75 to 7 in Tab 5 19.57 - fLA) × T2	0.89 le 9c) 18.94 fLA = Li	0.94 18.23 ving area ÷ (	0.96 17.64 4) =	0.48	(89) (90) (91)
(89)m=  Mean (90)m=  Mean (92)m=	0.96 n interna 17.66 n interna 18.08	o.95 I temper 17.85 I temper 18.27	ains for r 0.93 ature in 1 18.23 ature (fo	rest of d 0.89 the rest 18.76 r the wh	welling, 0.81  of dwell 19.27  ole dwe	h2,r 0 ing 19	m (se .67 T2 (fc ).69 )) = fL	e Table 0.51  bllow ste 19.87  A × T1 20.33	19.9 9a) 0.55 eps 3 19.8 + (1 -	19.95  19.95  10.75  10.75  10.75  10.75  10.75  10.75  10.75  10.75  10.75  10.75  10.75  10.75	0.89 le 9c) 18.94 fLA = Li	0.94 18.23 ving area ÷ (	0.96	0.48	(89)
(89)m=  Mean (90)m=  Mean (92)m=  Apply	0.96 n interna 17.66 n interna 18.08 v adjustn	tor for g 0.95 I temper 17.85 I temper 18.27	ains for r 0.93 ature in 18.23 ature (fo 18.64 he mean	rest of d 0.89 the rest 18.76 r the wh 19.18 internal	welling, 0.81  of dwell 19.27  ole dwe 19.7 I temper	h2,r 0 ing 19 Illing 20 ratur	m (se .67 T2 (fc 9.69 )) = fL	e Table 0.51  bllow ste 19.87  A × T1 20.33  m Table	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v	19.95  19.95  19.95  to 7 in Tab  19.57  - fLA) × T2  1 20  where appr	0.89 le 9c) 18.94 fLA = Li	0.94 18.23 ving area ÷ (	0.96 17.64 4) =	0.48	(89) (90) (91) (92)
(89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08	o.95 I temper 17.85 I temper 18.27 nent to tl	ains for r 0.93 ature in 1 18.23 ature (fo 18.64 he mean	rest of d 0.89 the rest 18.76 r the wh	welling, 0.81  of dwell 19.27  ole dwe	h2,r 0 ing 19 Illing 20 ratur	m (se .67 T2 (fc ).69 )) = fL	e Table 0.51  bllow ste 19.87  A × T1 20.33	19.9 9a) 0.55 eps 3 19.8 + (1 -	19.95  19.95  19.95  to 7 in Tab  19.57  - fLA) × T2  1 20  where appr	0.89 le 9c) 18.94 fLA = Li	0.94 18.23 ving area ÷ (	0.96 17.64 4) =	0.48	(89) (90) (91)
(89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp	0.96 n interna 17.66 n interna 18.08 v adjustn 18.08 ace hea	tor for garage of the second s	ains for r 0.93 ature in 18.23 ature (fo 18.64 he mean 18.64	rest of d 0.89 the rest 18.76 r the wh 19.18 interna 19.18	welling, 0.81  of dwell 19.27  ole dwe 19.7  temper 19.7	h2,r 0 ing 19	m (se .67 T2 (fc 0.69 0.14 ) = fL 0.14	e Table 0.51  bllow ste 19.87  A × T1 20.33  m Table 20.33	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v	19.95  19.95  19.95  10.75  10.75  19.57  10.75  10	0.89 le 9c) 18.94 fLA = Li 19.35 opriate	0.94 18.23 ving area ÷ (	0.96 17.64 4) = 18.05		(89) (90) (91) (92)
(89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp  Set T	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08 ace hea	tor for garage of the second s	ains for r 0.93 ature in 18.23 ature (fo 18.64 he mean 18.64	rest of d 0.89 the rest 18.76 r the wh 19.18 internal 19.18	welling, 0.81  of dwell 19.27  ole dwe 19.7  temper 19.7	h2,r 0 ing 19	m (se .67 T2 (fc 0.69 0.14 ) = fL 0.14	e Table 0.51  bllow ste 19.87  A × T1 20.33  m Table 20.33	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v	19.95  19.95  19.95  to 7 in Tab  19.57  - fLA) × T2  1 20  where appr	0.89 le 9c) 18.94 fLA = Li 19.35 opriate	0.94 18.23 ving area ÷ (	0.96 17.64 4) = 18.05		(89) (90) (91) (92)
(89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp  Set T	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08 ace hea	tor for garage of the second s	ains for r 0.93 ature in 1 18.23 ature (fo 18.64 he mean 18.64 uirement	rest of d 0.89 the rest 18.76 r the wh 19.18 internal 19.18	welling, 0.81  of dwell 19.27  ole dwe 19.7  temper 19.7	h2,r 0 ing 19 20 eatur 20	m (se .67 T2 (fc 0.69 0.14 ) = fL 0.14	e Table 0.51  bllow ste 19.87  A × T1 20.33  m Table 20.33	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v	19.95  19.95  19.95  10.75  10	0.89 le 9c) 18.94 fLA = Li 19.35 opriate	0.94 18.23 ving area ÷ ( 18.64 =(76)m an	0.96 17.64 4) = 18.05		(89) (90) (91) (92)
Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08 ace hea ii to the n tilisation Jan	o.95 I temper 17.85 I temper 18.27 nent to tl 18.27 ting requesting requesting requesting factor for Feb	ains for r 0.93  ature in r 18.23  ature (for r 18.64 he mean r 18.64 uirement ternal	rest of double of the rest of the whole of t	welling, 0.81  of dwell 19.27  ole dwe 19.7  temper 19.7  re obtain	h2,r 0 ing 19 20 eatur 20	m (se .67 T2 (fc 0.69 )) = fL 0.14 re from	e Table  0.51  bllow ste  19.87  A × T1  20.33  m Table  20.33  ep 11 of	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v 20.3	19.95  19.95  10.75  10	0.89 le 9c) 18.94 19.35 opriate 19.35	0.94 18.23 ving area ÷ ( 18.64 =(76)m an	0.96 17.64 4) = 18.05 18.05		(89) (90) (91) (92)
Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08 ace hea ii to the n tilisation Jan	o.95 I temper 17.85 I temper 18.27 nent to tl 18.27 ting requesting requesting requesting factor for Feb	ains for r 0.93 ature in 1 18.23 ature (fo 18.64 he mean 18.64 uirement ernal ter or gains of	rest of double of the rest of the whole of t	welling, 0.81  of dwell 19.27  ole dwe 19.7  temper 19.7  re obtain	h2,r 0 ing 19 llling 2ccature 2cc	m (se .67 T2 (fc 0.69 )) = fL 0.14 re from	e Table  0.51  bllow ste  19.87  A × T1  20.33  m Table  20.33  ep 11 of	19.9 9a) 0.55 19.8 + (1 - 20.3 4e, v 20.3	19.95 19.95 10.75 10.75 10.75 19.57	0.89 le 9c) 18.94 19.35 opriate 19.35	0.94 18.23 ving area ÷ ( 18.64 =(76)m an	0.96 17.64 4) = 18.05 18.05		(89) (90) (91) (92)
Mean (90)m=  Mean (92)m= Apply (93)m=  8. Sp Set T the ut  Utilisa (94)m=	0.96 n interna 17.66 n interna 18.08 n adjustn 18.08 ace hea ii to the n tillisation Jan ation face	o.95 I temper 17.85 I temper 18.27 nent to tl 18.27 ting requesting requesting requesting requesting rector for great to for great to for great to for great to for great to for great to for great to for great to for great to for great for for great for great for for great for	ains for r 0.93  ature in 1 18.23  ature (fo 18.64 he mean 18.64 uirement ernal ter or gains r Mar ains, hm	rest of double of the rest of the whole of t	welling, 0.81  of dwell 19.27  ole dwe 19.7 I temper 19.7  re obtair able 9a May  0.8	h2,r 0 ing 19 llling 20 aturn 20 ned 0	m (se .67 T2 (fc ).69 )) = fL ).14 re from ).14 at ste	e Table 0.51  bllow ste 19.87  A × T1 20.33  m Table 20.33  ep 11 of Jul	19.9 9a) 0.59 19.8 + (1 - 20.3 4e, v 20.3 Table	19.95 19.95 10.75 10.75 10.75 19.57	0.89 le 9c) 18.94 19.35 opriate 19.35 at Ti,ma	0.94  18.23  ving area ÷ (  18.64  =(76)m an  Nov	0.96 17.64 4) = 18.05 18.05 d re-cald		(89) (90) (91) (92) (93)

Month	alv aver	ane evte	ernal tem	inerature	from Ta	ahla 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)
	Lloss rate	e for me	an intern	al tempe	erature,	Lm , W =	-[(39)m :	x [(93)m	L – (96)m	]				
(97)m=	823.98	797.42	722.3	603.2	468.38	319.72	215.64	225.17	342.46	512.36	679.33	819.48		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	396.1	329.68	304.06	209.85	130.7	0	0	0	0	186.7	293.02	400.31		
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2250.43	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								45.3	(99)
9a. En	ergy red	quiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	_										_		_
Fracti	on of sp	ace hea	at from so	econdar	y/supple	mentary	system					Ĺ	0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) <b>=</b>				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								90.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	າ, %					[	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space	e heatin	g require	ement (c	alculate	d above)	)								
	396.1	329.68	304.06	209.85	130.7	0	0	0	0	186.7	293.02	400.31		
(211)m	ı = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	438.17	364.69	336.35	232.14	144.58	0	0	0	0	206.52	324.14	442.82		_
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	2489.41	(211)
		•	econdar	• •	month									
		1	00 ÷ (20		_	_	0	_	_		_			
(215)m=	0	0	0	0	0	0	0	0 Tota	0 L(k\\\\h\\\es	0 ar) =Sum(3	0 215) <sub>15.1012</sub>	0		(215)
14/-4	l 4!	_						Tota	ii (KVVII/ yCc	ar) =00111(2	- 10/15,1012	L	0	(213)
	heating		ter (calc	ulated al	hove)									
Output	162.45	141.9	147.64	130.95	126.78	111.66	106.98	119.26	120.58	137.3	146.57	158.63		
Efficier	ncy of w	ater hea	ıter										80.3	(216)
(217)m=	87.21	87.1	86.83	86.23	85.13	80.3	80.3	80.3	80.3	85.83	86.76	87.28		(217)
		•	kWh/mo		•	•		•	•					
` ,	1 = (64) 186.27	m x 100	) ÷ (217) L <sub>470.02</sub>		140.02	120.06	122.22	148.52	150.16	159.98	160.00	181.74		
(219)111=	100.27	162.91	170.03	151.86	148.93	139.06	133.23		150.16 I = Sum(2		168.93	101.74	1001.62	7(240)
Annus	ıl totals							7010	ii – Gaiii(2		Wh/year	. L	1901.63 <b>kWh/yea</b>	(219)
			ed, main	system	1					N.	wii/yeai	Г	2489.41	<u>'</u>
•	•	fuel use		,									1901.63	╡
	•		ans and	alactric	kaan-ho	+						L	1001.00	_
		•			•		nnu4 f====	اماده اماده	•			045		(220-)
			n - balan	icea, ext	ract or p	ositive II	iput iron	ท บนเรเติ	J			215		(230a)
		ng pump										30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)

Total electricity for the above, kWh/year sum of (230a)...(230g) = (231)290 Electricity for lighting (232)243.4 12a. CO2 emissions - Individual heating systems including micro-CHP **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) (261)0.216 537.71 (215) x Space heating (secondary) 0.519 (263)0 (219) x Water heating (264) 0.216 410.75 Space and water heating (261) + (262) + (263) + (264) =(265) 948.46 (231) x Electricity for pumps, fans and electric keep-hot (267)0.519 150.51 (232) x Electricity for lighting (268)0.519 126.33 Total CO2, kg/year sum of (265)...(271) = (272)1225.3  $(272) \div (4) =$ **Dwelling CO2 Emission Rate** 24.66 (273)

El rating (section 14)

(274)

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		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property A	Address	Flat Ty	pe E En	ergy Eff	only		
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\			(1a) x	3	3.09	(2a) =	153.51	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 4	9.68	(4)			·		
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	153.51	(5)
2. Ventilation rate:	main seconda	<b>W</b> 1.7	other		40401			m³ nor hou	•
	heating heating	, 	Other	, –	total		,	m³ per hou	_
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				2	X	10 =	20	(7a)
Number of passive vents	1			Ī	0	X	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	<b>X</b>	40 =	0	(7c)
				_				_	
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				20		÷ (5) =	0.13	(8)
Number of storeys in t	peen carried out or is intended, proced the dwelling (ns)	ed to (17), c	otherwise o	continue tr	om (9) to	(16)		0	(9)
Additional infiltration	no awaming (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	r 0.35 for	masoni	y constr	uction	-		0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding	to the greate	er wall are	a (after			'		
deducting areas of openii	ngs);	).1 (seale	d). else	enter 0				0	(12)
If no draught lobby, en	,	(0000	۵,, ۵.۵۵					0	(13)
• •	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelope	area	5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.38	(18)
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has been do	ne or a deg	ree air pe	rmeability	is being u	sed			7(40)
Shelter factor	cu		(20) = 1 -	[0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.38	(21)
Infiltration rate modified f	_								` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 Easter (22a)m (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(-20)	1.00 0.93	1 3.33	3.02		L	12	10	I	

Adjusted infiltration rate (allowing for s	helter and wind s	speed) = (21a) x	(22a)m				
0.48 0.48 0.47 0.42	0.41 0.36	0.36 0.35	0.38 0.41	0.43	0.45		
Calculate effective air change rate for If mechanical ventilation:	the applicable ca	ise				•	(23a)
If exhaust air heat pump using Appendix N, (	23h) = (23a) <b>x</b> Fmy (6	equation (N5)) othe	nwise (23h) = (23a)			0	
If balanced with heat recovery: efficiency in 9						0	(23b)
a) If balanced mechanical ventilation	-			(23h) <b>v</b> [1	   _ (23c)	0 ÷ 1001	(23c)
(24a)m= 0 0 0 0	0 0		0 0	0	0	- 100]	(24a)
b) If balanced mechanical ventilation	without heat red	covery (MV) (24h	$\frac{1}{1} = \frac{1}{(22b)m} + \frac{1}{(22b)m}$	(23b)			, ,
(24b)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24b)
c) If whole house extract ventilation	or positive input	ventilation from (	outside	1	<u> </u>		
if (22b)m < 0.5 x (23b), then (24	•			b)			
(24c)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24c)
d) If natural ventilation or whole hou if (22b)m = 1, then (24d)m = (22							
(24d)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(24d)
Effective air change rate - enter (24a	a) or (24b) or (24	c) or (24d) in box	x (25)	•			
(25)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(25)
3. Heat losses and heat loss parameter	ter:						
ELEMENT Gross Openii		rea U-val	ue AXL	J	k-value	)	ΑΧk
area (m²) r	n <sup>2</sup> A ,r	m² W/m²	2K (W	/K)	kJ/m²-ł	<	kJ/K
Doors Type 1	2.13	x 1	= 2.13				(26)
Doors Type 1 Doors Type 2	0.7	x 1 x 1	= 2.13				(26) (26)
• •		x 1					. ,
Doors Type 2	0.7	x 1	= 0.7				(26)
Doors Type 2 Doors Type 3	0.7	x 1 x 1	= 0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 0.96 0.7	x 1 x 1 x 1 x 1	= 0.7 = 0.96 = 0.7 = 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $-0.04] = 1.41$ $-0.04] = 0.24$				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 0.96 0.7 0.7 1.06	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7 0.96 0.7 0.7 1.06 0.18	x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7 0.96 0.7 0.7 1.06 0.18 1.93	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7 0.96 0.7 1.06 0.18 1.93 1.4	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ = 0.7 = 0.96 = 0.7 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 1.05				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)	
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0 Walls Type 4 2.81 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 0.51				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.44 = 1.06 = 1.05 = 0.51 = 1.06				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 17.56 1.91 0.18 3.16 Roof (30)49.68 0 49.68 0.13 6.46 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium 250 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)6.15 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)38.36 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =31.28 31.05 30.83 29.76 29.56 28.64 28.64 28.46 28.99 29.56 29.97 30.39 (38)(39)m = (37) + (38)m Heat transfer coefficient, W/K (39)m =69.65 69.41 69.19 68.12 67.92 67 67 66.82 67.35 67.92 68.33 68.75 (39)Average =  $Sum(39)_{1...12}/12=$ 68.12 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.37 1.35 1.35 1.35 (40)m =1.4 1.39 1.37 1.36 1.37 1.38 1.38 (40)Average =  $Sum(40)_{1...12}/12=$ 1.37 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):	0			(48)
Temperature factor from Table 2b	0			(49)
Energy lost from water storage, kWh/year (48) x (49) =	0			(50)
b) If manufacturer's declared cylinder loss factor is not known:				
Hot water storage loss factor from Table 2 (kWh/litre/day)	0			(51)
If community heating see section 4.3  Volume factor from Table 2a	0			(52)
Temperature factor from Table 2b	0			(53)
Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0			(54)
Enter (50) or (54) in (55)	0			(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$				
(56)m= 0 0 0 0 0 0 0 0 0	0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where	(H11) is from	Appendi	хН	
(57)m= 0 0 0 0 0 0 0 0 0	0	0		(57)
Primary circuit loss (annual) from Table 3				(58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m				
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo	ostat)			
(59)m= 0 0 0 0 0 0 0 0 0	0	0		(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$				
(61)m= 41.55 36.16 38.52 35.82 35.5 32.9 33.99 35.5 35.82 38.52	38.74	41.55		(61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	(46)m + (5	57)m + (	(59)m + (61)m	
(62)m= 162.45 141.9 147.64 130.95 126.78 111.66 106.98 119.26 120.58 137.3	146.57	158.63		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	tion to water	heating)		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)				
(63)m= 0 0 0 0 0 0 0 0 0	0	0		(63)
Output from water heater				
(64)m= 162.45 141.9 147.64 130.95 126.78 111.66 106.98 119.26 120.58 137.3	146.57	158.63		_
Output from water heate	er (annual) <sub>112</sub>	2	1610.71	(64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	+ (57)m +	- (59)m	]	
(65)m= 50.59 44.2 45.91 40.59 39.23 34.41 32.77 36.73 37.14 42.47	45.54	49.32		(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f	rom comm	nunity he	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts				
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov	Dec		
(66)m= 84.03 84.03 84.03 84.03 84.03 84.03 84.03 84.03 84.03 84.03 84.03	84.03	84.03		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5				
(67)m= 13.89 12.33 10.03 7.59 5.68 4.79 5.18 6.73 9.03 11.47	13.39	14.27		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5				
(68)m=   146.4   147.92   144.09   135.94   125.66   115.99   109.53   108.01   111.84   119.99	130.27	139.94		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5				
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 31.4 31.4 31.4 31.4 31.4 31.4 31.4 31.4	31.4	31.4		(69)
	31.4	31.4		(69) (70)

Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)
Water	heating	gains (T	able 5)										
(72)m=	67.99	65.77	61.71	56.37	52.72	47.8	44.04	49.36	51.58	57.09	63.25	66.29	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	70)m + (7	1)m + (72)	m	•
(73)m=	279.49	277.24	267.04	251.12	235.27	219.79	209.96	215.31	223.66	239.76	258.12	271.71	(73)
6. Sol	ar gains	S:											

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.93	x	10.63	x	0.63	x	0.7	=	6.27	(74)
North	0.9x	0.77	x	1.4	x	10.63	x	0.63	x	0.7	=	4.55	(74)
North	0.9x	0.77	x	1.4	x	10.63	x	0.63	x	0.7	=	4.55	(74)
North	0.9x	0.77	x	1.93	x	20.32	x	0.63	x	0.7	=	11.99	(74)
North	0.9x	0.77	x	1.4	x	20.32	x	0.63	x	0.7	=	8.69	(74)
North	0.9x	0.77	x	1.4	x	20.32	x	0.63	x	0.7	=	8.69	(74)
North	0.9x	0.77	x	1.93	x	34.53	x	0.63	x	0.7	=	20.37	(74)
North	0.9x	0.77	x	1.4	x	34.53	x	0.63	x	0.7	=	14.77	(74)
North	0.9x	0.77	x	1.4	x	34.53	x	0.63	x	0.7	=	14.77	(74)
North	0.9x	0.77	x	1.93	x	55.46	x	0.63	x	0.7	=	32.71	(74)
North	0.9x	0.77	x	1.4	x	55.46	X	0.63	x	0.7	=	23.73	(74)
North	0.9x	0.77	x	1.4	x	55.46	x	0.63	x	0.7	=	23.73	(74)
North	0.9x	0.77	x	1.93	x	74.72	x	0.63	x	0.7	=	44.07	(74)
North	0.9x	0.77	x	1.4	X	74.72	X	0.63	X	0.7	=	31.97	(74)
North	0.9x	0.77	x	1.4	X	74.72	X	0.63	X	0.7	=	31.97	(74)
North	0.9x	0.77	x	1.93	X	79.99	X	0.63	X	0.7	=	47.18	(74)
North	0.9x	0.77	x	1.4	X	79.99	X	0.63	X	0.7	=	34.22	(74)
North	0.9x	0.77	x	1.4	X	79.99	X	0.63	X	0.7	=	34.22	(74)
North	0.9x	0.77	x	1.93	X	74.68	X	0.63	X	0.7	=	44.05	(74)
North	0.9x	0.77	x	1.4	X	74.68	X	0.63	X	0.7	=	31.95	(74)
North	0.9x	0.77	x	1.4	X	74.68	X	0.63	X	0.7	=	31.95	(74)
North	0.9x	0.77	x	1.93	X	59.25	X	0.63	X	0.7	=	34.95	(74)
North	0.9x	0.77	x	1.4	X	59.25	X	0.63	X	0.7	=	25.35	(74)
North	0.9x	0.77	x	1.4	X	59.25	X	0.63	X	0.7	=	25.35	(74)
North	0.9x	0.77	x	1.93	X	41.52	X	0.63	X	0.7	=	24.49	(74)
North	0.9x	0.77	x	1.4	X	41.52	X	0.63	X	0.7	=	17.76	(74)
North	0.9x	0.77	x	1.4	x	41.52	x	0.63	x	0.7	=	17.76	(74)
North	0.9x	0.77	x	1.93	X	24.19	X	0.63	X	0.7	=	14.27	(74)
North	0.9x	0.77	x	1.4	x	24.19	X	0.63	X	0.7	=	10.35	(74)
North	0.9x	0.77	X	1.4	X	24.19	X	0.63	X	0.7	=	10.35	(74)

North	0.9x	0.77	1 ,	1.00	l .,	40.40	1 ,	0.00	۱	0.7	1 _	774	(74)
North	-	0.77	] X ]	1.93	X I	13.12	X	0.63	X	0.7	] = ]	7.74	╡゛
North	0.9x	0.77	] X ]	1.4	l X	13.12	X	0.63	X	0.7	] = ]	5.61	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	]	1.4	l x	13.12	l x	0.63	X	0.7	] = 1 _	5.61	
North	<u> </u>	0.77	] X ]	1.93	l x l	8.86	X	0.63	X	0.7	] = ]	5.23	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	] X ] ,,	1.4	l x	8.86	X	0.63	X	0.7	] = ] _	3.79	$= \frac{1}{1} \frac{(74)}{(74)}$
East	0.9x	0.77	] X ] <sub>v</sub>	1.4	l x	8.86	X	0.63	X	0.7	] = ] <sub>=</sub>	3.79	$\frac{1}{2}$ (74) (76)
East	0.9x	0.77	]	0.95	X	19.64	l x	0.63	X	0.7	] 1	5.7	(76) (76)
East	0.9x C	0.77	]	0.95	x x	38.42	x x	0.63	X	0.7	=	11.15	(76) (76)
East	0.9x	0.77	] x ] x	0.95	^   x	63.27 92.28	] ^   ] <sub>x</sub>	0.63	x	0.7	]	26.79	] <sub>(76)</sub>
East	0.9x	0.77	」^ ] ×	0.95	^   x	113.09	] ^ ] <sub>x</sub>	0.63	X	0.7	] =	32.83	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	115.77	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	33.61	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	110.22	] ^ ] <sub>x</sub>	0.63	X	0.7	]	33.61	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	94.68	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	27.49	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	73.59	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	21.37	(76)
East	0.9x	0.77	」 ^ ] <sub>×</sub>	0.95	l ^ l x	45.59	] ^ ] <sub>x</sub>	0.63	X	0.7	]	13.24	(76)
East	0.9x	0.77	] ^ ] <sub>x</sub>	0.95	l ^	24.49	] ^ ] <sub>x</sub>	0.63	X	0.7	]	7.11	(76)
East	0.9x	0.77	」 ^ ] x	0.95	l ^ l x	16.15	] ^ ] <sub>x</sub>	0.63	X	0.7	]	4.69	(76)
South	0.9x	0.77	]	1.06	l ^	46.75	]	0.63	X	0.7	]	15.15	(78)
South	0.9x	0.77	]	0.18	l ^	46.75	]	0.63	X	0.7	]	2.57	(78)
South	0.9x	0.77	]	0.31	l x	46.75	)	0.63	x	0.7	] ] =	4.43	(78)
South	0.9x	0.77	] x	1.06	x	76.57	) x	0.63	x	0.7	] ] <sub>=</sub>	24.8	(78)
South	0.9x	0.77	] x	0.18	X	76.57	X	0.63	x	0.7	] ] <sub>=</sub>	4.21	(78)
South	0.9x	0.77	] ]	0.31	l X	76.57	] ]	0.63	X	0.7	] ]	7.25	(78)
South	0.9x	0.77	] ]	1.06	X	97.53	)   X	0.63	X	0.7	] ] =	31.6	(78)
South	0.9x	0.77	X	0.18	X	97.53	X	0.63	X	0.7	]   =	5.37	(78)
South	0.9x	0.77	X	0.31	X	97.53	X	0.63	x	0.7	j   =	9.24	(78)
South	0.9x	0.77	X	1.06	х	110.23	X	0.63	X	0.7	=	35.71	(78)
South	0.9x	0.77	X	0.18	x	110.23	X	0.63	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	0.31	x	110.23	x	0.63	x	0.7	j =	10.44	(78)
South	0.9x	0.77	j×	1.06	x	114.87	x	0.63	x	0.7	j =	37.21	(78)
South	0.9x	0.77	x	0.18	x	114.87	X	0.63	x	0.7	=	6.32	(78)
South	0.9x	0.77	x	0.31	x	114.87	x	0.63	x	0.7	] =	10.88	(78)
South	0.9x	0.77	X	1.06	x	110.55	x	0.63	x	0.7	j =	35.81	(78)
South	0.9x	0.77	x	0.18	x	110.55	x	0.63	x	0.7	] =	6.08	(78)
South	0.9x	0.77	x	0.31	x	110.55	x	0.63	x	0.7	] =	10.47	(78)
South	0.9x	0.77	x	1.06	x	108.01	x	0.63	x	0.7	] =	34.99	(78)
South	0.9x	0.77	×	0.18	x	108.01	x	0.63	x	0.7	] =	5.94	(78)
South	0.9x	0.77	x	0.31	x	108.01	x	0.63	x	0.7	] =	10.23	(78)
South	0.9x	0.77	X	1.06	x	104.89	x	0.63	x	0.7	<b>=</b>	33.98	(78)
South	0.9x	0.77	×	0.18	x	104.89	x	0.63	X	0.7	] =	5.77	(78)

	_															
South	0.9x	0.77	x	0.3	31	X	1	04.89	X		0.63	X	0.7	=	9.94	(78)
South	0.9x	0.77	x	1.0	)6	X	1	01.89	X		0.63	X	0.7	=	33.01	(78)
South	0.9x	0.77	x	0.1	18	x	10	01.89	X		0.63	X	0.7	=	5.6	(78)
South	0.9x	0.77	X	0.3	31	X	1	01.89	X		0.63	x	0.7	=	9.65	(78)
South	0.9x	0.77	X	1.0	06	x	8	2.59	X		0.63	x	0.7	=	26.75	(78)
South	0.9x	0.77	X	0.1	18	X	8	2.59	X		0.63	x	0.7	=	4.54	(78)
South	0.9x	0.77	X	0.3	31	X	8	2.59	X		0.63	Х	0.7	=	7.82	(78)
South	0.9x	0.77	X	1.0	06	X	5	5.42	X		0.63	х	0.7	=	17.95	(78)
South	0.9x	0.77	Х	0.1	18	X	5	5.42	X		0.63	x	0.7	=	3.05	(78)
South	0.9x	0.77	X	0.3	31	X	5	5.42	X		0.63	x	0.7	=	5.25	(78)
South	0.9x	0.77	X	1.0	06	X	4	40.4	X		0.63	x	0.7	=	13.09	(78)
South	0.9x	0.77	X	0.1	18	X	4	40.4	X		0.63	x	0.7	=	2.22	(78)
South	0.9x	0.77	X	0.3	31	X	4	40.4	X		0.63	x	0.7	=	3.83	(78)
ĭ		watts, ca	alculated			1			(83)m	ı = Sı	ım(74)m .	(82)m			7	
(83)m=	43.22	76.8	114.49	159.19	195.25		01.6	191.11	162	.82	129.64	87.32	52.32	36.64		(83)
Ī	r		nd solar			<del>-</del>							1	l	7	(0.4)
(84)m=	322.71	354.04	381.53	410.3	430.52	42	21.39	401.07	378.	.13	353.3	327.08	310.44	308.35	_	(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)										
Temp	erature	during h	eating p	eriods ir	n the livi	ing a	area	from Tal	ole 9,	Th1	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	iving are	ea, h1,n	1 (se	ee Ta	ble 9a)							-	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.93	(	0.82	0.67	0.7	'2	0.91	0.98	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able	e 9c)				_	
(87)m=	19.48	19.62	19.87	20.23	20.58	2	0.85	20.96	20.9	94	20.74	20.3	19.84	19.46		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Th	n2 (°C)					
(88)m=	19.76	19.77	19.77	19.79	19.79	T	19.8	19.8	19.8		19.8	19.79	19.78	19.78		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling.	h2.	m (se	e Table	9a)				-		_	
(89)m=	1	0.99	0.99	0.97	0.9	1	0.73	0.52	0.5	58	0.85	0.97	0.99	1		(89)
Mean	interna	l tampar	ature in	tha rast	of dwall	lina	T2 (f	ollow etc	ne 3	to 7	in Tahl	o 9c)	_!		_	
(90)m=	17.76	17.96	18.33	18.87	19.36	T	19.7	19.79	19.		19.57	18.97	18.3	17.75	1	(90)
` ′		<u> </u>			<u> </u>			<u> </u>	<u> </u>		f		ing area ÷ (	<u>1</u> 4) =	0.48	(91)
			-1 //-			II.	- \ (1		. /4		A) TO					`
(92)m=	18.59	18.76	ature (fo	19.53	19.95	_	g) = 11 :0.25	20.35	+ (1		A) × 12 20.14	19.61	19.04	18.58	7	(92)
			he mean					<u> </u>					19.04	10.30	_	(02)
(93)m=	18.59	18.76	19.08	19.53	19.95	1	0.25	20.35	20.:		20.14	19.61	19.04	18.58	7	(93)
			uirement													
					re obtai	ned	at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,m=	(76)m an	d re-cal	culate	
			or gains	•								, , , , , , , , , , , , , , , , , , ,	, ,		-	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
1			ains, hm			_				,				1	7	
(94)m=	0.99	0.99	0.98	0.96	0.9	(	).77	0.59	0.6	35	0.87	0.97	0.99	1		(94)
ı		1	W = (94)	<del></del>	<del></del>	_				1			1	T ===	7	(05)
(95)m=	320.99	351.03	375.39	394.75	389.1	32	24.49	238.52	244	.67	306.54	317	307.6	307.01		(95)

Monthly	/ average e	kternal tem	perature	e from Ta	able 8								
(96)m=	4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate for n	nean interr	al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
` /	962.3		723.87	560.29	378.82	251.36	263.28	406.57	612.3	815.97	988.5		(97)
_	heating requ		1	1				<del></del>	<del></del>	·			
(98)m= 5	501.81 410.7	8 368.06	236.97	127.36	0	0	0 	0	219.71	366.03	507.03	0707.70	7(00)
				2,4			rota	i per year	(kwn/year	r) = Sum(9	8)15,912 =	2737.76	<u> </u> (98)
·	heating requ			•							L	55.11	(99)
	gy requirem	ents – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	<b>heating:</b> n of space h	eat from s	econdar	v/supple	mentary	svstem					[	0	(201)
	n of space h				ota.y	oyoto	(202) = 1	- (201) =				1	(202)
	n of total he		-	` '			(204) = (2	02) <b>x</b> [1 –	(203)] =		Į [	1	(204)
Efficien	cy of main s	space heat	ing syste	em 1								93.4	(206)
Efficien	cy of secon	dary/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan Fe	o Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space h	neating requ	uirement (d	alculate	d above)		•		•	•	•			
5	501.81 410.7	8 368.06	236.97	127.36	0	0	0	0	219.71	366.03	507.03		
(211)m =	= {[(98)m x (	204)] } x 1	100 ÷ (20	06)		•		•	•				(211)
5	537.27 439.8	1 394.07	253.71	136.36	0	0	0	0	235.23	391.9	542.86		_
										244)	_		
							lota	l (kWh/yea	ar) =Sum(2	ZII) <sub>15,1012</sub>	<i>-</i>	2931.22	(211)
•	heating fuel	•	• •	month			Tota	l (kWh/yea	ar) =5um(2	2 I I) <sub>15,10</sub> 12	Ē [	2931.22	(211)
= {[(98)m	n x (201)] } :	100 ÷ (20	)8)		0	0		r	r	·		2931.22	(211)
•	_	•	• •	month 0	0	0	0	0	0	0	0	2931.22	_
= {[(98)m (215)m=	n x (201)] } ;	100 ÷ (20	)8)		0	0	0	0	0	·	0		(211)
= {[(98)m (215)m=	n x (201)] } ;	(100 ÷ (20	08)	0	0	0	0	0	0	0	0		_
= {[(98)m (215)m= Water he Output fr	eating  rom water h	eater (calco) 147.64	08)	0	0 111.66	0 106.98	0	0	0	0	0		(215)
= {[(98)m (215)m= Water he Output fr	eating  rom water h  162.45 141.  141.	eater (calco) 147.64 eater	08) 0 ulated a	0 bove)	111.66	106.98	0 Tota 119.26	0 I (kWh/yea 120.58	0 ar) =Sum(2 137.3	0	158.63		(215)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m=	eating rom water h 162.45 141. y of water h 87.7 87.5	eater (calco) 147.64 eater 7 87.26	0 sulated a 130.95	0 bove)			0 Tota	0 I (kWh/yea	0 ar) =Sum(2	0	0	0	(215)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v	eating rom water h 162.45 141.  y of water h 87.7 87.5  water heatin	eater (calco) 147.64 eater 7 87.26 g, kWh/me	0 0 culated a 130.95 86.53 onth	0 bove) 126.78	111.66	106.98	0 Tota 119.26	0 I (kWh/yea 120.58	0 ar) =Sum(2 137.3	0 215) <sub>15,1012</sub> 146.57	158.63	0	(215)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v	eating  com water h 162.45 141.  y of water h 87.7 87.5  water heating (64) m x 1	eater (calco) 147.64 eater 7 87.26 ng, kWh/me 00 ÷ (217)	0 0 culated a 130.95 86.53 onth	0 bove) 126.78	111.66	106.98	0 Tota 119.26	0 I (kWh/yea 120.58	0 ar) =Sum(2 137.3	0 215) <sub>15,1012</sub> 146.57	158.63	0	(215)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m =	eating  com water h 162.45 141.  y of water h 87.7 87.5  water heating (64) m x 1	eater (calco) 147.64 eater 7 87.26 ng, kWh/me 00 ÷ (217)	0 sulated a 130.95 86.53 onth	0 bove) 126.78 85.06	111.66	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58	0 137.3 86.23	0 215) <sub>15,1012</sub> 146.57	0 = 158.63 87.77	0	(215)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 (219)m= 1	eating  mater h  162.45	eater (calco) 147.64 eater 7 87.26 eg, kWh/m 00 ÷ (217) 4 169.2	0 vulated a 130.95 86.53 onth )m 151.34	0 bove) 126.78 85.06	111.66	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15,1012</sub> 146.57	0 = 158.63 87.77	0 80.3	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 (219)m= 1	eating  rom water h 162.45	eater (calco) 147.64 eater 7 87.26 eg, kWh/m 00 ÷ (217) 4 169.2	0 vulated a 130.95 86.53 onth )m 151.34	0 bove) 126.78 85.06	111.66	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15.1012</sub> 146.57 87.26	0 = 158.63 87.77	0 80.3 1895.75	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 (219)m= 1	eating  mater h  162.45	eater (calco) 147.64 eater 7 87.26  100 ÷ (217) 4 169.2	0 vulated a 130.95 86.53 onth )m 151.34	0 bove) 126.78 85.06	111.66	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15.1012</sub> 146.57 87.26	0 = 158.63 87.77	0 80.3 1895.75 <b>kWh/year</b>	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 Annual t Space he Water he	eating om water h 162.45	eater (calco) 147.64 eater 7 87.26 ng, kWh/me 00 ÷ (217) 4 169.2	08) 0 culated a 130.95 86.53 conth )m 151.34	0 bove) 126.78 85.06	111.66 80.3 139.06	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15.1012</sub> 146.57 87.26	0 = 158.63 87.77	0 80.3 1895.75 <b>kWh/year</b> 2931.22	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 Annual t Space he Water he Electricity	eating  com water h 162.45	eater (calco)   147.64   eater   87.26   eater   87.26   eater   169.2   eater	08) 0 culated a 130.95 86.53 conth )m 151.34	0 bove) 126.78 85.06	111.66 80.3 139.06	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15.1012</sub> 146.57 87.26	0 = 158.63 87.77	0 80.3 1895.75 <b>kWh/year</b> 2931.22	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 Annual t Space he Water he Electricity	eating  com water h 162.45	eater (calco) 147.64 eater 7 87.26 ng, kWh/me 00 ÷ (217) 4 169.2 used, main sed , fans and	0   0   0   0   0   0   0   0   0   0	0 bove) 126.78 85.06	111.66 80.3 139.06	106.98	0 Tota 119.26 80.3	0 I (kWh/yea 120.58 80.3	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15.1012</sub> 146.57 87.26	0 = 158.63 87.77	0 80.3 1895.75 <b>kWh/year</b> 2931.22	(215) (216) (217) (219)
= {[(98)m (215)m= Water he Output fr 1 Efficiency (217)m= Fuel for v (219)m = 1 Annual t Space he Water he Electricity central i	eating  mater h mater	eater (calco) 147.64 eater 7 87.26 ng, kWh/me 100 ÷ (217) 4 169.2 used, main sed np: sisted flue	0   0   0   0   0   0   0   0   0   0	0 bove) 126.78 85.06 149.05	111.66 80.3 139.06	106.98	0 Tota 119.26 80.3 148.52 Tota	0 I (kWh/yea 120.58 80.3 150.16 I = Sum(2	0 ar) =Sum(2 137.3 86.23 159.23 19a) <sub>112</sub> =	0 215) <sub>15,1012</sub> 146.57 87.26 167.96	0 = 158.63 87.77 180.74	0 80.3 1895.75 <b>kWh/year</b> 2931.22	(215) (216) (217) (219)

Electricity for lighting			245.23 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	633.14 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	409.48 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1042.63 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	127.27 (268)
Total CO2, kg/year	sum	n of (265)(271) =	1208.82 (272)
TER =			24.33 (273)

#### Property Details: Flat Type A - ASHP

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Opening types:

V\_01

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 55.3 m<sup>2</sup> 3.09 m

Living area: 28.01 m<sup>2</sup> (fraction 0.507)

Front of dwelling faces: North East

Opening types.						
Name:	Source:	Type:	Glazing:		Argon:	Frame:
08_01	Manufacturer	Solid				Metal
Vent_08_03	Manufacturer	Solid				
Vent_08_02	Manufacturer	Solid				
Vent_08_06	Manufacturer	Solid				
V_01	Manufacturer	Solid				Metal
Window_08_07	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_01	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_04	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_05	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En =$	0.05, soft coat	Yes	
Name:	Gap:	Frame Fac	ctor: g-value:	U-value:	Area:	No. of Openings
08_01	mm	0	0	1	2.13	1
/ent_08_03	mm	0	0	1	0.96	1
/ent_08_02	mm	0	0	1	0.96	1
/ent_08_06	mm	0	0	1	0.7	1
/_01	mm	0	0	1	0.2	1
Window_08_07	6mm	0.7	0.4	1.2	0.86	1
Window_08_01	6mm	0.7	0.4	1.2	2.01	1
Nindow_08_04	6mm	0.7	0.4	1.2	2.01	1
Vindow_08_05	6mm	0.7	0.4	1.2	1.46	1
anlight	6mm	0.7	0.4	1.2	0.32	1
Name:	Type-Name:	Location:	Orient:		Width:	Height:
D8_01	31	8_01	North East		0	0
/ent_08_03		8_07	South West		0	0
Vent_08_02		8_07	South West		0	0
Vent_08_06		8_07	South West		0	0

North East

8\_01

0.2

1.01

Window_08_07	8_05	North East	0.6	1.44
Window_08_01	8_07	South West	1.22	1.65
Window_08_04	8_07	South West	1.22	1.65
Window_08_05	8_07	South West	1.22	1.2
Fanlight	8 01	North East	1.01	0.315

Overshading: Average or unknown

Opaque Elements:							
Type: External Elemer	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
8_01	15.172	2.65	12.52	0.13	0	False	N/A
8_02	1.854	0	1.85	0.13	0	False	N/A
8_03	6.727	0	6.73	0.13	0	False	N/A
8_04	1.823	0	1.82	0.13	0	False	N/A
8_05	6.365	0.86	5.5	0.13	0	False	N/A
8_07	28.737	8.1	20.64	0.13	0	False	N/A
8_08	19.467	0	19.47	0.13	0.82	False	N/A
Ground	55.3			0.11			N/A
Internal Elemer	<u>nts</u>						

<u>Internal Elements</u> <u>Party Elements</u>

Therma	ساما ا	ہملمان	
		ura ra	Дς.

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

Ventilation.

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329 Piping>=1991, pre-insulated, medium temp, variable flow

No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights:

Terrain type:

Dense urban
EPC language:

Wind turbine:

No
Photovoltaics:

Assess Zero Carbon Home:

No0

No0

		Heor F	Details:						
A N	Adam Ditabia	USELL		- 11			OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Hame.		Property				SHP	VCISIO	71. 1.0.4.20	
Address :				,					
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	[(10) ×		ight(m)	7(20)	Volume(m³	_
	-> (41) - (4 -> - (4 1) - (4 -> - (4			(1a) x	3	3.09	(2a) =	170.88	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(	in) [	55.3	(4)		n (5 )	(a.)		_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:	main seconda	arv	other		total			m³ per hou	r
North an of all increases	heating heating						40 -	-	_
Number of chimneys	0 + 0	_  +	0	] = [	0		40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				0	X	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
•	een carried out or is intended, proce			continue fi			. (0) –	0	
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of the contract			•	ruction			0	(11)
deducting areas of opening		to the grea	ici wan arc	a (anci					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
J	s and doors draught stripped		0.05 10.6	) (4.4) 4	1001			0	(14)
Window infiltration			0.25 - [0.2		_	. (15) -		0	(15)
Infiltration rate	aEO expressed in public mot	oo nor h	(8) + (10)				oroo	0	(16)
•	q50, expressed in cubic metitive value, then $(18) = [(17) \div 20]$	•	•	•	ietre or e	rivelope	alea	2.5	(17)
•	es if a pressurisation test has been d				is being u	sed		0.12	(18)
Number of sides sheltere				·	J			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed							•	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
								ı	

Adjusted infilt	ration rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se					•		¬
If mechanic			andiv N. (C	2h) _ (22d	) Em. (c	auation (I	VEVV otho	muiaa (22h	) - (22a)			0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
If balanced wit		-	-	_					2h\ //	20h) [/	1 (00.5)	75.65	(23c)
a) If balanc (24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	23D) <b>×</b> [ 0.26	0.27	÷ 100]	(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat rec	covery (N	иV) (24b	p)m = (22)	2b)m + (2	23b)	!		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I				•	•				(00h	\			
(24c)m = 0	m < 0.5 >	(230),	nen (240	(230) = (230)	o); other	wise (24	$\frac{C}{C} = (220)$	0) m + 0.	.5 × (230	0	0		(24c)
d) If natural		<u> </u>				<u> </u>		<u> </u>	0	0	0		(240)
	m = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - e	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/k	۲)	k-value kJ/m²-l		
Doors Type 1													
					2.13	×	1	=	2.13				(26)
Doors Type 2					2.13 0.96	=	1	= =	2.13 0.96				(26) (26)
Doors Type 2 Doors Type 3						x		=					, ,
• •					0.96	x	1	=	0.96				(26)
Doors Type 3					0.96	x x	1	=	0.96				(26) (26)
Doors Type 3 Doors Type 4					0.96 0.96 0.7	x x x	1 1	= = = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7				(26) (26) (26)
Doors Type 3 Doors Type 4 Doors Type 5	e 1				0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1 1	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2				(26) (26) (26) (26)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2				0.96 0.96 0.7 0.2	x x x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98				(26) (26) (26) (26) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ	e 1 e 2 e 3				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x 1 x 1 x 1 x 1	1 1 1 1 /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4	7	2.65	;	0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor	e 1 e 2 e 3 e 4 e 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1	e 1 e 2 e 3 e 4 e 5	5			0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2 e 3 e 4 e 5	3	0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Win	e 1 e 2 e 3 e 4 e 5	5 3 2	0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 1 e 2 e 3 e 4 e 5	5 3 2 6	0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	e 1 e 2 e 3 e 4 e 5  15.1 1.8 6.7 1.8 6.3	5 3 2 6	0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13 0.13 0.13	= = = = = = = = = = = = = = = = = = =	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

				· · · · · · · · · · · · · · · · · · ·	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
					lls and part	titions								
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat ca	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therma	al mass	parame	ter (TMF	c = Cm ÷	: TFA) ir	n kJ/m²K			Indicat	tive Value	: Low		100	(35)
•	•	sments wh ad of a dea			constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						20.32	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								(33) +				47.64	(37)
Ventila	tion hea			d monthly	i						25)m x (5)	<u> </u>	1	
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
		( /)	II D) \A/	/ 21.C						_	Sum(39) <sub>1</sub>	12 /12=	62.22	(39)
г		meter (F		r	4.40			44		= (39)m ÷			1	
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14	1.13	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	average =	Sum(40) <sub>1</sub> .	12 / 12=	1.13	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(41)m=			31	30	31	30	-	Ť		31	30	-		(41)
	31			l		30	-	Ť		31	30	-	ear:	(41)
4. Wa	31 ter heat	28 ting ener	gy requi	l		30	-	Ť		31		31 kWh/ye	ear:	
4. Wa Assum if TF	ter heat ed occu A > 13.9	ze ting ener upancy, I 9, N = 1	rgy requi	irement:			31	31	30		1.	31	ear:	(41)
4. Wa Assum if TF if TF Annual	ter heat ed occu A > 13.9 A £ 13.9 averag	ing energipancy, I 9, N = 1 9, N = 1 e hot wa	rgy requi N + 1.76 x	irement:  [1 - exp	o(-0.0003	349 x (TF	31 FA -13.9 erage =	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/ye	ear:	
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annua	ing energy, I pancy, I p, N = 1 p, N = 1 e hot wall average	rgy requi N + 1.76 x ater usag hot water	irement:  [1 - exp ge in litre usage by	o(-0.0003 es per da 5% if the a	349 x (TF ay Vd,av welling is	31 FA -13.9 erage = designed to	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	əar:	(42)
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annual	ing energipancy, I pancy, I pancy, I pancy, I pancy, I pancy I	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the a	349 x (TF ay Vd,av lwelling is hot and co	31  FA -13.9 erage = designed id	31 (25 x N) (25 achieve	30 0013 x (7 + 36 a water us	ΓFA -13. se target o	9) 78	31 kWh/yu 85	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occur A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa  Assume if TF, if TF, Annual Reduce in not more	ter heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy in N = 1 p	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr  ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from T	31  FA -13.9 erage = designed to ld)  Jul Table 1c x	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us	ΓFA -13. se target o Oct	1. 9) 78	31 kWh/yu 85 0.05	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occur A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36 a water us Sep	ΓFA -13. se target o  Oct  79.61	9) 78 Nov 82.73	85 .05 Dec		(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirement of the second reports of the second reports of the second requirement of the second req	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec	936.55	(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirement of the second reports of the second reports of the second requirement of the second req	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec		(42)
4. Wa  Assume if TF, if TF, Annual Reduce in not more  Hot wate (44)m= [  Energy contact   15   15   15   15   15   15   15   1	ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in 85.85	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy energe litres per pancy feb panc	rgy requive the second of the	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24	FA -13.9 erage = designed id Id Jul Table 1c x 70.24	31 (25 x N) to achieve Aug (43) 73.36	30  0013 x (7  + 36     a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1. 9) 78 Nov 82.73 m(44)12 = ables 1b, 1	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3		(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [  Energy co (45)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan er usage in 85.85 content of	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pan	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy c (45)m= [ If instanta (46)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the over the second 5% of the over the second 5% of the over the second 5% of the over the second 5% of the second 5	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
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4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy co (45)m= [ If instanta (46)m= [ Water s Storage	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1 storage e volum	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  m x nm x E  76.86  enter 0 in  11.53  storage	31 (25 x N) (25 x N) (25 x N) (26 achieve  Aug (43) (73.36 (77.3600  88.2 (46) (13.23) within sa	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  0 to (61)  13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31 kWh/ys 85 3.05 Dec 85.85 c, 1d) 123.3	936.55	(42) (43) (44)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the content of t	ed occur A > 13.9 A £ 13.9 A £ 13.9 A verage the annual of that 125 Jan Ber usage in 85.85 Content of 127.31 Storage e volume munity herise if no	ing energy, I pancy,  pancy I p	rgy requiverse to the second requirement of	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49  culated me 100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = fai  73.36  onthly = 4.  96.12 o hot water  14.42	349 x (TF ay Vd,av lwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS	an x nm x E  76.86  enter 0 in  11.53  storage  litres in	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy of (45)m= [ Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commother If the common If the co	ed occu A > 13.9 A £ 13.9 A £ 13.9 averag the annua that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated mo  100.17  for use (no  15.03  and any so ank in dw er (this in	es per da 5% if the avater use, I  May  Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  - c, 1d)  123.3  - 18.49	936.55	(42) (43) (44) (45) (46) (47)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the common of the c	der heat ed occur A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no storage anufact	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely requirements of the sector	irement:  [1 - exp  ge in litre usage by and and (all we  Apr ach month  76.49  culated mo 100.17  for use (no 15.03  and any so ank in dw er (this in	of (-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fact  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  sel	1.9) 78 Nov 82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54 m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)

Energy lost from water storage, kWh/year	$(48) \times (49) =$	110	(50)
b) If manufacturer's declared cylinder loss factor is not known	:		1 (54)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3		0.02	(51)
Volume factor from Table 2a		1.03	(52)
Temperature factor from Table 2b		0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	(54)
Enter (50) or (54) in (55)		1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(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 contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where	(H11) is from Append	lix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.01	30.98 32.01	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div 3$	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m	-	
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each month	h (62)m = 0.85 × (45)m +	(46)m + (57)m +	ı (59)m + (61)m
(62)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	<del>, , , , , , , , , , , , , , , , , , , </del>	167.03 178.57	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan			l ' '
(add additional lines if FGHRS and/or WWHRS applies, see A		ion to water neating)	
(63)m= 0 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater		<u> </u>	I
(64)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29	167.03 178.57	
	Output from water heate	r (annual) <sub>112</sub>	1878.81 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)ml + 0.8 x [(46)m	+ (57)m + (59)m	1
(65)m= 86.55 76.97 82.43 76.1 76.18 70.37 69.78	73.55 72.47 78.81	80.55 85.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the		ļ. ļ.	l neating
5. Internal gains (see Table 5 and 5a):	arraming of flot mater is t		.ou.iig
,			
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 110.77 110.77 110.77 110.77 110.77 110.77 110.77	<del>                                     </del>	110.77 110.77	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	<del>-</del>	1	, ,
(67)m= 39.79 35.34 28.74 21.76 16.26 13.73 14.84	19.28 25.88 32.87	38.36 40.89	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	<u> </u>	33.03	·
(68)m= 240.24 242.73 236.45 223.07 206.19 190.33 179.73	<del>, , , , , , , , , , , , , , , , , , , </del>	213.77 229.64	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	1 1	210.77   220.04	
(69)m= 47.92 47.92 47.92 47.92 47.92 47.92 47.92 47.92	47.92 47.92 47.92	47.92 47.92	(69)
	11.02 11.02 11.32	11.02 71.02	I (55)
Pumps and fans gains (Table 5a) (70)m=	0 0 0	0 0	(70)
			I (10)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -73.85   -73.85			
(71)m=   -73.85   -73.85   -73.85   -73.85   -73.85   -73.85   -73.85	-73.85 -73.85 -73.85	-73.85 -73.85	(71)

Water heati	ng gains (T	able 5)												
(72)m= 116.3	<del></del>	110.79	105.7	102.39	97.74	93.79	98.	85 100	0.65	105.92	111.87	114.54	]	(72)
Total intern	nal gains =	<u> </u>			(6	<b></b> 66)m + (67)n	า + (68	3)m + (69)			<del></del>	m	J	
(73)m= 481.	<del>_</del>	460.82	435.38	409.7	386.6	1 373.19	380	.22 394	4.9	420.52	448.85	469.91	1	(73)
6. Solar ga	ins:													
Solar gains a		using sola	r flux from	Table 6a	and ass	ociated equa	ations	to convert	to the	applica	able orientat	ion.		
Orientation:			Area			lux		g_			FF		Gains	
	Table 6d		m²		T	able 6a		Table	6b	-	Table 6c		(W)	
Northeast 0.9	0.77	X	3.0	36	x	11.28	x	0.4	ļ	_ x [	0.7	=	1.88	(75)
Northeast 0.9	0.77	X	0.3	32	x	11.28	X	0.4	ļ	x_[	0.7	=	0.7	(75)
Northeast 0.9	0.77	X	3.0	36	x	22.97	X	0.4	ļ	x_[	0.7	=	3.83	(75)
Northeast 0.9	0.77	X	0.3	32	x	22.97	X	0.4	ļ	x	0.7	=	1.43	(75)
Northeast 0.9	0.77	Х	3.0	36	x	41.38	X	0.4	ļ	x_[	0.7	=	6.91	(75)
Northeast 0.9	0.77	X	0.3	32	x	41.38	X	0.4	ļ	] x [	0.7	=	2.57	(75)
Northeast 0.9	0.77	X	3.0	36	x	67.96	X	0.4	ļ	x	0.7	=	11.34	(75)
Northeast 0.9	0.77	X	0.3	32	x	67.96	X	0.4		x_[	0.7	=	4.22	(75)
Northeast 0.9	0.77	X	3.0	36	x	91.35	X	0.4		x_[	0.7	=	15.24	(75)
Northeast 0.9	0.77	X	0.3	32	x	91.35	X	0.4	ļ	x	0.7	=	5.67	(75)
Northeast 0.9	0.77	Х	3.0	36	x	97.38	X	0.4	ļ	x_[	0.7	=	16.25	(75)
Northeast 0.9	0.77	X	0.3	32	x	97.38	X	0.4	ļ	x_[	0.7	=	6.05	(75)
Northeast 0.9	0.77	X	3.0	36	X	91.1	X	0.4	ļ	x_[	0.7	=	15.2	(75)
Northeast 0.9	0.77	X	0.3	32	x	91.1	X	0.4	ļ	_ x [	0.7	=	5.66	(75)
Northeast 0.9	0.77	X	3.0	36	x	72.63	X	0.4	ļ	x_[	0.7	=	12.12	(75)
Northeast 0.9	0.77	X	0.3	32	x	72.63	X	0.4	ļ	x	0.7	=	4.51	(75)
Northeast 0.9	0.77	Х	3.0	36	x	50.42	X	0.4	ļ	_ x [	0.7	=	8.41	(75)
Northeast 0.9	0.77	X	0.3	32	x	50.42	X	0.4	ļ	_ x [	0.7	=	3.13	(75)
Northeast 0.9	0.77	X	3.0	36	x	28.07	X	0.4	ļ	x	0.7	=	4.68	(75)
Northeast 0.9	0.77	X	0.3	32	x	28.07	X	0.4	ļ	<b>x</b>	0.7	=	1.74	(75)
Northeast 0.9	0.77	X	3.0	36	x	14.2	X	0.4	ļ	_ x [	0.7	=	2.37	(75)
Northeast 0.9	0.77	X	0.3	32	x	14.2	X	0.4	ļ	x [	0.7	=	0.88	(75)
Northeast 0.9	0.77	X	3.0	36	x	9.21	X	0.4	ļ	x_[	0.7	=	1.54	(75)
Northeast 0.9	0.77	X	0.3	32	x	9.21	x	0.4	ļ	x_[	0.7	=	0.57	(75)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	36.79	]	0.4	ļ	x_[	0.7	=	14.35	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	36.79	]	0.4	ļ	] x [	0.7	=	14.35	(79)
Southwest <sub>0.9</sub>	0.77	X	1.4	ŀ6	x	36.79	]	0.4	1	x_[	0.7	=	10.42	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	62.67	]	0.4	ļ	x_[	0.7	=	24.44	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	62.67	]	0.4	ļ	x_[	0.7	=	24.44	(79)
Southwest <sub>0.9</sub>	0.77	х	1.4	l6	x	62.67	]	0.4		x_[	0.7	=	17.76	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	85.75	]	0.4	1	x	0.7	=	33.45	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	85.75	]	0.4	1	<b>x</b> [	0.7	=	33.45	(79)

Southwest <sub>0.9x</sub>								1			1 г		_	Г		7(70)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		5.75	] 1	0.4		]	0.7	=	= [ 	24.29	(79)
	0.77	×	2.0		X		06.25	 	0.4		]	0.7	=	= [ 	41.44	(79)
Southwesto.9x	0.77	X	2.0		X		06.25	] 1	0.4		] X	0.7	=	= [ 	41.44	(79)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		06.25	] i	0.4		]	0.7		= [   	30.1	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	19.01		0.4		]	0.7		= [ 	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	19.01		0.4		]	0.7		= [	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	19.01		0.4		] × [	0.7		= [	33.72	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	18.15		0.4		] x [	0.7	-	= [	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	18.15		0.4		X	0.7		إ =	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	18.15		0.4		×	0.7		= [	33.47	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	13.91		0.4		x	0.7	:	= [	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91		0.4		x	0.7		= [	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	13.91		0.4		x	0.7	:	= [	32.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39		0.4		] x [	0.7	:	= [	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39		0.4		] x [	0.7		= [	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	04.39		0.4		] x [	0.7		= [	29.57	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85		0.4		] x [	0.7		= [	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	g	2.85		0.4		] x [	0.7		= [	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	g	2.85		0.4		] x [	0.7	:	= [	26.3	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	6	9.27		0.4		] x [	0.7	:	= [	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	6	9.27		0.4		x [	0.7	:	= [	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	x	6	9.27		0.4		x	0.7		= [	19.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07		0.4		×	0.7		= [	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07		0.4		×	0.7		= [	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	4	4.07		0.4		x	0.7		<u> </u>	12.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	3	1.49		0.4		×	0.7		<b>-</b> [	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	3	1.49	İ	0.4		×	0.7		= [	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	3	1.49	j	0.4		×	0.7		<u> </u>	8.92	(79)
•																_
Solar gains in	watts, cal	lculated	for each	n month	1			(83)m	= Sum(74	l)m(	(82)m					
(83)m= 41.71	71.9	100.66	128.54	147.46	14	47.93	141.98	127	.63 110.	.28	80.08	50.11	35.59	9		(83)
Total gains –	internal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts									
(84)m= 522.91	549.35	561.48	563.92	557.16	5	34.57	515.18	507	.85 505.	.18	500.6	498.96	505.5	1		(84)
7. Mean inte	rnal tempe	erature (	(heating	seasor	า)											
Temperature	during he	eating p	eriods in	the livi	ing	area	from Tal	ole 9,	Th1 (°C	;)				ſ	21	(85)
Utilisation fa	ctor for ga	ins for l	iving are	a, h1,m	า (ร	ee Ta	ble 9a)									_
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Se	ер	Oct	Nov	De	С		
(86)m= 0.91	0.9	0.87	0.82	0.74	(	0.61	0.47	0.9	5 0.6	6	0.81	0.89	0.92			(86)
Mean interna	al tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)	•		-				
(87)m= 19.12	19.3	19.62	20.05	20.46	_	0.78	20.92	20.			20.22	19.61	19.08	3		(87)
Temperature	during be	eating o	erinde in	rest of	. 4/v	elling	from To	hle (	Th2 (%	C)		-1				
(88)m= 20.43	20.43	20.43	20.44	20.44	_	0.45	20.45	20.	`		20.44	20.44	20.43	3		(88)
250												1	L			. /

Utilisa	ition fac	tor for a	ains for	rest of d	welling, l	n2 m (se	e Table	9a)						
(89)m=	0.91	0.89	0.86	0.81	0.72	0.57	0.42	0.45	0.63	0.79	0.88	0.91		(89)
Mean	internal	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	L 7 in Tabl	e 9c)				
(90)m=	18.65	18.83	19.15	19.58	19.97	20.27	20.39	20.38	20.2	19.74	19.15	18.62		(90)
			l	l			l		f	L LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	internal	l temner	ature (fo	or the wh	ole dwel	ling) – f	Ι Δ <b>ν</b> Τ1	+ (1 – fl	Δ) <b>v</b> T2					
(92)m=	18.89	19.07	19.38	19.82	20.22	20.53	20.66	20.65	20.46	19.98	19.39	18.86		(92)
L	adiustn		L he mear	ı ı interna	tempera	ature fro	ı m Table	4e. whe	ere appro	L opriate				
(93)m=	18.89	19.07	19.38	19.82	20.22	20.53	20.66	20.65	20.46	19.98	19.39	18.86		(93)
8. Spa	ace hea	ting requ	uirement											
				mperatui using Ta		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ւ Utilisa			ains, hm	<u> </u>	···ωy	0011		7.09	Сор		1101	200		
(94)m=	0.89	0.87	0.84	0.79	0.71	0.58	0.44	0.47	0.63	0.78	0.86	0.89		(94)
Usefu	I gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	464.36	478.28	472.44	445.22	393.8	308.43	228.74	236.33	317.81	389.7	428.12	452.36		(95)
Month	nly avera	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 I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]		-	· 	
(97)m=	926.12	896.95	813.58	679.84	528.85	362.98	248.38	259.21	391.32	582.55	767.07	920.24		(97)
Space					nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	<del> </del>	1)m		l	
(98)m=	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		_
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1883.71	(98)
Space	e heating	g require	ement in	kWh/m²	/year								34.06	(99)
9a. Ene	ergy red	Juiremer	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatir	_										,		_
					y/supple	mentary	•						0	(201)
Fraction	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								100	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	heating	g require	ement (c	alculate	d above)									
	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		
(211)m	= {[(98]	)m x (20	(4)] } x 1	00 ÷ (20	06)									(211)
	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		
_								Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	F	1883.71	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month							!		_
= {[(98)	m x (20	1)]}x1	00 ÷ (20	8)						-	-		1	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)

Water heating Water heating from separate communit	v system:				
Annual water heating requirement	y system.			1878.81	(64)
Fraction of heat from community CHP				1	(303a)
Factor for charging method for commu	ınity water heating			1	(305)
Distribution loss factor (Table 12c) for	community heating system			1.1	(306)
Water heat from CHP		(64) x (303a) x (305) x (306) =	=	2066.69	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(	310e)] =	20.67	(313)
Annual totals Space heating fuel used, main system	1	kWh/year		<b>kWh/year</b> 1883.71	7
Electricity for pumps, fans and electric	keep-hot				_
mechanical ventilation - balanced, exti	ract or positive input from o	utside	218.89	]	(230a)
Total electricity for the above, kWh/yea	r	sum of (230a)(230g) =		218.89	(231)
Electricity for lighting				281.06	(232)
10a. Fuel costs - individual heating sys	stems:				
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	c 0.01 =	248.46	(240)
Space heating - main system 2	(213) x	0	c 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	c 0.01 =	0	(242)
Water heating from CHP	(310a) x	4.24	0.01 =	87.63	(342a)
Pumps, fans and electric keep-hot	(231)	13.19	c 0.01 =	28.87	(249)
(if off-peak tariff, list each of (230a) to (2 Energy for lighting	230g) separately as applica		ding to -	Table 12a 37.07	(250)
Additional standing charges (Table 12)				60	(251)
Appendix Q items: repeat lines (253) ar	nd (254) as needed				
Total energy cost	(245)(247) + (250)(254) =			462.03	(255)
11a. SAP rating - individual heating sy	stems				
Energy cost deflator (Table 12)				0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =			1.93	(257)
SAP rating (Section 12)				73.01	(258)
12a. CO2 emissions – Individual heati	ng systems including micro	-CHP			
	<b>Energy</b> kWh/year	Emission fact kg CO2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.519	=	977.65	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)

Water heating from community system

		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		wo fuels repeat (363) to	(366) for the second fue	el 329 (367a)
CO2 associated with heat source 1	[(307b)+(31	0b)] x 100 ÷ (367b) x	0.52	326.02 (367)
Electrical energy for heat distribution	[(3	13) x	0.52	= 10.73 (372)
Total CO2 associated with community systems	(36	33)(366) + (368)(372	) :	336.75 (373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	113.61 (267)
Electricity for lighting	(232) x		0.519 =	145.87 (268)
Total CO2, kg/year		sum of (265)	(271) =	1573.87 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		28.46 (273)
EI rating (section 14)				79 (274)
13a. Primary Energy				
Space heating (main system 1)	Energy kWh/year	Prin facto	•	P. Energy kWh/year
Space heating (secondary)	(215) x		3.07	0 (263)
Water heating from community system				
		Energy kWh/year	Primary factor	Emissions kWh/year
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		wo fuels repeat (363) to	(366) for the second fue	329 (367a)
Energy associated with heat source 1	[(307b)+(31	0b)] x 100 ÷ (367b) x	3.07	1928.49 (367)
Electrical energy for heat distribution	[(3	13) x	2.92	60.35 (372)
Total Energy associated with community systems	(36	63)(366) + (368)(372	) =	336.75 (373)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	672 (267)
Electricity for lighting	(232) x		0 =	862.85 (268)
'Total Primary Energy		sum of (265)	(271) =	9306.69 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =		168.29 (273)

		User D	otaile:						
	A.I. Bir.I.i	USELL					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom: Softwa					019516 on: 1.0.4.25	
Software Name.		Property .				SHP	VEISIO	JII. 1.0.4.25	
Address :		Toporty .	rtaaress.	T lat Ty	pon n	.OI II			
1. Overall dwelling dime	ensions:								
		Area	a(m²)		Av. He	ight(m)		Volume(m³)	)_
Ground floor			55.3	(1a) x	3	3.09	(2a) =	170.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) :	55.3	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	170.88	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	_ + _	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	7 + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x '	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
							Air ch	anges per ho	ur
'	ys, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)
	peen carried out or is intended, proced	ed to (17), o	otherwise o	ontinue fr	om (9) to	(16)			7.00
Number of storeys in the Additional infiltration	ne dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	uction	[(0)	· jaco	0	(11)
	resent, use the value corresponding t	o the great	er wall are	a (after					<b>」</b> ` ′
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	1 (coole	ad) also	ontor O					7(40)
If no draught lobby, en	,	i (Seale	d), else	enter 0				0	(12)
• ,	s and doors draught stripped							0	(14)
Window infiltration	o and doors arangin empres		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 cubic metr	es per ho	our per s	quare m	etre of e	envelope	area	2.5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	ise (18) = (	16)				0.12	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	n 075 v (1	19)1 –			0	(19)
	ting chalter factor		$(20) = 1^{-1}$ (21) = (18)		13)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	-		(21) = (10)	/ X (20) =				0.12	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 ' 1 ' 1	1		•				I	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (00c) : (0	2) 4	•	•			•		•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(ZZUJIII- 1.ZI 1.ZU	1.20   1.1   1.00   0.99	0.95	0.92	'	1.00	1.12	1.10	I	

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effect		_	rate for t	he appli	cable ca	se	•	•	•	•			(00-)
If exhaust air he			andiv N (2	3h) - (23s	a) × Fmv (e	aguation (	N5N othe	rwisa (23h	) <i>- (</i> 23a)			0.5	(23a)
If balanced with									) = (25a)			0.5	(23b)
a) If balanced		-	-	_					2h)m + (	23h) 🗸 [1	 1 <i>– (23c</i> )	75.65 ± 1001	(23c)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(24a)
b) If balanced	d mecha	nical ve	ntilation	without	heat rec	coverv (ľ	л ИV) (24b	)m = (22	2b)m + (2	1 23b)		l	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	ouse extr	ract ven	tilation o	or positiv	re input v	ventilatio	on from o	outside				ı	
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	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change r	ate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)				•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losses	s and hea	at loss p	paramete	er:									
ELEMENT	Gross area (		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Boole Type T					2.13	X	1	= [	2.13				(26)
Doors Type 2					2.13 0.96	=	1	= [	2.13 0.96				(26) (26)
						x		=					, ,
Doors Type 2					0.96	x	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x x	1 1	= [ = [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2				0.96 0.96 0.7 0.2	x x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.2 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3			7 [	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4	7	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5	_	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	2 3 4 5				0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ 0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ (0.11 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

			ows, use e sides of in				ated using	TOTTIGIA 1	I( I/O Vala	( <del>C)+</del> 0.04] a	io givoii iii	paragrapri		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therma	al mass	parame	eter (TMF	P = Cm -	: TFA) in	n kJ/m²K			Indica	tive Value	: Low		100	(35)
			ere the de tailed calci		constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						20.32	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			47.64	(37)
Ventila	tion hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
•											Sum(39) <sub>1</sub> .	12 /12=	62.22	(39)
Heat lo	-	meter (F	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14		<b>—</b>
Numbo	r of day	ıs in moı	nth (Tab	lo 1a\					/	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.13	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30 30	31	30	31		(41)
(41)111=	- 51		] 31		31		] 31	31	30	31	30	31		(+1)
4. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum if TF	ed occu A > 13.9	upancy, l 9, N = 1			(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x (T	ΓFA -13.		kWh/ye	ear:	(42)
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 78		ear:	(42)
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usaç	[1 - exp ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 78	85	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 78	85	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 78 Nov	.05	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 78	.05	ear:	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed in designed i	(25 x N) o achieve Aug (43) 73.36	+ 36 a water us  Sep  76.49	Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44)112 =	.05 Dec 85.85	936.55	, ,
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed in designed i	(25 x N) o achieve Aug (43) 73.36	+ 36 a water us  Sep  76.49	Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44)112 =	.05 Dec 85.85		(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in 85.85	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cal	[1 - exp ge in litre usage by day (all w Apr ach month 76.49	es per da 5% if the day vater use, I May Vd,m = factorized 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24	erage = designed in designed i	(25 x N) to achieve  Aug (43)  73.36	+ 36 a water us  Sep  76.49 a kWh/mon 89.25	Oct  79.61  Total = Su  104.01	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1	.05  Dec  85.85  c, 1d)  123.3		(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per I Feb n litres per 82.73	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cal	[1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me	es per da 5% if the de tater use, l'  May  Vd,m = fact  73.36  onthly = 4.	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24	erage = designed to designed t	(25 x N) o achieve Aug (43) 73.36 0Tm / 3600 88.2	+ 36 a water us  Sep  76.49 kWh/mon 89.25	Oct  79.61  Total = Su  104.01	82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54	.05  Dec  85.85  c, 1d)  123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan 85.85 content of 127.31 aneous w	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73  thot water 111.35  vater heatin	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cale	[1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me	es per da 5% if the de tater use, l'  May  Vd,m = fact  73.36  onthly = 4.	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24	erage = designed to designed t	(25 x N) o achieve Aug (43) 73.36 0Tm / 3600 88.2	+ 36 a water us  Sep  76.49 kWh/mon 89.25	Oct  79.61  Total = Su  104.01	82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54	.05  Dec  85.85  c, 1d)  123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in 85.85 content of 127.31 aneous w	upancy, I 9, N = 1 9, N = 1 le hot wa al average litres per l Feb n litres per 82.73  thot water 111.35  vater heatif 16.7  loss:	N + 1.76 x ater usag hot water person per Mar r day for ear 79.61 used - calc 114.9 ng at point 17.24	[1 - exp ge in litre usage by day (all w Apr ach month 76.49  culated mo 100.17	es per da 5% if the divater use, I May Vd,m = factor 13.36	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 0 to (61) 13.39	Oct  79.61  Total = Su  104.01  Total = Su  15.6	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> =	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce a not more  Hot water  (44)m=  Energy of  (45)m=  If instant  (46)m=  Water s  Storage	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73 f hot water 111.35 vater heatil 16.7 loss:	N + 1.76 x ater usage hot water person per Mar day for ear 79.61  used - calc 114.9  ng at point 17.24	ge in litre usage by a day (all we have ach month)  76.49  culated month  100.17  of use (noth)  15.03	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  07m / 3600 88.2  boxes (46) 13.23  within sa	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 0 to (61) 13.39	Oct  79.61  Total = Su  104.01  Total = Su  15.6	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> =	85.85 = c, 1d) 123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s  Storage If comm	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 le hot wa al average litres per l 82.73  Thot water 111.35  vater heatin 16.7  loss: le (litres)	N + 1.76 x ater usag hot water person per Mar r day for ear 79.61 used - calc 114.9 ng at point 17.24	ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17  of use (no	es per da 5% if the divater use, $P$ May $Vd,m = fac$ $73.36$ $96.12$ $96.12$ older or Welling, e	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF if TF Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m= Water s  Storage If commotherw	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l 82.73  f hot water 111.35  vater heatin 16.7  loss: he (litres) heating a b stored	N + 1.76 x ater usage hot water person per Mar r day for ear 79.61  used - calc 114.9  ng at point 17.24  including and no talc and no talc at 1.76 x	ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17  of use (no	es per da 5% if the divater use, $P$ May $Vd,m = fac$ $73.36$ $96.12$ $96.12$ older or Welling, e	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce anot more  Hot wate  (44)m=  Energy of  (45)m=  If instant  (46)m=  Water s  Storage If commotherw Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume nunity has storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l 82.73  f hot water 111.35  vater heatil 16.7  loss: line (litres) lineating all o stored loss:	N + 1.76 x ater usage hot water person per Mar r day for ear 79.61  used - calc 114.9  ng at point 17.24  including and no talc and no talc at 1.76 x	ge in litre usage by day (all w Apr ach month 76.49  culated mo 100.17  for use (no 15.03  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS nter 110	erage = designed to do do do do do do do do do do do do do	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) = 110	(50)
b) If manufacturer's declared cylinder loss factor is not known		<b>4</b> - 13
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3	0.02	(51)
Volume factor from Table 2a	1.03	(52)
Temperature factor from Table 2b	0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) = 1.03	(54)
Enter (50) or (54) in (55)	1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	
(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 contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.01 30.98 32.01	(57)
		(58)
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 3		(30)
(modified by factor from Table H5 if there is solar water hea	• •	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26 22.51 23.26	(59)
		, ,
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	<del>``</del>	(04)
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0	(61)
Total heat required for water heating calculated for each mont		, ,
(62)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29 167.03 178.57	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant	ity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)	
(63)m= 0 0 0 0 0 0	0 0 0 0 0	(63)
Output from water heater		
(64)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29 167.03 178.57	
	Output from water heater (annual) <sub>112</sub>	378.81 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 86.55 76.97 82.43 76.1 76.18 70.37 69.78	73.55 72.47 78.81 80.55 85.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):		
Metabolic gains (Table 5), Watts		
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
(66)m= 92.31 92.31 92.31 92.31 92.31 92.31 92.31	92.31 92.31 92.31 92.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	
Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	also see Table 5 7.71 10.35 13.15 15.34 16.36	(67)
	7.71 10.35 13.15 15.34 16.36	(67)
(67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5	(67) (68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86	
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86	
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15)         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86 a), also see Table 5	(68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86 a), also see Table 5	(68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15 or L15 or L15         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23       32.23         Pumps and fans gains (Table 5a)         (70)m=       0       0       0       0       0       0	7.71 10.35 13.15 15.34 16.36  13a), also see Table 5  118.75 122.95 131.92 143.23 153.86  a), also see Table 5  32.23 32.23 32.23 32.23 32.23	(68) (69)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15 or L15         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23         Pumps and fans gains (Table 5a)	7.71	(68) (69)

Water h	heatin	g gains (T	able 5)								_		ī	
(72)m=	116.34	114.53	110.79	105.7	102.39	97.7	4 93.79	98.	85 100.65	105.9	2 111.87	114.54		(72)
Total in	nterna	al gains =					(66)m + (67)	m + (68	3)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m=	343.9	341.99	331.4	314.55	297.74	281.	44 270.83	276	.01 284.65	301.6	8 321.13	335.45		(73)
6. Sola														
Ū			ŭ					ations	to convert to th	ne applic		ion.		
Orienta	ation:	Access F Table 6d	actor	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northea	ıst <sub>0.9x</sub>	0.77	x	0.8	36	х	11.28	X	0.4	x	0.7		1.88	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.3	32	х	11.28	×	0.4	×	0.7		0.7	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	х	22.97	X	0.4	x	0.7	=	3.83	(75)
Northea	st 0.9x	0.77	x	0.3	32	х	22.97	X	0.4	x	0.7	<u> </u>	1.43	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.0	36	х	41.38	×	0.4	х	0.7	=	6.91	(75)
Northea	st 0.9x	0.77	x	0.3	32	x $\Box$	41.38	x	0.4	×	0.7	=	2.57	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.8	36	х	67.96	X	0.4	x	0.7	_	11.34	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	67.96	X	0.4	x	0.7	=	4.22	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	х	91.35	X	0.4	x	0.7	=	15.24	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	91.35	X	0.4	X	0.7	=	5.67	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	x	97.38	X	0.4	x	0.7	=	16.25	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	97.38	X	0.4	x	0.7	=	6.05	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	x	91.1	X	0.4	x	0.7	=	15.2	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	91.1	X	0.4	x	0.7	=	5.66	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	72.63	X	0.4	x	0.7	=	12.12	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	72.63	X	0.4	X	0.7	=	4.51	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	50.42	X	0.4	x	0.7	=	8.41	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	50.42	X	0.4	X	0.7		3.13	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	28.07	X	0.4	X	0.7	=	4.68	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	28.07	X	0.4	X	0.7		1.74	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	14.2	X	0.4	X	0.7	=	2.37	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	14.2	X	0.4	X	0.7	=	0.88	(75)
Northea	ıst <u>0.9</u> x	0.77	X	3.0	36	X	9.21	X	0.4	X	0.7		1.54	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	9.21	X	0.4	X	0.7	=	0.57	(75)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	36.79		0.4	X	0.7	=	14.35	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	36.79		0.4	X	0.7	=	14.35	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	1.4	16	x	36.79		0.4	x	0.7	=	10.42	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	62.67		0.4	x	0.7	=	24.44	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	62.67		0.4	x	0.7	=	24.44	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	1.4	16	x	62.67		0.4	x	0.7	=	17.76	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	2.0	)1	x	85.75		0.4	x	0.7	=	33.45	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	85.75		0.4	x	0.7	=	33.45	(79)

Southwest <sub>0.9x</sub>		<b>—</b>			1			1			ı ا				2.22	7(70)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		35.75	] 1		0.4	_ ×	0.7		=	24.29	(79)
<u>L</u>	0.77	×	2.0		X		06.25	] 1		0.4	X	0.7		=	41.44	(79)
Southwesto.s	0.77	×	2.0		X		06.25	]		0.4	_ × ¦	0.7		=	41.44	(79)
Southwesto.gx	0.77	×	1.4		X		06.25	]		0.4	X	0.7	_	=	30.1	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	1	19.01	]		0.4	_ ×	0.7		=	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	1	19.01	]		0.4	x	0.7	_	=	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	19.01	]		0.4	X	0.7		=	33.72	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	18.15	_		0.4	X	0.7		=	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	18.15	_		0.4	X	0.7		=	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	18.15	_		0.4	X	0.7		=	33.47	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91	<u> </u>		0.4	X	0.7		=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91	]		0.4	X	0.7		=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	13.91			0.4	x	0.7		=	32.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39			0.4	X	0.7		=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39	]		0.4	X	0.7		=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	Х	1.4	6	X	1	04.39			0.4	x	0.7		=	29.57	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	9	2.85			0.4	x	0.7		=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85	]		0.4	x	0.7		=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	x	9	2.85	]		0.4	x	0.7		=	26.3	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	6	9.27			0.4	x	0.7		=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	х	2.0	1	X	6	9.27	]		0.4	x	0.7		=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	6	9.27	]		0.4	x	0.7		=	19.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07	ĺ		0.4	x	0.7		=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	4	4.07	ĺ		0.4	x	0.7		=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	4	4.07	ĺ		0.4	x	0.7		=	12.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	x	3	31.49	ĺ		0.4	x	0.7	司	=	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	3	1.49	ĺ		0.4	x	0.7		=	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	3	1.49	i		0.4	T x	0.7	一	=	8.92	(79)
L																
Solar gains in	watts, cal	culated	for each	n month	1			(83)m	n = Sur	m(74)m .	(82)m				_	
(83)m= 41.71	71.9	100.66	128.54	147.46	14	47.93	141.98	127	.63	110.28	80.08	50.11	35.5	59		(83)
Total gains – i	nternal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts			-		-			_	
(84)m= 385.61	413.89	432.05	443.09	445.2	42	29.38	412.81	403	.64	394.93	381.76	371.25	371.	.04		(84)
7. Mean inter	nal tempe	erature (	(heating	seasor	า)											
Temperature	during he	eating p	eriods in	the liv	ing	area	from Tal	ole 9	, Th1	(°C)					21	(85)
Utilisation fac	tor for ga	ins for li	iving are	a, h1,n	า (ร	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	De	ec		
(86)m= 0.95	0.94	0.92	0.88	0.81	(	0.69	0.56	0.5	59	0.75	0.88	0.94	0.9	6		(86)
Mean interna	l tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ns 3 to 7	7 in T	able	9c)		•			-	
(87)m= 18.76	18.96	19.32	19.82	20.3	_	0.69	20.88	20.	- 1	20.58	19.99	19.31	18.7	73	]	(87)
Temperature	during be	ating n	eriode in	rest of	: 4/v	مااام	from To	عامه	 G Th	I 2 (°C\		_!			1	
(88)m= 20.43	20.43	20.43	20.44	20.44	_	0.45	20.45	20.	- 1	20.44	20.44	20.44	20.4	43	1	(88)
25			****				L							_	J	` ,

	factor for g	ains for	rest of d	welling, h	n2,m (se	e Table	9a)						
(89)m= 0.95	5 0.94	0.91	0.87	0.79	0.66	0.51	0.54	0.72	0.87	0.93	0.95		(89)
Mean inter	nal temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m= 18.3		18.86	19.35	19.82	20.2	20.36	20.35	20.1	19.53	18.85	18.27		(90)
	•							f	LA = Livin	g area ÷ (4	ł) =	0.51	(91)
Mean inter	nal temper	ature (fo	r the wh	ole dwel	llina) = fl	IA×T1	+ (1 – fl	A) x T2			'		_
(92)m= 18.5	<del></del> -	19.09	19.59	20.06	20.45	20.62	20.6	20.34	19.76	19.08	18.5		(92)
Apply adju	stment to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 18.5	3 18.73	19.09	19.59	20.06	20.45	20.62	20.6	20.34	19.76	19.08	18.5		(93)
8. Space h	eating req	uirement											
Set Ti to th					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisati						<del> </del>	_	_	_		_		
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	<del> </del>	· ·	1	0.70	0.00	0.50	0.55	0.70	0.05	0.04	0.04		(04)
(94)m= 0.94		0.9	0.85	0.78	0.66	0.53	0.55	0.72	0.85	0.91	0.94		(94)
Useful gair (95)m= 360.9		387.29	377.77	346.87	282.86	216.84	222.35	283.22	324.83	339.35	348.87		(95)
Monthly av						210.04	222.33	200.22	324.03	339.33	340.07		(00)
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss r						oxdot							, ,
(97)m= 903.7		795.23	665.53	519.14	358	246.18	256.61	384.39	568.84	748.09	898.1		(97)
Space hea	ting require	ement fo	r each m	ı nonth, k\	Wh/mon	th = $0.02$	4 x [(97	)m – (95	)m] x (4′	1)m			
(98)m= 404.	<del>- ř · · ·</del>	303.51	207.19	128.17	0	0	0	0	181.54	294.29	408.63		
	•						Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2260.05	(98)
Space hea	ting require	ement in	kWh/m²	/year								40.87	(99)
9a. Energy	requiremen	nts – Indi	ividual h	eating sy	/stems i	ام ما المام ما							_
Space hea		nto ma	viadaiiii	Jannig o		'ATOILUIOILAIOL	micro-C	HP)					
•					,	nciuaing	micro-C	HP)					
Fraction of	space hea	at from s	econdary	//supple			micro-C	HP)				0	(201
Fraction of Fraction of	•		-			system	micro-C (202) = 1 -	, in the second				0	╡ ゚
	space hea	at from m	nain syst	em(s)		system	(202) = 1 -	, in the second	(203)] =				(202)
Fraction of	space heati	at from m	nain syst main sys	em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202)
Fraction of Fraction of Efficiency	space heat total heati of main spa	at from ming from take	nain systomain systomain systom	em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1 1 100	(202)
Fraction of Fraction of Efficiency	space heat total heati of main spa	at from mag from lace heat	main systemain systemain systementary	em(s) stem 1 em 1 y heating	mentary	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -		Nov	Doo	1 1 100 0	(202) (204) (206) (208)
Fraction of Fraction of Efficiency of Efficiency	space heating total heating from the space of secondary to the space o	at from m ng from ace heat ry/supple Mar	nain systemain systemain systementary	em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 -	- (201) =	(203)] =	Nov	Dec	1 1 100	(202) (204) (206) (208)
Fraction of Fraction of Efficiency Efficiency Jan Space hea	space heat total heati of main space of seconda n Feb tting require	at from m ng from ace heat ry/supple Mar ement (c	main systemain systemain systementary Apr	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct			1 1 100 0	(202) (204) (206) (208)
Fraction of Fraction of Efficiency of Efficiency of Jan Space hea	space heating from the space of secondary required the space of secondary required the space of secondary required the space of secondary required the space of secondary required the space of space of secondary required the space of spac	at from mager from mager heat ry/supplement (compared to 303.51	main systemain systemain systementary Apr calculated	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -		Nov 294.29	Dec 408.63	1 1 100 0	(202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jai Space head 404.	total heati of main spa of seconda n Feb tting require 11 332.6 98)m x (20	at from many from mace heat ry/supplement (company) and a supplement (compa	main systemain systemain systematary  Apr  calculated  207.19  00 ÷ (20	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = 0	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0	(201) (202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jan Space hea	total heati of main spa of seconda n Feb tting require 11 332.6 98)m x (20	at from mager from mager heat ry/supplement (compared to 303.51	main systemain systemain systementary Apr calculated	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar
Fraction of Fraction of Fraction of Efficiency of  Efficiency of  Jan Space head  404.*  (211)m = {[(	total heating from the secondary of secondary from the secondary from	mat from many from mace heat ry/supplement (compared and sold and	main systemain systemain systementary Apr alculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0	(202) (204) (206) (208) ar
Fraction of Fraction of Fraction of Efficiency of Efficiency of Jan Space head 404.*  (211)m = {[(	space heat total heating frequire 11 332.6 11 332.6 11 332.6 11 332.6	mat from many from mace heat ry/supplement (company 303.51 square) and square from market	main systemain systemain systemantary Apr calculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jan Space head 404.  (211)m = {[(	space heat total heating frequire 11 332.6 11 332.6 11 332.6 11 332.6	mat from many from mace heat ry/supplement (company 303.51 square) and square from market	main systemain systemain systemantary Apr calculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar

#### Water heating Water heating from separate community system: Annual water heating requirement (64)1878.81 Fraction of heat from community CHP (303a) (305)Factor for charging method for community water heating 1 Distribution loss factor (Table 12c) for community heating system (306)1.1 Water heat from CHP (64) x (303a) x (305) x (306) = (310a) 2066.69 Electricity used for heat distribution $0.01 \times [(307a)...(307e) + (310a)...(310e)] =$ (313)20.67 **Annual totals** kWh/year kWh/year Space heating fuel used, main system 1 2260.05 Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside (230a) 218.89 sum of (230a)...(230g) = (231) Total electricity for the above, kWh/year 218.89 Electricity for lighting (232)281.06 12a. CO2 emissions - Individual heating systems including micro-CHP **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) 1172.96 (261)0.519 Space heating (secondary) (215) x (263)0.519 Water heating from community system **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 329 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0.52 326.02 Electrical energy for heat distribution [(313) x]0.52 10.73 (372)Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)336.75 Electricity for pumps, fans and electric keep-hot (231) x (267)0.519 113.61 (232) x Electricity for lighting (268)0.519 145.87 sum of (265)...(271) = Total CO2, kg/year (272)1769.19 **Dwelling CO2 Emission Rate** $(272) \div (4) =$ (273)31.99

El rating (section 14)

76

(274)

		llsor F	Details:						
Assessor Name:	Adam Ritchie	— <u>USCI</u> -L	Strom	a Num	her		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	: Flat Ty	pe A - A	SHP			
Address :									
Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>2</sup>	3)
Ground floor				(1a) x		3.09	(2a) =	170.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)			J		
Dwelling volume		·		J	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:								0.00	
2. Ventilation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	<b> </b> =	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>	0		0	x	20 =	0	(6b)
Number of intermittent fa	ins				2	x ·	10 =	20	(7a)
Number of passive vents	3				0	x ·	10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
				L				_	
				_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+( been carried out or is intended, proce			continue fr	20		÷ (5) =	0.12	(8)
Number of storeys in t		ou to (11),	ouror wide (	oonanao n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
ir both types of wall are p deducting areas of openi	resent, use the value corresponding angs); if equal user 0.35	o tne grea	ter wall are	ea (arter					
•	floor, enter 0.2 (unsealed) or (	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	) v (14) · 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) -		0	(15)
	q50, expressed in cubic metr	es ner hø					area	5	(16)
,	lity value, then $(18) = [(17) \div 20] +$			•		лисюрс	aroa	0.37	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			`
Number of sides sheltered	ed		(00) 4	50 0 <b>7</b> 5 (4	40)1			0	(19)
Shelter factor	ting abolton footon		(20) = 1 -		19)] =			1	(20)
Infiltration rate incorpora	•		(21) = (18	) X (20) =				0.37	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	1 ' 1 ' 1	1 00	1 7.59	T COP		1		l	
(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 Foster (00s) : (2	2)		•	•	•	•	•	•	
Wind Factor $(22a)m = (2(22a)m = 1.27   1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18	]	
1.27	1.30 0.93	1 0.00	1 3.02	<u> </u>	1	12	10	J	

Adjusted infiltrat	tion rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
Calculate effect		•	rate for t	he appli	cable ca	se	!						
If mechanical If exhaust air hea			andiv N. (2	2h) _ (22c	) v Emy (c	auation (	VEVV othor	wico (22h	) - (222)		[	0	(23a)
If balanced with I									) = (23a)			0	
		-	-	_					26\m , /'	22h) [4	1 (220)	. 1001	(23c)
a) If balanced	o mechar	o lical ve	nulation	with nea	at recove		7R) (24a	$\frac{1)m = (22)}{0}$	20)m + (2 0	23b) <b>x</b> [	0	÷ 100j	(24a)
b) If balanced							ļ		<b>!</b>		U		(214)
(24b)m= 0	0 0	0	0	0 Without	0	0	0	0	0	0	0		(24b)
c) If whole ho													(= .0)
if (22b)m				-	-				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	entilation	or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	!				
if (22b)m	= 1, ther	n (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air c	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				ı	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losses	and hea	it loss p	paramete	er:									
ELEMENT	Gross area (r		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Doors Type I					2.13	X	1	= [	2.13				(26)
Doors Type 1 Doors Type 2					2.13 0.96	x x	1	= [	2.13 0.96				(26) (26)
						=		=					` '
Doors Type 2					0.96	×	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x	1 1	= [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 2	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x 1	1 1 1 1 /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 2 Windows Type 3	2 3				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type 6 Windows Type 6	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type 1	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 7 Windows Type 8 Windows Type 8 Windows Type 9	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 1.94 0.42 7.189 2.25 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 8	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 7 Windows Type 8 Floor Walls Type 1 Walls Type 2 Walls Type 3 Walls Type 4	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99 3.71				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)

* for win	dows and	root windi	ows, asc c				ateu using	i Torritala 17	I ( 170 valu	C)+0.0+j C	is given in	paragrapi	7 3.2	
		as on both	sides of in	nternal wal	ls and pan	แนงกร								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				33.3	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therm	al mass	parame	ter (TMF	= Cm +	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	•				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
		ad of a de					,							<b>–</b>
	ŭ	`	,		using Ap	•	<b>\</b>						6.77	(36)
	abric he		are not kn	iown (36) =	= 0.05 x (3	1)			(33) +	(36) =			40.08	(37)
			alculated	d monthly	V						25)m x (5)		40.00	(•••)
Ventilation heat loss calculated monthly    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec													]	
(38)m=	34.37	34.13	33.89	32.79	32.58	31.62	31.62	31.44	31.99	32.58	33	33.44		(38)
∐oot tr	anefor o	coefficier	1 o+ \///k/	l	l .		l .	<u> </u>	(30)m	= (37) + (37)	38)m		J	
(39)m=	74.45	74.21	73.97	72.87	72.66	71.7	71.7	71.52	72.07	72.66	73.08	73.52	1	
(00)111=	74.40	'2	70.07	72.07	72.00	/ 1.7	' '.'	71.02			Sum(39) <sub>1</sub> .	<u> </u>	72.87	(39)
Heat Ic	oss para	meter (H	HLP), W	/m²K						$= (39)m \div$			. 2.0.	` ′
(40)m=	1.35	1.34	1.34	1.32	1.31	1.3	1.3	1.29	1.3	1.31	1.32	1.33		
					•		•	•	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.32	(40)
Numbe		/s in moi	<u> </u>	<del>-                                    </del>		ı					1	<u> </u>	1	
	Jan	Feb	Mar	Apr	l May	Jun	Jul	Aug	Sep	Oct	I Nov	I Daa		
		-	-	<del></del>	May		-	Ť			Nov	Dec	ł	
	31	28	31	30	31	30	31	31	30	31	30	31 kWh/ye	ear:	(41)
(41)m= 4. Wa	31	28	31	30	31		-	Ť			-	31	ear:	(41)
4. Wa	31 ater heat	28 ting ener	31 rgy requi	30	31	30	31	31	30	31	30	31	ear:	
4. Wa	ater heat ned occu (A > 13.9	ting energy, Iupancy,	31 rgy requi	30	31	30	31	Ť	30	31	30	31 kWh/ye	ear:	
4. Wa Assum if TF if TF	31 ned occu (A > 13.9 (A £ 13.9	28 ting energy, I upancy, I 9, N = 1	31 rgy requi N + 1.76 x	30 irement:	31	30 349 x (TF	31 -A -13.9	31	30 0013 x (7	31	30	31 kWh/ye	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average	ngy required to the second sec	irement:  [1 - exp ge in litre usage by	31 o(-0.0003 es per da 5% if the d	30 349 x (TF ay Vd,av lwelling is	31 FA -13.9 erage = designed to	31	30 0013 x (7 + 36	31 ГFA -13.	30 1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce	ater heat ned occu A > 13.9 A £ 13.9 I averag the annual that 125	ting energy, I pancy, I pancy, I pancy, I pancy, I pancy pan	31  N + 1.76 x  ater usage hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31 o(-0.0003 es per da 5% if the o	30 349 x (TF ay Vd,av lwelling is not and co	31  FA -13.9 erage = designed to	31 (25 x N) (25 achieve	30 0013 x (7 + 36 a water us	31 ΓFA -13. se target o	30 1. 9) 78	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua that 125	ting energy, I pancy, I pancy, I pe hot was al average litres per per per per per per per per per per	31  N + 1.76 x ater usag hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31  o(-0.0003  es per da 5% if the of vater use, I	30 349 x (TF ay Vd,av lwelling is that and co	31  FA -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (7 + 36	31 ГFA -13.	30 1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125 Jan er usage in	ting energy, I pancy, I pancy, I pe hot was al average litres per I pe hot litres per li	31  N + 1.76 x ater usag hot water person per Mar r day for ea	irement:  [1 - exp ge in litre usage by r day (all w  Apr ach month	31  o(-0.0003  es per da  5% if the of  vater use, I  May  Vd,m = fa	30 349 x (TF ay Vd,av Iwelling is that and co Jun ctor from T	31  FA -13.9 erage = designed to ld)  Jul Table 1c x	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us	31  FFA -13.  See target of	30 1. 9) 78	31 kWh/yo 85 .05	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua that 125	ting energy, I pancy, I pancy, I pe hot was al average litres per per per per per per per per per per	31  N + 1.76 x ater usag hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31  o(-0.0003  es per da 5% if the of vater use, I	30 349 x (TF ay Vd,av lwelling is that and co	31  FA -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61	30 1.9) 78 Nov	31 kWh/yo 85 .05 Dec		(42)
4. Wa Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ater heat ned occu (A > 13.9 (A £ 13.9 I averag the annual e that 125 Jan er usage in	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usage hot water person per Mar r day for ear 79.61	30 irement: [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  o(-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fa  73.36	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61  Fotal = Su	30 1.99) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ater heat ned occu (A > 13.9 (A £ 13.9 I averag the annual e that 125 Jan er usage in	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usage hot water person per Mar r day for ear 79.61	30 irement: [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  o(-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fa  73.36	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61  Fotal = Su	30 1.99) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec		(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m=	ater heat ned occur (A > 13.9 (A £ 13.9 I average the annual e that 125  Jan er usage in 85.85	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	30 irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  (-0.0003 es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.	30 349 x (TF ay Vd,av (welling is not and co Jun ctor from 7 70.24	Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30  0013 x (7  + 36     a water us  Sep  76.49  0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Sulth (see Tail 104.01)	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3		(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy (45)m=	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125  Jan 85.85  content of	ting energy, lapancy,	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me 100.17	31  o(-0.0003  es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep 76.49 0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Sulth (see Tail 104.01)	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3	936.55	(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy (45)m= If instant (46)m=	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125  Jan 85.85  content of 127.31  taneous w 19.1	ting energy, lapancy,	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me 100.17	31  o(-0.0003  es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30 0013 x (7 + 36 a water us Sep 76.49 0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Sulth (see Tail 104.01)	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3	936.55	(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy ( (45)m= If instant (46)m= Water	ater heat ned occur (A > 13.9 (A £ 1	ing energy, I pancy, I pancy, I pancy, I possible properties of the second seco	31  N + 1.76 x ater usage hot water person per day for ear 114.9  ng at point 17.24	30  irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me 100.17  of use (no	31  31  (-0.0003  es per da 5% if the covater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  76.86  enter 0 in  11.53	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2 boxes (46) 13.23	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  1 to (61)  13.39	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	30  1. 9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m= Water Storag	ater heat  alter h	ting energy, lapancy,	31  rgy requivalent requirements of the second reports of the second reports of the second requirement	30  irement:  [1 - exp ge in litre usage by a r day (all w Apr ach month 76.49  culated mo 100.17  for use (no	31 31 31 31 31 31 31 31 31 31 31 31 31 3	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  m x nm x E  76.86  enter 0 in  11.53  storage	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  1 to (61)  13.39	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	30  1. 9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31 kWh/yo 85 .05 Dec 85.85 = c, 1d) 123.3	936.55	(42) (43) (44) (45) (46)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy ( (45)m= Water Storag If comr	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua e that 125 Jan ar usage ii  85.85  content of 127.31  taneous w 19.1 storage e volum munity h	ting energy, I pancy, I pancy, I pancy, I possible for water litres per partie	31  rgy requiver 1.76 x ater usage hot water person per reday for early 114.9  rg at point 17.24  including and no talk and no talk and required the reday for early 114.9	30  irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated mo 100.17  for use (no 15.03  and any so ank in dw	31  31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44 /WHRS nter 110	an x nm x E  76.86  enter 0 in  11.53  storage  litres in	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m=  Water Storag If comr Otherw	31  ater heat ned occur in A > 13.9 if A £ 13.9 If average the annual in the that 125  Jan ar usage in ataneous w 19.1 storage e volum munity he vise if no	ting energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I	31  rgy requiver 1.76 x ater usage hot water person per reday for early 114.9  rg at point 17.24  including and no talk and no talk and required the reday for early 114.9	30  irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated mo 100.17  for use (no 15.03  and any so ank in dw	31  31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44 /WHRS nter 110	an x nm x E  76.86  enter 0 in  11.53  storage  litres in	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m= Water Storag If comr Otherw Water	ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater annual  ater annual  ater that 125  Jan  ater usage in  ater usage	ting energy, I pancy, I pancy, I pancy, I possible for water sper part of the second s	31  rgy requivalent requirements of the second reports of the second reports of the second requirement	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated mo  100.17  for use (no  15.03  and any so ank in dw er (this in	31  31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46) (47)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m=  Water Storag If comr Otherw Water a) If m	ater heat ned occur in A > 13.9 I average the annual the that 125  Jan 85.85  content of 127.31  taneous w 19.1 storage to volum munity h vise if no storage nanufact	ting energy, I pancy, I pancy, I pancy, I possible for water sper part of the second s	31  rgy requiver 1.76 x ater usage hot water overson per mar reay for ear reay for ear 114.9  rg at point 17.24  including and no tale hot water and no tale cale and lectared I	30  irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me 100.17  for use (no 15.03  ang any so ank in dw er (this in	31  (-0.0003 es per da 5% if the da vater use, I  May Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.99)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  -c, 1d)  123.3  -18.49	936.55	(41) (42) (43) (44) (45) (46) (47) (48) (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75											
<ul> <li>b) If manufacturer's declared cylinder loss factor is not known</li> <li>Hot water storage loss factor from Table 2 (kWh/litre/day)</li> </ul>	:		(54)								
If community heating see section 4.3		0	(51)								
Volume factor from Table 2a		0	(52)								
Temperature factor from Table 2b		0	(53)								
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)								
Enter (50) or (54) in (55)		0.75	(55)								
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$										
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33	(56)								
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else $(57)$ m = $(56)$ m where $($	H11) is from Append	ix H								
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33	(57)								
Primary circuit loss (annual) from Table 3		0	(58)								
Primary circuit loss calculated for each month $(59)$ m = $(58) \div (58)$	365 × (41)m		•								
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	stat)									
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)								
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m										
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)								
Total heat required for water heating calculated for each month	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m								
(62)m= 173.91 153.44 161.5 145.27 142.72 128.04 123.44	<del></del>	158.63 169.89	(62)								
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contribut	ion to water heating)	l								
(add additional lines if FGHRS and/or WWHRS applies, see A		-									
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)								
Output from water heater			•								
(64)m= 173.91 153.44 161.5 145.27 142.72 128.04 123.46	3 134.79 134.34 150.61	158.63 169.89									
	Output from water heate	r (annual) <sub>112</sub>	1776.58 (64)								
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	]								
(65)m= 79.61 70.69 75.48 69.38 69.24 63.65 62.83	66.6 65.75 71.86	73.83 78.27	(65)								
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is fr	om community h	eating								
5. Internal gains (see Table 5 and 5a):											
Metabolic gains (Table 5), Watts											
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec									
(66)m= 92.31 92.31 92.31 92.31 92.31 92.31 92.31	92.31 92.31 92.31	92.31 92.31	(66)								
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	l l									
(67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	7.71 10.35 13.15	15.34 16.36	(67)								
Appliances gains (calculated in Appendix L, equation L13 or L	13a), also see Table 5	l l									
(68)m= 160.96 162.63 158.42 149.46 138.15 127.52 120.43	<del>-                                    </del>	143.23 153.86	(68)								
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5	l l									
(69)m= 32.23 32.23 32.23 32.23 32.23 32.23 32.23	32.23 32.23 32.23	32.23 32.23	(69)								
Pumps and fans gains (Table 5a)	<u> </u>	<u> </u>	ı								
(70)m= 3 3 3 3 3 3 3 3	3 3 3	3 3	(70)								
	3 3 3	3 3	(70)								
(70)m= 3 3 3 3 3 3 3 3 Losses e.g. evaporation (negative values) (Table 5) (71)m= -73.85 -73.85 -73.85 -73.85 -73.85 -73.85		3 3	(70)								

Water heating gains (Table 5)																	
(72)m=	107	105.2	101.45	96.36	93.06	8	88.41	84.45	89.	52 91.32	96	.59	102.54	105.2	7		(72)
Total i	nterna	l gains =				•	(66)	)m + (67)m	+ (68	3)m + (69)m -	+ (70)m	n + (	71)m + (72)	m	_		
(73)m=	337.57	335.65	325.06	308.22	291.41	2	75.11	264.49	269	.67 278.32	2 295	5.34	314.8	329.11	7		(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated (	using sola	r flux from	Table 6a	and	assoc	iated equa	tions	to convert to	the app	plica	ıble orientat	ion.			
Orienta		Access F	actor	Area			Flu			g_ -		_	FF		C	Sains	
		Table 6d		m²			I al	ble 6a		Table 6l	b 		Table 6c			(W)	
Northea	ist <sub>0.9x</sub>	0.77	X	3.0	36	X	1	1.28	X	0.63		<b>x</b> [	0.7	=		2.97	(75)
Northea	ist <sub>0.9x</sub>	0.77	X	0.3	32	X	1	1.28	X	0.63		x	0.7	=		1.1	(75)
Northea	ast 0.9x	0.77	X	3.0	36	X	2	22.97	X	0.63		x [	0.7	=		6.04	(75)
Northea	ast 0.9x	0.77	X	0.3	32	X	2	22.97	X	0.63		x [	0.7	=		2.25	(75)
Northea	ast 0.9x	0.77	X	3.0	36	X	4	11.38	x	0.63		x [	0.7	=		10.88	(75)
Northea	nst <sub>0.9x</sub>	0.77	X	0.3	32	X	4	11.38	x	0.63		<b>x</b> [	0.7	=		4.05	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.0	36	X	6	67.96	x	0.63		x [	0.7	=		17.86	(75)
Northea	nst <sub>0.9x</sub>	0.77	X	0.3	32	X	6	67.96	X	0.63		x [	0.7	=		6.65	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	3.0	36	X	9	91.35	x	0.63		x [	0.7	=		24.01	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.3	32	X	9	1.35	x	0.63		x [	0.7	=		8.93	(75)
Northea	ast 0.9x	0.77	X	0.0	36	X	9	97.38	x	0.63		x [	0.7	=		25.6	(75)
Northea	ast 0.9x	0.77	X	0.3	32	X	9	7.38	x	0.63		x [	0.7	=		9.52	(75)
Northea	st 0.9x	0.77	Х	0.8	36	X		91.1	x	0.63		x [	0.7	=		23.94	(75)
Northea	ast 0.9x	0.77	X	0.3	32	X		91.1	x	0.63		x [	0.7	=		8.91	(75)
Northea	st 0.9x	0.77	X	0.0	36	X	7	72.63	x	0.63		x [	0.7			19.09	(75)
Northea	st 0.9x	0.77	Х	0.3	32	X	7	72.63	x	0.63		x [	0.7	=		7.1	(75)
Northea	st 0.9x	0.77	Х	0.0	36	X	5	50.42	x	0.63		x [	0.7	=		13.25	(75)
Northea	st 0.9x	0.77	X	0.3	32	X	5	50.42	x	0.63		x [	0.7			4.93	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	X	2	28.07	x	0.63		x [	0.7			7.38	(75)
Northea	st 0.9x	0.77	х	0.3	32	X	2	28.07	x	0.63		x [	0.7	=		2.74	(75)
Northea	st 0.9x	0.77	X	0.0	36	X		14.2	x	0.63		x [	0.7			3.73	(75)
Northea	st 0.9x	0.77	Х	0.3	32	X		14.2	x	0.63		x [	0.7	=		1.39	(75)
Northea	st 0.9x	0.77	X	0.0	36	X		9.21	x	0.63		x [	0.7			2.42	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.3	32	X	,	9.21	x	0.63		x [	0.7	_ =		0.9	(75)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	3	36.79		0.63		x [	0.7	_ =		22.6	(79)
Southw	est <sub>0.9x</sub>	0.77	X	2.0	)1	X	3	36.79		0.63		x [	0.7	_ =		22.6	(79)
Southw	est <sub>0.9x</sub>	0.77	X	1.4	16	X	3	36.79		0.63		x [	0.7	<del>-</del>		16.42	(79)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	6	62.67		0.63		x [	0.7	=		38.5	(79)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	6	62.67		0.63		x [	0.7	=		38.5	(79)
Southw	est <sub>0.9x</sub>	0.77	х	1.4	16	X	6	62.67		0.63		x [	0.7			27.96	(79)
Southw	est <sub>0.9x</sub>	0.77	х	2.0	)1	X	8	35.75		0.63		x [	0.7	=		52.68	(79)
Southw	est <sub>0.9x</sub>	0.77	х	2.0	)1	X	8	35.75		0.63		x [	0.7	=		52.68	(79)

Southwesto, 94 0.77	Southweste o					, –	05	7					25.55	(70)
Southwests 9, 0.77 × 2.01 × 106.25 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 1.46 × 119.01 0.63 × 0.7 = 73.11 (79)  Southwests 9, 0.77 × 2.01 × 119.01 0.63 × 0.7 = 73.11 (79)  Southwests 9, 0.77 × 2.01 × 119.01 0.63 × 0.7 = 53.1 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 53.1 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 72.58 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 72.58 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46	<u>L</u>		=		<del></del>	<b>-</b>		<u> </u>		=		<del> </del>		== ` '
Southwests, 9x	<u>L</u>		_			<b>-</b>		<u> </u>		=		=		== ` '
Southwesto, as	<u>L</u>		=			*  _		<u> </u>		×		=		====
Southwesto, sx	<u>L</u>	0.77	X	1.46	5	×		_	0.63	×	0.7	=	47.41	== ` '
Southwesto, sx	<u>L</u>	0.77	X	2.01		x	119.01	_	0.63	X	0.7	=	73.11	== ` '
Southwesto, 9k	<u> </u>	0.77	X	2.01		×	119.01	_	0.63	X	0.7	=	73.11	(79)
Southwesto, 9x	<u>L</u>	0.77	X	1.46	3	×	119.01	_	0.63	X	0.7	=	53.1	(79)
Southwesto 9x	<u>L</u>	0.77	X	2.01		x	118.15	_	0.63	X	0.7	=	72.58	(79)
Southwesto, 9x	<u>L</u>	0.77	X	2.01		x	118.15	<u> </u>	0.63	X	0.7	=	72.58	(79)
Southwesto, 9x	<u>L</u>	0.77	X	1.46	3	x	118.15	<u> </u>	0.63	X	0.7	=	52.72	(79)
Southwesto.9x	<u>L</u>	0.77	X	2.01		x	113.91		0.63	X	0.7	=	69.97	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	113.91	]	0.63	X	0.7	=	69.97	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.46	6	x	113.91	]	0.63	X	0.7	=	50.83	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	104.39	]	0.63	X	0.7	=	64.13	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	104.39	]	0.63	X	0.7	=	64.13	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.46	3	x	104.39	]	0.63	X	0.7	=	46.58	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	92.85	]	0.63	х	0.7	=	57.04	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	92.85	]	0.63	x	0.7	=	57.04	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	x	1.46	6	x	92.85	Ī	0.63	x	0.7	=	41.43	(79)
Southwest0,9x 0.77 x 1.46 x 69.27 0.63 x 0.7 = 30.91 (79) Southwest0,9x 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 1.46 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 1.46 x 44.07 0.63 x 0.7 = 19.66 (79) Southwest0,9x 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.66 (79) Southwest0,9x 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34 (79) Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79) Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 1.40 x	Southwest <sub>0.9x</sub>	0.77	x	2.01	1	x	69.27	Ī	0.63	x	0.7		42.55	(79)
Southwest0.9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	69.27	Ī	0.63	x	0.7	=	42.55	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	x	1.46	3	x	69.27	Ī	0.63	x	0.7		30.91	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	44.07	ĺ	0.63	x	0.7		27.07	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	44.07	Ī	0.63	x	0.7	_	27.07	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest <sub>0.9x</sub> 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	1.46	5	x	44.07	Ī	0.63	x	0.7		19.66	(79)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  [86)m = 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	31.49	ĺ	0.63	x	0.7		19.34	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	2.01		x $\square$	31.49	i	0.63	x	0.7	=	19.34	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	X	1.46	3	x	31.49	i	0.63	x	0.7		14.05	(79)
(83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	L							_						
(83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Solar gains in	watts, cal	culated	for each	month			(83)m	n = Sum(74)m	ı(82)m	l.			
(84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	1					1	9 223.62	201	.02 173.69	126.1	3 78.93	56.06	]	(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Total gains – ii	nternal an	nd solar	(84)m =	(73)m	+ (83)	m , watts		•		•		_	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(84)m= 403.25	448.9	483.6	510.67	523.66	508.	1 488.12	470	.69 452.01	421.4	7 393.72	385.17		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	7. Mean inter	nal tempe	erature (	heating	season	)								
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec							a from Ta	ble 9	, Th1 (°C)				21	(85)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Utilisation fac	tor for gai	ins for li	ving area	a, h1,m	see	Table 9a)		, ,					
(86)m=       1       0.99       0.98       0.96       0.91       0.78       0.61       0.65       0.86       0.97       0.99       1       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       19.62       19.77       20.02       20.36       20.67       20.89       20.97       20.96       20.82       20.43       19.97       19.6         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)						r	<del></del>	A	ug Sep	Oc	t Nov	Dec	]	
(87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(86)m= 1	0.99	0.98	0.96	0.91	0.78	0.61	0.6	55 0.86	0.97	0.99	1	1	(86)
(87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Mean interna	l temnera	ture in l	iving are	a T1 (fo	ollow s	stens 3 to	7 in T	able 9c)	_	<b>!</b>		_	
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		· · ·			•		_i	1		20.43	3 19.97	19.6	1	(87)
	` '	<u> </u>	!							1			1	
(00)							<del></del>	_		10.94	3 10.92	10.92	1	(88)
	(00)111= 19.0	19.01	10.61	15.03	13.03	19.0	1 13.04	1 19.	19.04	1 19.0	19.02	19.02	J	(00)

Substantian factor for gains for rest of develling, 12, m (see) Table 9a)   (89)   (89)   (80)   (	1 14:11:4:	6		-: <b>f</b>			-0 (	- T-51-	0-1						
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   (90)ms   18   18.22   18.58   19.07   19.5   19.77   19.83   19.83   19.80   19.10   19.10   18.52   17.98   (90)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (92)ms   (18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (92)   (93)ms   18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (92)   (93)ms   18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (92)   (93)ms   18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (93)   (93)   (93)   (93)   (93)   (93)   (94)   (93)   (93)   (94)   (93)   (94)   (93)   (94)   (93)   (94)   (93)   (94)   (93)   (94)   (93)   (94)   (93)   (94							`	i		0.78	0.95	0.99	1		(89)
(90)m= 18 18 2.2 18.58 19.07 19.5 19.77 19.83 19.83 19.86 19.18 18.52 17.98 (90)  **RLA = LaVing area + (4) = 0.51 (91)  **RLA = LaVing	` ′							-				0.99	'		(00)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2							<u> </u>		·		<del>'</del>	10.50	17.00		(90)
Mean intermal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (92)m   18.82   18   19.31   19.72   20.09   20.34   20.41   20.4   20.28   19.81   19.25   18.8   (92)   Apply adjustment to the mean intermal temperature from Table 4e, where appropriate   (93)m   18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (83)   38.5pace heating requirement   Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a   Value   Valu	(90)111=	10	10.22	10.00	19.07	19.5	19.77	19.63	19.63					0.54	<b>¬</b> `´
(92)m										'	LA - LIVIII	g arca + (-	-	0.51	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (83)ms   8.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (93)    8. Space heating requirement to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec    Useful gains, hm:  (94)ms 0.98   0.99   0.98   0.95   0.88   0.72   0.54   0.58   0.81   0.95   0.99   0.99   0.99   (94)    Useful gains, hm:  (95)ms 40.06   44.2.91   471.51   482.82   458.31   368.31   264.38   274.11   367.31   400.57   388.04   382.66   (95)    Monthly average external temperature from Table 8    (96)ms 4.3   4.9   6.5   8.9   11.7   14.8   16.6   16.4   14.1   10.6   7.1   4.2   (98)    Heat loss rate for mean internal temperature, Lm . W = ((39)m x ([93)m x ([9				<u> </u>			ling) = f	LA × T1	+ (1 – fL						
Same   18.82   19	` ′											19.25	18.8		(92)
Set   1 to the mean internal temperature obtained at step   11 of Table   9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table   9a	· · · · · ·														(00)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m 0.99 0.99 0.98 0.95 0.88 0.72 0.54 0.58 0.81 0.96 0.99 0.99 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 40.00.6 442.91 471.51 482.82 458.31 368.31 264.38 274.11 367.31 400.57 388.04 382.66 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, lm, W = (39)m x (93)m x (96)m x (97)m x (98)m x (9	` '					20.09	20.34	20.41	20.4	20.26	19.81	19.25	18.8		(93)
The bilisation factor for gains using Table 9a   Sep   Sep   Oct   Nov   Dec											. —				
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:  (94)m= 0.99 0.99 0.98 0.98 0.95 0.88 0.72 0.54 0.58 0.81 0.95 0.99 0.99 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 400.06 442.91 471.51 482.82 458.31 368.31 264.38 274.11 367.31 400.57 388.04 382.66 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)    (97)m= 1080.82 1046.57 947.57 788.66 609.63 411.49 273.2 288.41 444.14 669.22 888.21 1073.2 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m  (98)m= 506.48 405.66 354.19 22.0 112.58 0 0 0 0 0 199.87 360.12 513.77  Total per year (kWh/year) = Sum(98)sz = 2672.88 (98)  Space heating requirements - Individual heating systems including micro-CHP)  Space heating requirements - Individual heating systems including micro-CHP)  Space heating from main system 1 (202) = 1 - (201) = 1 (202)  Fraction of space heat from space heating system 1 (202) = 1 - (201) = 1 (202)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 3 (202) = 1 - (201) = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1							Jun	.lul	Aun	Sen	Oct	Nov	Dec		
(94)   (94)   (95)   (99)   (99)   (99)   (94)   (94)   (94)   (94)   (95)   (94)   (95)   (94)	L Utilisatio					iviay	Odii	- Oui	7 tag	ОСР	001	1407	DCO		
Useful gains, hmGm , W = (94)m x (84)m (95)m = 400.06	_	ī				0.88	0.72	0.54	0.58	0.81	0.95	0.99	0.99		(94)
(95)m		gains,	hmGm .	W = (94	1)m x (8	 4)m									
(96)me				· ·	<u> </u>		368.31	264.38	274.11	367.31	400.57	388.04	382.66		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)   (97)m=	Monthly	/ avera	age exte	rnal tem	perature	from Ta	able 8								
(97)me   1080.82   1046.57   947.57   788.66   609.63   411.49   273.2   286.41   444.14   669.22   888.21   1073.2   (97)					·			16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m = 506.48	Heat los	ss rate	for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
Space heating requirement in kWh/m²/year   Sum(98)ssv   2672.88   (98)	(97)m= 10	080.82	1046.57	947.57	788.66	609.63	411.49	273.2	286.41	444.14	669.22	888.21	1073.2		(97)
Space heating requirement in kWh/m²/year   Sum(98)s   2672.88   (98)	Space h	heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
Space heating requirement in kWh/m²/year   48.33   (99)	(98)m= 5	506.48	405.66	354.19	220.2	112.58	0	0	0	0	199.87	360.12	513.77		
Space heating:   Fraction of space heat from secondary/supplementary system   Qu20   1 - (201)   =   1   (202)									Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2672.88	(98)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.5 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         506.48 405.66 354.19 220.2 112.58 0 0 0 0 0 199.87 360.12 513.77         60.12 513.77           (211)m = {[(98)m x (204)] } x 100 ÷ (206)         Total (kWh/year) = Sum(211),4.101,=         2858.69 (211)           Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)           Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)	Space h	heatin	g require	ement in	kWh/m²	/year							ĺ	48.33	(99)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.5 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         506.48 (405.66) (354.19) (202) (112.58) 0 0 0 0 0 199.87 (360.12) (513.77)           (211) m = {[(98)m x (204)] } x 100 ÷ (206)         (211)           Space heating fuel (secondary), kWh/month           = [(98)m x (201)] } x 100 ÷ (208)           (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9a. Ener	av rea	uiremer	nts – Indi	vidual h	eating sv	/stems i	ncludina	micro-C	CHP)					
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211)_1.510_112 = 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		· .								<b>,</b>					
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) (204) (204) (205) (206) (208) (	•		•	t from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.5012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of tot	al heati	na from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =		i	1	(204)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_	-										= '
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year		•	•				n evetom	0/-							╡```
Space heating requirement (calculated above)  506.48															
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								Jul	Aug	Sep	Oct	Nov	Dec	kwn/ye	ear
$ (211) \text{m} = \{ [(98) \text{m x } (204)] \ \} \times 100 \div (206) \\ \hline 541.69 \ 433.86 \ 378.81 \ 235.51 \ 120.41 \ 0 \ 0 \ 0 \ 0 \ 213.77 \ 385.16 \ 549.48 \\ \hline \hline                                $		<del>- i</del>	•	· `				0	0	0	100.97	260.12	512 77		
541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>15,1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0							U	U	U	U	199.07	300.12	513.77		
	· · · · —	í			· ` ·										(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	_ 5	541.69	433.86	378.81	235.51	120.41	0	0							<b>¬</b> ,
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $	_								lota	ı (KVVN/yea	ar) =5um(2	(11) <sub>15,1012</sub>	=	2858.69	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	•	•	•		• , .	month									
						_	_	_	0	_	_	_			
	(Z15)M=	U	U	U	U	U	U	U							(245)
Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0 (215)									Tota	(ICVVIII/ y GC	, →Cum(2	-· · · / <sub>15,1012</sub>		U	(213)

#### Water heating Water heating from separate community system: Annual water heating requirement (64)1776.58 kWh/year **Annual totals** kWh/year Space heating fuel used, main system 1 2858.69 Water heating fuel used 2103.94 Electricity for pumps, fans and electric keep-hot central heating pump: (230c)30 boiler with a fan-assisted flue (230e)45 sum of (230a)...(230g) = Total electricity for the above, kWh/year 75 (231)Electricity for lighting 281.06 (232)12a. CO2 emissions - Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year Space heating (main system 1) (211) x 617.48 (261)0.216 (215) x Space heating (secondary) 0.519 0 (263)(219) x Water heating (264)0.216 454.45 (261) + (262) + (263) + (264) =Space and water heating 1071.93 (265)Water heating from community system **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year Electrical energy for heat distribution [(313) x (372)0 0 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)0 Electricity for pumps, fans and electric keep-hot (231) x (267)0.519 38.93 (232) x Electricity for lighting 145.87 (268)0.519 sum of (265)...(271) = Total CO2, kg/year 1256.72 (272)

TER =

(273)

33.39

#### **SAP Input**

#### Property Details: Flat Type B - ASHP

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Living area: 22 m<sup>2</sup> (fraction 0.594)

Front of dwelling faces: North East

#### Opening types:

Window\_05\_08

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_5_01	Manufacturer	Solid	3	3	Metal
Vent_05_03	Manufacturer	Solid			
Vent_05_01	Manufacturer	Solid			
Vent_D5_08	Manufacturer	Solid			
Window_05_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_05_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_05_08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D_5_01	mm	0	0	1	2.13	1
Vent_05_03	mm	0	0	1	0.94	1
Vent_05_01	mm	0	0	1	0.75	1
Vent_D5_08	mm	0	0	1	0.68	1
Window_05_02	6mm	0.7	0.4	1.2	2	1
Window_05_01	6mm	0.7	0.4	1.2	1.04	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

0.7

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_5_01		5_01	North East	0	0
Vent_05_03		5_05	South West	0.57	1.65
Vent_05_01		5_01	North East	0.623	1.2
Vent_D5_08		5_05	South West	0.57	1.2
Window_05_02		5_05	South West	1.21	1.65
Window_05_01		5_01	North East	1.2	0.863
Fanlight		5_01	North East	1.01	0.315
Window_05_08		5_05	South West	1.21	1.2

0.4

1.2

1.45

1

6mm

# **SAP Input**

Overshading:	Average or unknown

Opaque Elements:							
Type: Gr External Elements	oss area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
5_01	15.481	4.24	11.24	0.13	0	False	N/A
5_02	2.039	0	2.04	0.13	0	False	N/A
5_03	2.874	0	2.87	0.13	0	False	N/A
5_05	18.386	5.07	13.32	0.13	0	False	N/A
R_01	35	0	35	0.1	0		N/A
Internal Elements							
Party Elements							
Thermal bridges:							
Thermal bridges:		No info	rmation on therm	al bridging (y=0.	15) (y =0.15)		
Ventilation:							
Pressure test:		Yes (As	designed)				
Ventilation:			ed with heat recov	very			
		Numbe	r of wet rooms: K	itchen + 1			
		Ductwo	rk: Insulation, rig	jid			
		Approve	ed Installation Sc	heme: False			
Number of chimneys	:	0					
Number of open flue	s:	0					
Number of fans:		0					
Number of passive s		0					
Number of sides she	Itered:	0					
Pressure test:		2.5					
Main heating system:							
Main heating system	:	Electric Standar	underfloor heatir	ng			
			ectricity				
			urce: SAP Tables				
			ble: 425				
				diately below floo	r coverina		
				s in insulated tim	•		
			heating pump : 2				
			•	: Design flow ten	nperature >45°C		
		Room-s			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
		Boiler ir	nterlock: Yes				
Main heating Control:							
Main heating Control	l:	-	nmer and room tl code: 2704	hermostat			
Secondary heating sys	stem:	CONTROL	COUC. 2704				
Secondary heating sy		None					
Water heating:							
Water heating:		952 Fro	m DHW-only con	nmunity scheme			
			•	•	ınity scheme - hea	t pump	
				•	ion 1, efficiency 32		
				ated, medium ter	•		
			water cylinder				
		Solar pa	anel: False				
Others:							
Electricity tariff:		Standar	d Tariff				
In Smoke Control Are	ea:	Yes					

## **SAP Input**

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

		Hear F	Details:						
	A 1	USELL					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Hame.		Property				SHP	VCISIO	71. 1.0.4.20	
Address :				j					
1. Overall dwelling dime	ensions:								
Ground floor		Are	a(m²)	las		ight(m)	7(0-)	Volume(m³	<u>-</u>
	-) · (41-) · (4 -) · (4 -) · (4 -) ·			(1a) x	3	3.09	(2a) =	108.15	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	in) [	35	(4)		n (5 )	(a.)		_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	108.15	(5)
2. Ventilation rate:	main seconda	arv	other		total			m³ per hou	r
North an of all incomes	heating heating						40 =		_
Number of chimneys	0 + 0	_	0	] = [	0			0	(6a)
Number of open flues	0 + 0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				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	0		÷ (5) =	0	(8)
'	neen carried out or is intended, proce			continue fi			. (0) –	0	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of resent, use the value corresponding			•	ruction			0	(11)
deducting areas of openii	-	to the grea	ici wan arc	a (anci					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stripped		0.05 10.6	) (4.4) 4	1001			0	(14)
Window infiltration			0.25 - [0.2		_	. (15) -		0	(15)
Infiltration rate	aEO expressed in subject that	oo nor h			12) + (13)		oroo	0	(16)
•	q50, expressed in cubic metality value, then $(18) = [(17) \div 20]$	-	•	•	ietre or e	rivelope	area	2.5	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$
	es if a pressurisation test has been de				is beina u	sed		0.12	(18)
Number of sides sheltere			<b>5</b>	,	3			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
·				·				I	

Adjusted infilti	ration rate	(allowi	ng for sh	nelter an	id wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	se	!	!	!		!		
If mechanic			anadin N. (O	)OF) (OO.	-) <b></b>		\  <b> </b>		\ (00-\			0.5	(23a
If exhaust air h		0 11	, ,	, (	, (		,, .	`	) = (23a)			0.5	(23b
If balanced wit		-	-	_					<b>.</b>		4 (00.)	75.65	(230
a) If balance	ed mechai			with he	at recov	<del>,                                    </del>	HR) (24a   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24			0.26		0.27	J	(240
b) If balance						<del>, , ,</del>	<del></del>	<del>í `</del>	<del>r ´     `</del>		Ι ,	1	(24k
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(241
c) If whole h	nouse extr m < 0.5 × 1								5 v (23h	۸			
(24c)m = 0	0.5 2	0	0	0	0	0	0 = (221	0	0	0	0	1	(240
d) If natural	L			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				J	
,	m = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	) or (24h	o) or (24	c) or (24	d) in bo	x (25)	!		•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	as and had	et loop r	oromot	ori								4	
ELEMENT	Gross area (	3	Openin m	ıgs	Net Ar A ,r		U-val		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	X	1		2.13				(26)
Doors Type 2					0.94	x	1	<b>=</b> i	0.94	=			(26)
Doors Type 3					0.75	x		_ :		=			(26)
Doors Type 4							1	=	0.75				
Windows Type					0.68	X	1	= [ = [	0.75	$\exists$			(26)
	e 1							= [	0.68				` '
• •					2	x1	1/[1/( 1.2 )+	= [	0.68 2.29				(27)
Windows Type	e 2				1.04	x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27) (27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4	_	4 24	$\neg$	2 1.04 0.32 1.45	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4	극	4.24		2 1.04 0.32 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0 0 5.07		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements,	m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	as given in	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [ ]	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	s given in	paragrapl		(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both season between the season both season between season between season between season between season sea	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m² ws, use e ides of in S (A x	0 5.07 0 effective winternal walk	indow U-va	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (29) (29) (29)

can he u	usad insta	ad of a de	tailed calc	ulation										
					using Ap	pendix I	<						11.07	(36)
	J	`	,		= 0.05 x (3	•	•						11.07	(00)
	abric hea	0 0		, ,	,	,			(33) +	(36) =			28.41	(37)
Ventila	tion hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38)
Heat tr	ansfer c	oefficier	nt, W/K		-	-	-		(39)m	= (37) + (	38)m		-	
(39)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		
Heat Ic	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	: Sum(39) <sub>1</sub> - (4)	12 /12=	37.63	(39)
(40)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		
Numbe	er of day	s in mor	nth (Tab	le 1a)		-	-		,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			_		-	-	-		-	-			_	
4. Wa	ter heat	ing ener	rgy requi	rement:								kWh/y	ear:	
if TF		0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		.28	]	(42)
Annua Reduce	the annua	e hot wa Il average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target c		1.62	]	(43)
not more	. 1				<u> </u>			Ι	0	0-4	Nan		1	
Hot wate	Jan er usage ir	Feb i litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	]	
(44)m=	71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08	1	
(1.7,11											ım(44) <sub>112</sub> :	ļ	775.4	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600						
(45)m=	105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08	]	
										Total = Su	ım(45) <sub>112</sub> :	=	1016.67	(45)
ı				,		· · ·		boxes (46	,		_	•	٦	
(46)m= Water	15.81 storage	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31	]	(46)
	_		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0	1	(47)
•		,			/elling, e		_						1	, ,
	•	-			_			mbi boil	ers) ente	er '0' in (	(47)			
	storage												-	
,					or is kno	wn (kWł	n/day):					0	<u> </u>	(48)
•			m Table									0	<u> </u>	(49)
			storage	-	ear loss fact	or is not	known:	(48) x (49)	) =		1	10	]	(50)
Hot wa	ter stora	age loss		om Tabl	le 2 (kW						0	.02	]	(51)
	e factor	-		JII 7.U							1	.03	1	(52)
			m Table	2b							-	).6	1	(53)
													_	

Energy lost from water storage, kWh/year	(47) y (54) y (52) y (52) -			(54)
Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	= 1.0		(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	1.0		(33)
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32	2.01 30.98	32.01	(56)
If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50)$ – $(H11)]$ ÷				()
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32	2.01 30.98	32.01	(57)
Primary circuit loss (annual) from Table 3	! !		)	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div$	365 × (41)m			
(modified by factor from Table H5 if there is solar water hea	` '	ermostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23	3.26 22.51	23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (4	1)m			
(61)m= 0 0 0 0 0 0	0 0	0 0	0	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)$	)m + (46)m +	 (57)m + (59)m +	(61)m
(62)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	1 128.3 127.39 14	11.39 147.5	157.36	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar cor	ntribution to wate	r heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)			
(63)m= 0 0 0 0 0 0	0 0	0 0	0	(63)
Output from water heater				
(64)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	1 128.3 127.39 14	11.39 147.5	157.36	
	Output from water	heater (annual) <sub>1.</sub>	12 1667.	51 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)	m + (61)m] + 0.8 x [(4	46)m + (57)m	+ (59)m ]	
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38	68.5 67.36 72	2.86 74.05	78.16	(65)
include (57)m in calculation of (65)m only if cylinder is in the	e dwelling or hot water	r is from com	munity heating	
5. Internal gains (see Table 5 and 5a):				
Martal alla asias (Tall E) Marta				
ivietabolic gains (Table 5), Watts				
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep (	Oct Nov	Dec	
	<del>                                     </del>	Oct Nov 6.84 76.84	Dec 76.84	(66)
Jan Feb Mar Apr May Jun Jul	76.84 76.84 76			(66)
Jan   Feb   Mar   Apr   May   Jun   Jul	76.84 76.84 76 also see Table 5			(66) (67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5	6.84     76.84       1.65     25.27	76.84	` ,
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84         76.84         76.84         76.84         76.84         76.84         76.84           Lighting gains (calculated in Appendix L, equation L9 or L9a),         (67)m=         26.21         23.28         18.94         14.34         10.72         9.05         9.78	76.84 76.84 76 also see Table 5 12.71 17.05 21 .13a), also see Table	6.84     76.84       1.65     25.27	76.84	` ,
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  120.23 124.5 13	6.84 76.84 1.65 25.27 5	76.84	(67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5	6.84 76.84 1.65 25.27 5	76.84	(67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5	6.84 76.84 1.65 25.27 5 33.57 145.02	76.84 26.94 155.79	(67) (68)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table 3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84 1.65 25.27 5 33.57 145.02	76.84 26.94 155.79	(67) (68)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table 3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96	76.84 26.94 155.79	(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96	76.84 26.94 155.79	(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0	76.84 26.94 155.79 43.96	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5 43.96 43.96 43 0 0 0	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0	76.84 26.94 155.79 43.96	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5 43.96 43.96 43 0 0 0	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43  0 0  3 -51.23 -51.23 -5  92.07 93.56 97  m + (68)m + (69)m + (70)m	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43  0 0  3 -51.23 -51.23 -5  92.07 93.56 97  m + (68)m + (69)m + (70)m	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85  m + (71)m + (72)	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	1.04	x	11.28	x	0.4	x	0.7	=	2.28	(75)
Northeast 0.9x	0.77	X	0.32	x	11.28	x	0.4	х	0.7	] =	0.7	(75)
Northeast 0.9x	0.77	X	1.04	x	22.97	x	0.4	x	0.7	] =	4.63	(75)
Northeast 0.9x	0.77	X	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast 0.9x	0.77	X	1.04	x	41.38	x	0.4	x	0.7	] =	8.35	(75)
Northeast 0.9x	0.77	X	0.32	x	41.38	x	0.4	x	0.7	] =	2.57	(75)
Northeast 0.9x	0.77	X	1.04	x	67.96	x	0.4	х	0.7	] =	13.71	(75)
Northeast 0.9x	0.77	X	0.32	x	67.96	x	0.4	x	0.7	] =	4.22	(75)
Northeast 0.9x	0.77	X	1.04	x	91.35	x	0.4	x	0.7	] =	18.43	(75)
Northeast 0.9x	0.77	X	0.32	x	91.35	x	0.4	x	0.7	] =	5.67	(75)
Northeast 0.9x	0.77	X	1.04	x	97.38	x	0.4	x	0.7	] =	19.65	(75)
Northeast 0.9x	0.77	X	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast 0.9x	0.77	X	1.04	x	91.1	x	0.4	х	0.7	] =	18.38	(75)
Northeast 0.9x	0.77	X	0.32	x	91.1	x	0.4	х	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast 0.9x	0.77	X	0.32	x	72.63	x	0.4	х	0.7	] =	4.51	(75)
Northeast 0.9x	0.77	X	1.04	x	50.42	x	0.4	x	0.7	] =	10.17	(75)
Northeast 0.9x	0.77	X	0.32	x	50.42	x	0.4	x	0.7	] =	3.13	(75)
Northeast 0.9x	0.77	X	1.04	x	28.07	x	0.4	x	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	0.32	x	28.07	x	0.4	x	0.7	] =	1.74	(75)
Northeast 0.9x	0.77	X	1.04	x	14.2	x	0.4	x	0.7	j =	2.86	(75)
Northeast 0.9x	0.77	X	0.32	x	14.2	x	0.4	x	0.7	j =	0.88	(75)
Northeast 0.9x	0.77	X	1.04	x	9.21	x	0.4	x	0.7	] =	1.86	(75)
Northeast 0.9x	0.77	X	0.32	x	9.21	x	0.4	x	0.7	] =	0.57	(75)
Southwest <sub>0.9x</sub>	0.77	X	2	x	36.79		0.4	x	0.7	] =	14.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	36.79		0.4	x	0.7	] =	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	62.67		0.4	x	0.7	] =	24.32	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	62.67		0.4	x	0.7	] =	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	х	85.75		0.4	x	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	х	85.75		0.4	x	0.7	<b>=</b>	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	106.25	ĺ	0.4	x	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	106.25		0.4	x	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	х	119.01		0.4	x	0.7	<b>=</b>	46.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	119.01	ĺ	0.4	x	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	118.15		0.4	x	0.7	] =	45.85	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	118.15		0.4	x	0.7	j =	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	113.91		0.4	x	0.7	j =	44.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.45	x	113.91		0.4	x	0.7	] =	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	104.39	j	0.4	x	0.7	] =	40.51	(79)
				-		-				-		

					_										
Southwest <sub>0.9x</sub>	0.77	×	1.4	15	x	10	04.39			0.4	X	0.7	=	29.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	2	2	x	9	2.85			0.4	x	0.7	=	36.03	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	9	2.85			0.4	x	0.7	=	26.12	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	2	x	6	9.27	]		0.4	x [	0.7	=	26.88	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	6	9.27	] [		0.4	x [	0.7	=	19.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	2	x	4	4.07	]		0.4	x [	0.7	=	17.1	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	4	4.07	]		0.4	x [	0.7	=	12.4	(79)
Southwest <sub>0.9x</sub>	0.77	х	2	2	x	3	1.49			0.4	x [	0.7	=	12.22	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	3	1.49			0.4	x	0.7	=	8.86	(79)
				_	_										
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m= 27.61	48.02	68.33	89.06	103.78	10	4.79	100.3	89.0	05	75.46	53.78	33.25	23.51		(83)
Total gains –	internal a	and solar	· (84)m =	= (73)m	+ (8	33)m	, watts					-		_	
(84)m= 392.92	410.6	419.2	422.05	418.96	40	3.69	389.45	383.	.64	380.16	376.5	375.97	380.88		(84)
7. Mean inte	rnal temp	perature	(heating	season	)										
Temperature			,		<i>'</i>	area f	from Tab	ole 9,	, Th	1 (°C)				21	(85)
Utilisation fa	•	٠.			_					, ,					
Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(86)m= 0.88	0.86	0.82	0.76	0.66	0	.52	0.39	0.4	<del>-</del>	0.58	0.74	0.84	0.88		(86)
Mean interna	al temper	ature in	livina ar	oa T1 /f/	سال	w sto	ns 3 to 7	I 7 in T	able	. 0c)		1	<u>I</u>	_	
(87)m= 19.45	19.62	19.91	20.29	20.62		0.86	20.95	20.9		20.81	20.42	19.9	19.42	1	(87)
` '		ı		<u> </u>				<u> </u>				1 .0.0			(- )
Temperature	<del></del>	· · ·		1	_	$\overline{}$			$\overline{}$	<u> </u>	00.40	1 00 40	00.40	7	(00)
(88)m= 20.45	20.45	20.45	20.46	20.46		0.47	20.47	20.4	47	20.47	20.46	20.46	20.46		(88)
Utilisation fa	<del></del>				_	<u> </u>		9a)				,		7	
(89)m= 0.87	0.85	0.81	0.74	0.64	0	.49	0.35	0.3	37	0.55	0.73	0.83	0.88		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing <sup>·</sup>	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)				
(90)m= 19	19.16	19.45	19.82	20.14	20	0.37	20.44	20.4	44	20.31	19.95	19.45	18.97		(90)
										f	LA = Livi	ng area ÷ (	4) =	0.63	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	llinc	a) = fl	_A × T1	+ (1 -	– fL	A) x T2					
(92)m= 19.28	19.45	19.74	20.12	20.44	ī	0.68	20.76	20.		20.62	20.25	19.73	19.26	7	(92)
Apply adjust	ment to t	he mear	interna	l temper	ı atur	re fro	m Table	4e, v	<u> </u>	re appro	priate	Į		_	
(93)m= 19.28	19.45	19.74	20.12	20.44	_	0.68	20.76	20.		20.62	20.25	19.73	19.26	]	(93)
8. Space he	ating requ	uirement													
Set Ti to the	mean int	ternal ter	nperatu	re obtair	ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
the utilisation	n factor fo	or gains	using Ta	able 9a								,		7	
Jan	Feb	Mar	Apr	May	L	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fa	<del></del>			_	_							1	ı	٦	(0.1)
(94)m= 0.85	0.83	0.79	0.73	0.64		0.5	0.38	0.4	4	0.56	0.72	0.81	0.86		(94)
Useful gains	1	· `	<u> </u>	·	1 00	0.40	440.5	154	ا ۵۵	044.0	070.4	1 004.05	000.40	7	(05)
(95)m= 333.77		332.77	308.76	267.09	<u> </u>	2.43	146.5	151.	.83	211.2	270.1	304.95	326.49		(95)
Monthly ave	rage exte	1	i –	ı	_		16.6	16.	<u>, I</u>	111	10.6	7.4	4.0	1	(96)
` '		6.5	8.9	11.7	<u> </u>	4.6	16.6			14.1	10.6	7.1	4.2	J	(30)
Heat loss ra (97)m= 575.94	1	an intern	422.4	328.31	1	, VV =	=[(39)m ] 153.97	X [(93	<del>_</del> т	- (96)M 242.73	J 362.28	477.18	572.03	1	(97)
(37)111= 373.94	337.01	303.02	722.4	320.31		. <del>-1</del> .01	133.81	100.	.03	۷٦۷.۱۵	JUZ.20	7//.10	312.03	J	(07)

Space heating requi	rement fo	or each r	month, k\	Vh/mon	nth = 0.02	24 x [(97)	)m – (95	5)m] x (4	1)m			
(98)m= 180.17 145.96	T	81.82	45.55	0	0	0	0	68.58	124.01	182.69		
	-				<u>-</u>	Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	957.53	(98)
Space heating requi	rement ir	n kWh/m	²/year								27.36	(99)
9a. Energy requireme	ents – Ind	dividual h	neating sy	/stems i	including	micro-C	CHP)					
Space heating:	at from a	o o o o o d o o	a /aunala	montor	, avetam					ı	0	(201)
Fraction of space he Fraction of space he				memary	-	(202) = 1 -	- (201) =				1	(202)
Fraction of total hea		-	, ,			(204) = (204)	, ,	(203)] =			1	(204)
Efficiency of main sp	•	-				, , ,	, .	, ,,			100	(206)
Efficiency of second				svster	n. %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	J` ′
Space heating requi		<u> </u>	<u> </u>		<b></b>	7.0.9			1.101			••
180.17 145.96	128.75	81.82	45.55	0	0	0	0	68.58	124.01	182.69		
$(211)$ m = {[(98)m x (2		<del> </del>	06)				1	1		1	l	(211)
180.17 145.96	128.75	81.82	45.55	0	0	0 Tota	0 L (k\\/b/vo	68.58	124.01 211) <sub>15.1012</sub>	182.69		7(044)
Space heating fuel (	cocondo	nı) k\//h	/month			TOla	ii (KVVII/yea	ar) =Surri(	ZII) <sub>15,1012</sub>	<u>-</u>	957.53	(211)
$= \{[(98)m \times (201)]\} \times$		• /	/111011111									
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		
Water heating Water heating from s Annual water heatin	•		ity systen	า:		Tota	ii (kvvn/yea	ar) =Sum(.	215) <sub>15,101</sub>	.= 	1667.51	](215) ](64)
Fraction of heat from	•		<b>5</b>							[		] <sup>(04)</sup> ] <sub>(303a</sub>
		•		ar baati	ina						1	╡`
Factor for charging i			•		•					ļ	1	(305)
Distribution loss fact	,	: 12C) 101	r commu	nty nea	iting syste	em	(0.4) (0.	00 ) (00	E) (000)		1.1	(306)
Water heat from CH							, , ,	, ,	5) x (306)	ļ	1834.27	(310a
Electricity used for h	eat distri	bution				0.01	× [(307a)		+ (310a)	ı	18.34	(313)
Annual totals Space heating fuel us	sed, mair	n system	1					k	Wh/yeaı	r I	kWh/year 957.53	1
Electricity for pumps,	•	•		t						l		J
mechanical ventilation			•		input fron	n outside	Э			138.54		(230a
Total electricity for the	e above,	kWh/yea	ar .		·	sum	of (230a).	(230g) =	:		138.54	(231)
Electricity for lighting	,	,									185.19	] (232)
10a. Fuel costs - inc	ividual h	eating sv	/stems:_							l	755	J, ,
				_				F	\u!		Fuel O (	
				Fu kV	<b>iel</b> Vh/year			Fuel P (Table			Fuel Cost £/year	
Space heating - main	system	1		(21	1) x			13.	19	x 0.01 =	126.3	(240)

Space heating - main system 2	(213) x	0 x 0.01	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	0 (242)
Water heating from CHP	(310a) x	4.24 × 0.01	= 77.77 (342a)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	18.27 (249)
(if off-peak tariff, list each of (230a) to (230g) s	separately as applicable	· · · ·	
Energy for lighting	(232)	13.19 × 0.01	24.43 (250)
Additional standing charges (Table 12)			60 (251)
Appendix Q items: repeat lines (253) and (254	) as needed		
Total energy cost (245)	.(247) + (250)(254) =		306.77 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	x (256)] ÷ [(4) + 45.0] =		1.61 (257)
SAP rating (Section 12)			77.53 (258)
12a. CO2 emissions – Individual heating syst	tems including micro-Ch	<del>I</del> P	
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	496.96 (261)
Space heating (secondary)	(215) x	0.510 =	0 (263)
3 (***** ),	(= :0) //	0.519	0 (203)
Water heating from community system	(2.6)	0.519	0 (200)
	E	nergy Emission facto	or Emissions
	E	0.319	
	E k' neating (not CHP)	nergy Emission facto	er Emissions kg CO2/year
Water heating from community system  CO2 from other sources of space and water h	E k heating (not CHP) If there is CHP using two fu	nergy Emission facto Wh/year kg CO2/kWh	r Emissions kg CO2/year
Water heating from community system  CO2 from other sources of space and water to Efficiency of heat source 1 (%)	E k heating (not CHP) If there is CHP using two fu	nergy Emission factor kg CO2/kWh els repeat (363) to (366) for the second for the	or Emissions kg CO2/year
Water heating from community system  CO2 from other sources of space and water to Efficiency of heat source 1 (%)  CO2 associated with heat source 1	E k neating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x	nergy Emission factor kg CO2/kWh els repeat (363) to (366) for the second for the	er Emissions kg CO2/year  uel 329 (367a) = 289.36 (367)
Water heating from community system  CO2 from other sources of space and water to Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  S (363)	nergy Emission factor kg CO2/kWh els repeat (363) to (366) for the second for the	er Emissions kg CO2/year  uel 329 (367a) = 289.36 (367) = 9.52 (372)
Water heating from community system  CO2 from other sources of space and water to Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  S (363)	nergy Emission factor kg CO2/kWh els repeat (363) to (366) for the second for the	r Emissions kg CO2/year  uel 329 (367a) = 289.36 (367) = 9.52 (372) = 298.88 (373)
Water heating from community system  CO2 from other sources of space and water to Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-he	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x	nergy Emission factor kg CO2/kWh els repeat (363) to (366) for the second for x 100 ÷ (367b) x 0.52  0.52  (366) + (368)(372)	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267)
CO2 from other sources of space and water is Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems Electricity for pumps, fans and electric keep-he Electricity for lighting	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267) 96.11 (268)
CO2 from other sources of space and water is Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems Electricity for pumps, fans and electric keep-he Electricity for lighting Total CO2, kg/year	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267) 96.11 (268) 963.85 (272)
CO2 from other sources of space and water is Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems Electricity for pumps, fans and electric keep-he Electricity for lighting Total CO2, kg/year CO2 emissions per m²	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267) 96.11 (268) 963.85 (272) 27.54 (273)
Water heating from community system  CO2 from other sources of space and water is Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-he  Electricity for lighting  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)	E k' heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x  (232) x	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267)  96.11 (268)  963.85 (272)  27.54 (273)  84 (274)
Water heating from community system  CO2 from other sources of space and water is Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-he  Electricity for lighting  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267) 96.11 (268) 963.85 (272) 27.54 (273)
Water heating from community system  CO2 from other sources of space and water is Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-he  Electricity for lighting  Total CO2, kg/year  CO2 emissions per m²  El rating (section 14)	Energy  Ek  (307b)+(310b)]  [(313) x  (363)	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) 289.36 (367) 29.52 (372) 298.88 (373)  71.9 (267) 96.11 (268) 963.85 (272) 27.54 (273) 84 (274)  P. Energy
CO2 from other sources of space and water is Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems Electricity for pumps, fans and electric keep-he Electricity for lighting Total CO2, kg/year CO2 emissions per m² El rating (section 14)  13a. Primary Energy	heating (not CHP) If there is CHP using two fu  [(307b)+(310b)]  [(313) x  (363)  (231) x  (232) x   Energy kWh/year	mergy Emission factor kg CO2/kWh  els repeat (363) to (366) for the second for th	r Emissions kg CO2/year  289.36 (367) = 289.36 (367) = 9.52 (372) = 298.88 (373)  71.9 (267)  96.11 (268)  963.85 (272)  27.54 (273)  84 (274)  P. Energy kWh/year

Water heating from community system

			Energy kWh/year	Primary factor			nissions Vh/year	
CO2 from other sources of space and water heati Efficiency of heat source 1 (%)	• •		) g two fuels repeat (363) to	(366) for the s	second fo	uel	329	(367a)
Energy associated with heat source 1	I	(307b)+	(310b)] x 100 ÷ (367b) x	3.07		=	1711.61	(367)
Electrical energy for heat distribution			[(313) x	2.92		=	53.56	(372)
Total Energy associated with community systems			(363)(366) + (368)(372	2)		=	298.88	(373)
Electricity for pumps, fans and electric keep-hot	(231)	X		3.07	=		425.32	(267)
Electricity for lighting	(232)	X		0	=		568.52	(268)
'Total Primary Energy			sum of (265	)(271) =			5698.61	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =	:			162.82	(273)

		User D	otaile: -						
Access	Adam D'UU						OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Stroma Softwa	-				019516 on: 1.0.4.25	
Software Name.		Property A				SHP	VEISIO	ni. 1.0.4.25	
Address :									
1. Overall dwelling dime	ensions:								
0 10		Area				ight(m)	<b>.</b>	Volume(m³)	_
Ground floor			35	(1a) x	3	.09	(2a) =	108.15	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	35	(4)					
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	108.15	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	= [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	x ′	10 =	0	(7a)
Number of passive vents				Ē	0	x '	10 =	0	(7b)
Number of flueless gas fi	res			Ė	0	X	40 =	0	(7c)
				L					
							Air ch	anges per ho	ur
•	ys, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)
	een carried out or is intended, procee	ed to (17), o	therwise o	ontinue fr	om (9) to	(16)			7(0)
Number of storeys in the Additional infiltration	ne dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 for	masonr	y constr	uction	[(0)	TJAOTT —	0	(11)
	resent, use the value corresponding t	to the greate	er wall area	a (after					<b>」</b> ` ′
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (spala	d) else	enter N					(12)
If no draught lobby, en	,	7.1 (Seale	u), eise	enter o				0	(13)
• ,	s and doors draught stripped							0	(14)
Window infiltration	3		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	ur per so	quare m	etre of e	envelope	area	2.5	(17)
•	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a deg	ıree air pei	meability	is being u	sed			7(40)
Number of sides sheltere Shelter factor	eu		(20) = 1 - [	0.075 x (1	[9)] <b>=</b>			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	_						ļ	V2	<b>」</b> ` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2\m ÷ 1								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
(-20)	1.00 0.00	1 3.50	3.02	•	I	L <u>-</u>		I	

Adjusted infilti	ration rate	(allowi	ng for sh	nelter an	id wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	se	!	!	!		!		
If mechanic			anadin N. (O	)OF) (OO.	-) <b></b>		\  <b> </b>		\ (00-\			0.5	(23a
If exhaust air h		0 11	, ,	, (	, (		,, .	`	) = (23a)			0.5	(23b
If balanced wit		-	-	_					<b>.</b>		4 (00.)	75.65	(230
a) If balance	ed mechai			with he	at recov	<del>,                                    </del>	HR) (24a   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24			0.26		0.27	J	(240
b) If balance						<del>, , ,</del>	<del></del>	<del>í `</del>	<del>r ´     `</del>		Ι ,	1	(24k
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(241
c) If whole h	nouse extr m < 0.5 × 1								5 v (23h	۸			
(24c)m = 0	0.5 2	0	0	0	0	0	0 = (221	0	0	0	0	1	(240
d) If natural	L			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				J	
,	m = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	) or (24h	o) or (24	c) or (24	d) in bo	x (25)	!		•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	as and had	et loop r	oromot	ori								4	
ELEMENT	Gross area (	3	Openin m	ıgs	Net Ar A ,r		U-val		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	X	1		2.13				(26)
Doors Type 2					0.94	x	1	<b>=</b> i	0.94	=			(26)
Doors Type 3					0.75	x		_ :		=			(26)
Doors Type 4							1	=	0.75				
Windows Type					0.68	X	1	= [ = [	0.75	$\exists$			(26)
	e 1							= [	0.68				` '
• •					2	x1	1/[1/( 1.2 )+	= [	0.68 2.29				(27)
Windows Type	e 2				1.04	x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27) (27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4	_	4 24	$\neg$	2 1.04 0.32 1.45	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4	극	4.24		2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0 0 5.07		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements,	m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	as given in	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	s given in	paragrapl		(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both season between season both season between season between season between season between season between season between season sea	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m² ws, use e ides of in S (A x	0 5.07 0 effective winternal walk	indow U-va	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13 0.13		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (29) (29) (29)

n be u														
	Ū	`	,		using Ap	•	K						11.07	(36
	of therma abric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			20.44	(37
		at loss ca	alculated	l monthly	V						25)m x (5)		28.41	(3/
Jiilia	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38
•	ansfer c	coefficier	nt M/K		<u> </u>	<u> </u>	!	ļ	(39)m	= (37) + (37)	38)m		l	
9)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		
,					<u> </u>	<u> </u>	!	ļ	,	L Average =	Sum(39) <sub>1</sub> .	12 /12=	37.63	(3
eat lo	ss para	meter (F	ILP), W	m²K					(40)m	= (39)m ÷	(4)			
0)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		_
ımhe	er of day	s in mor	nth (Tah	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.08	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
,						<u> </u>	<u> </u>	<u> </u>			<u> </u>		l	
L Wa	ter heat	ting ener	av regui	rement:								kWh/ye	ear:	
. ,,	nor noat	ing ono.	gyroqui	TOTTOTIC.								TXVVIII y X	Jan.	
		ipancy, I		[4 0)(0		) 40 v /TI	-	\2\1 · 0 (	0042 v /	FFA 40		28		(4
:f T [	A . 10 (				(-() ()()(),7	149 X ( ) F	-A - I.S 9	17 II + II I	JULO X L	IFA - IS.				
	A > 13.9 A £ 13.9		+ 1.76 X	[ι σχρ	( 0.0000	, 10 x (11	71 1010	<i>)</i> _/] . o.(	(		.9)			
if TF nnual	A £ 13.9 Laverag	9, N = 1 e hot wa	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		64	.62		(4
if TF nnual educe	A £ 13.9 l averag the annua	9, N = 1 e hot wa al average	ater usaç hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed		+ 36		64	.62		(4
if TF nnual duce	A £ 13.9 l averag the annua e that 125	9, N = 1 e hot wa al average litres per p	ater usaç hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is thot and co	erage = designed ld)	(25 x N) to achieve	+ 36 a water us	se target o	64 f	Г	]	(4
if TF nnual educe t more	A £ 13.9 l averag the annua e that 125 Jan	9, N = 1 le hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed ld) Jul	(25 x N) to achieve	+ 36		64	.62	]	(4
if TF nnual duce t more	A £ 13.9 I averag the annua that 125  Jan  r usage ir	P, N = 1 e hot want average litres per per per per per per per per per per	nter usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from	erage = designed ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	se target o	Nov	Dec	]	(4
if TF nnual duce t more	A £ 13.9 l averag the annua e that 125 Jan	9, N = 1 le hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 63.32	Oct	Nov 68.49	Dec 71.08	775 4	
if TF nnual educe t more of wate	A £ 13.9 I averag the annua e that 125  Jan er usage ir	P, N = 1 The hot was all average litres per proper litres per proper litres per litres per 68.49	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 63.32	es per da 5% if the d vater use, I May Vd,m = fa 60.74	ay Vd,av Iwelling is hot and co Jun ctor from 1	erage = designed Id)  Jul Table 1c x  58.16	(25 x N) to achieve Aug (43)	+ 36 a water us Sep 63.32	Oct  65.91  Total = Su	Nov  68.49  m(44) <sub>112</sub> =	71.08	775.4	
if TF nnual educe t more t wate l)m=	A £ 13.9 I averag the annua e that 125  Jan er usage ir	P, N = 1 The hot was all average litres per proper litres per proper litres per litres per 68.49	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 63.32	es per da 5% if the d vater use, I May Vd,m = fa 60.74	ay Vd,av Iwelling is hot and co Jun ctor from 1	erage = designed Id)  Jul Table 1c x  58.16	(25 x N) to achieve Aug (43) 60.74	+ 36 a water us Sep 63.32	Oct  65.91  Total = Su	Nov  68.49  m(44) <sub>112</sub> =	71.08	775.4	
if TF innual educe t more of wate  1)m= aergy 0  5)m=	A £ 13.9 A £ 13.9 A experience that 125  Jan The rusage in 71.08  content of 105.41	P, N = 1 The hot was all average litres per per per litres per per ferman formal forma	Mar 65.91  used - cale	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av liwelling is that and co  Jun ctor from 7  58.16  190 x Vd,r  68.67	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74  73.02	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49 m(44) <sub>112</sub> = ables 1b, 1	71.08 = c, 1d) 102.08	775.4	(4
if TF innual educe t more of wate  1)m= aergy 0  5)m=	A £ 13.9 A £ 13.9 A experience that 125  Jan The rusage in 71.08  content of 105.41	P, N = 1 The hot was all average litres per per per litres per per ferman formal forma	Mar 65.91  used - cale	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av liwelling is that and co  Jun ctor from 7  58.16  190 x Vd,r  68.67	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94	71.08 = c, 1d) 102.08		(4
if TF innual duce t more t wate  ergy c ergy c innstant	A £ 13.9 A verage the annual at that 125  Jan T1.08  content of 105.41  taneous w  15.81	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per per per per per per per per per	Mar 65.91  used - cale	ge in litre usage by day (all w Apr ach month 63.32 culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av liwelling is that and co  Jun ctor from 7  58.16  190 x Vd,r  68.67	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74  73.02	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94	71.08 = c, 1d) 102.08		(4
if TF if TF innual iduce t more t wate int wate is in metant is in metant ater ater	A £ 13.9 A £ 13.9 A verage the annual enthat 125 A Jan A Table 1.08 A	P, N = 1 He hot was all average litres per per litres per per litres per per litres per per litres per per litres per per litres per per litres per per litres per li	Mar day for each of the state o	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no	es per da $5\%$ if the of the following sets and $5\%$ if the of the following sets and $5\%$ if the original sets and $5\%$ in the following sets and $5\%$ in	ay Vd,av lwelling is hot and co  Jun  ctor from 5  58.16  190 x Vd,r  68.67  r storage),	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/more  73.89  1 to (61)  11.08	Oct  65.91  Total = Su  86.12  Total = Su  12.92	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		(4
if TF if TF innual induce it more it water into the	A £ 13.9 I average the annual enthat 125  Jan 71.08  content of 105.41  storage enthat 125  taneous w 15.81  storage enthat 125	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per per per per per per per per per	Mar Mar 65.91  used - calc 95.13  ng at point 14.27	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no	es per da 5% if the of vater use, I  May Vd,m = fact 60.74  onthly = 4.  79.58  o hot water 11.94  olar or W	ay Vd,av lwelling is hot and co  Jun ctor from 7 58.16  190 x Vd,r 68.67  r storage), 10.3	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/more  73.89  1 to (61)  11.08	Oct  65.91  Total = Su  86.12  Total = Su  12.92	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	71.08 = c, 1d) 102.08		(4)
if TF innual duce t more t wate t wate t)m= mstant ater orage	A £ 13.9 I average the annual enthat 125 I Jan Transperies Transperies Transperies Williams W	P, N = 1 He hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - call 95.13  ng at point 14.27  includin	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av welling is that and co Jun ctor from 58.16  190 x Vd,r 68.67  10.3  WHRS	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage ) litres in	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		
if TF nnual duce t more t wate t wate ergy t isin= nstant ater orag	A £ 13.9 I average the annual enthat 125 I Jan Transperies Transpe	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - call 95.13  ng at point 14.27  includin	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av welling is that and co Jun ctor from 58.16  190 x Vd,r 68.67  10.3  WHRS	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage ) litres in	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF if TF innual adduce t more t water instant orage committeers ater ater ater ater ater ater ater ater	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  content of 105.41  storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per litres per per litres per per litres per l	Mar Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includin nd no tal hot water	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no 12.44  ag any so nk in dw er (this in	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av lwelling is hot and co  Jun ctor from 58.16  190 x Vd,r 68.67  10.3  /WHRS nter 110 nstantar	erage = designed Id)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4 (4
if TF nnual duce t more  ergy c  ergy c  nstant  orag  comr herw ater ) If m	A £ 13.9 I average the annual enthat 125 I Jan The rusage in The 105.41 I storage enthat vise if no storage anufactions.	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per litres per per litres per per litres per l	Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includinate hot water	Apr Apr Ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The hot water 11.94  Color or Water Welling, encludes i	ay Vd,av lwelling is hot and co  Jun ctor from 58.16  190 x Vd,r 68.67  10.3  /WHRS nter 110 nstantar	erage = designed Id)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF innual iduce it more it water is instant in committee in committ	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  content of 105.41  storage enunity herise if no storage enunfactor anufactor enthat of the content of the conte	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includin and no talc hot water	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ in $5\%$ i	ay Vd,av liwelling is that and co  Jun ctor from 5 58.16  190 x Vd,r 68.67  10.3  IWHRS enter 110 nstantar wn (kWh	erage = designed ild)  Jul Table 1c x  58.16  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us Sep 63.32 73.89 1 to (61) 11.08 ame vess ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF nnual educe t more t more nstant orag commitherw fater ) If m empe	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  71.08  105.41  Istorage enthat vise if no storage enthat annufaction of the content of the conte	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar Mar Mar Mar Mar Mar Mar Mar Mar	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The properties of the water 11.94  Collar or Water Collar o	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) ombi boil	+ 36 a water us Sep 63.32 73.89 1 to (61) 11.08 ame vess ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31 0 0 0 10		(4 (4 (4 (4 (4
if TF innual educe t more t water instant orag committer therwise ater j If m empe nergy if m orag therwise the	A £ 13.9 I average the annual enthat 125 I Jan I T 1.08 I	P, N = 1 He hot was all average litres per l	Mar day for each of water usage hot water person per Mar day for each for each for each factor from the water day for each factor from the water day for each factor from the water day for each factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day for each factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day fact	ge in litre usage by day (all w Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ if the of $5\%$ is a second of $5\%$ in $5\%$ i	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) ombi boil	+ 36 a water us Sep 63.32 73.89 1 to (61) 11.08 ame vess ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF innual if TF	A £ 13.9 I average the annual enthat 125 I Jan I T1.08	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar day for each of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared eclared of the storage eclared ec	ge in litre usage by day (all w Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The properties of the water 11.94  Collar or Water Collar o	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) ombi boil	+ 36 a water us Sep 63.32 73.89 1 to (61) 11.08 ame vess ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1  47)	Dec 71.08 = c, 1d) 102.08 = 15.31 0 0 0 10		(4) (4) (4) (4) (5) (5) (5) (5) (5) (5)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	3 (54)
Enter (50) or (54) in (55)		1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.0	1 30.98	32.01 (56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m when	re (H11) is from	Appendix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.0	1 30.98	32.01 (57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder therr	mostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.2	6 22.51	23.26 (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m		
(61)m= 0 0 0 0 0 0	0 0 0	0	0 (61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m$	+ (46)m + (5	57)m + (59)m + (61)m
(62)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	128.3 127.39 141.3	39 147.5 1	157.36 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contri	bution to water h	heating)
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		
(63)m= 0 0 0 0 0 0	0 0 0	0	0 (63)
Output from water heater			
(64)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	128.3 127.39 141.3	39 147.5 1	157.36
	Output from water hea	ater (annual) <sub>112</sub>	1667.51 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)	m + (57)m +	(59)m 1
	. , ,	` '	(00)111]
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38	68.5 67.36 72.8	<del></del>	78.16 (65)
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38 include (57)m in calculation of (65)m only if cylinder is in the		6 74.05	78.16 (65)
		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	dwelling or hot water is	6 74.05 s from commo	78.16 (65) unity heating
include (57)m in calculation of (65)m only if cylinder is in the  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04	Aug Sep Oc 64.04 64.04 64.0	6 74.05 s from commo	78.16 (65) unity heating  Dec
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oc 64.04 64.04 64.0	6 74.05 s from common to t Nov 4 64.04	78.16 (65) unity heating  Dec
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5	6 74.05 s from common to t Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)
include (57)m in calculation of (65)m only if cylinder is in the  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04  Lighting gains (calculated in Appendix L, equation L9 or L9a),	Aug Sep Oc 64.04 64.04 64.0 also see Table 5	6 74.05 s from commodet Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4	6 74.05 s from commodet Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 667)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 66.0m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commodet Nov 4 64.04 6 10.11 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commis  tt Nov 4 64.04 6 10.11 9 97.16 1 4 29.4	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commis  tt Nov 4 64.04 6 10.11 9 97.16 1 4 29.4	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0	6 74.05 S from common st Nov 4 64.04 S 10.11 S	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0	6 74.05 s from commis  2t Nov 4 64.04 6 10.11 9 97.16 1 4 29.4 0 23 -51.23 -	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0  -51.23 -51.23 -51.2	6 74.05 s from commis  t Nov 4 64.04 6 10.11 9 97.16 1 4 29.4 0 23 -51.23 - 2 102.85 1 + (71)m + (72)m	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0  -51.23 -51.23 -51.2	6 74.05  s from commis  t Nov 4 64.04  6 10.11  9 97.16  1 29.4  0 0  23 -51.23  - (71)m + (72)m	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	11.28	x	0.4	x	0.7	] =	2.28	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	11.28	x	0.4	x	0.7	=	0.7	(75)
Northeast 0.9x 0.77	x	1.04	x	22.97	x	0.4	x	0.7	=	4.63	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	41.38	x	0.4	x	0.7	=	8.35	(75)
Northeast 0.9x 0.77	x	0.32	x	41.38	x	0.4	x	0.7	=	2.57	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	67.96	x	0.4	x	0.7	=	13.71	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	67.96	x	0.4	X	0.7	=	4.22	(75)
Northeast 0.9x 0.77	x	1.04	x	91.35	x	0.4	x	0.7	=	18.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.35	x	0.4	x	0.7	=	5.67	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	97.38	x	0.4	x	0.7	=	19.65	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	91.1	x	0.4	X	0.7	=	18.38	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.1	x	0.4	x	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	72.63	x	0.4	x	0.7	=	4.51	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	50.42	x	0.4	x	0.7	=	10.17	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	50.42	x	0.4	x	0.7	=	3.13	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	28.07	x	0.4	X	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	28.07	x	0.4	X	0.7	=	1.74	(75)
Northeast 0.9x 0.77	x	1.04	x	14.2	x	0.4	x	0.7	=	2.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	14.2	x	0.4	X	0.7	=	0.88	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	9.21	x	0.4	x	0.7	=	1.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	9.21	x	0.4	x	0.7	=	0.57	(75)
Southwest <sub>0.9x</sub> 0.77	X	2	x	36.79	]	0.4	X	0.7	=	14.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	36.79	]	0.4	X	0.7	=	10.35	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	62.67	]	0.4	X	0.7	=	24.32	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	62.67	]	0.4	X	0.7	=	17.63	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	85.75	]	0.4	X	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	X	85.75	]	0.4	X	0.7	=	24.13	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	106.25	]	0.4	X	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	106.25	]	0.4	X	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	119.01	]	0.4	X	0.7	=	46.19	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	119.01	]	0.4	X	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub> 0.77	x	2	x	118.15	]	0.4	x	0.7	=	45.85	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	118.15	]	0.4	x	0.7	=	33.24	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	113.91	]	0.4	x	0.7	=	44.21	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	113.91	]	0.4	x	0.7	=	32.05	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	×	104.39	]	0.4	x	0.7	=	40.51	(79)

Southwest <sub>0</sub>	.9x 0.77	×	1.4	15	X	10	04.39			0.4	X	0.7	=	29.37	(79)
Southwest <sub>0</sub>	.9x 0.77	х	2	2	X	9	2.85			0.4	X	0.7	=	36.03	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	X	9	2.85			0.4	х	0.7	=	26.12	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	X	6	9.27			0.4	x	0.7	=	26.88	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	X	6	9.27			0.4	X	0.7	=	19.49	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	x	4	4.07			0.4	x	0.7	=	17.1	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	x	4	4.07			0.4	x	0.7	=	12.4	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	x	3	1.49			0.4	x	0.7	=	12.22	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	x	3	1.49			0.4	X	0.7	=	8.86	(79)
	'			_	•										
Solar gains	s in watts, c	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m= 27.	61 48.02	68.33	89.06	103.78	10	04.79	100.3	89.0	05	75.46	53.78	33.25	23.51		(83)
Total gains	– internal a	and solar	r (84)m =	= (73)m	+ (8	33)m	, watts					_	_	_	
(84)m= 296	314.92	327.54	336.14	339	32	28.28	315.98	308	.97	301.47	292.06	285.58	285.93		(84)
7. Mean i	nternal tem	perature	(heating	season	)										
Temperat	ure during h	neating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	, Th′	1 (°C)				21	(85)
•	factor for g	•			-					,					
	an Feb	Mar	Apr	May	Ė	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec	]	
(86)m= 0.9	93 0.91	0.88	0.83	0.74	(	).61	0.47	0.5	<del>-  </del>	0.67	0.83	0.9	0.93	1	(86)
Mean inte	rnal tempe	atura in	livina ar	 aa T1 (f(	الد	w eta	ne 3 to 7	in T	ahle	a 0c)			1	1	
(87)m= 19.	<del></del>	19.62	20.08	20.49	_	20.8	20.93	20.9		20.71	20.22	19.6	19.06	1	(87)
` ′		1	<u> </u>	<u> </u>				L						]	` '
· -	ure during h	20.45	20.46	20.46	_	eiiing 0.47	20.47	20.4	$\overline{}$	20.47	20.46	20.46	20.46	1	(88)
(88)m= 20.	45 20.45	20.45	20.46	20.40		0.47	20.47	20.4	47	20.47	20.46	20.46	20.40	]	(00)
	factor for g	1	1		_	·		r –						7	
(89)m= 0.9	0.91	0.88	0.82	0.72	(	).57	0.42	0.4	15	0.64	0.81	0.89	0.93	]	(89)
Mean inte	rnal tempe	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)			_	
(90)m= 18.	64 18.84	19.17	19.62	20.02	2	0.31	20.42	20.4	41	20.24	19.76	19.16	18.62		(90)
										f	LA = Liv	ing area ÷ (	4) =	0.63	(91)
Mean inte	rnal tempe	ature (fo	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2					
(92)m= 18.	93 19.12	19.45	19.91	20.31	2	0.62	20.74	20.	73	20.54	20.05	19.44	18.9	]	(92)
Apply adj	ustment to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate			4	
(93)m= 18.	93 19.12	19.45	19.91	20.31	2	0.62	20.74	20.	73	20.54	20.05	19.44	18.9		(93)
8. Space	heating req	uirement													
	he mean in		•		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	:(76)m an	d re-cal	culate	
	tion factor fo			1				· .	1			1	Γ_	1	
	an Feb	Mar	Apr	May	<u></u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(94)m= 0.9	factor for g	0.86	0.8	0.71		0.58	0.45	0.4	17	0.64	0.8	0.88	0.91	1	(94)
` '		<u> </u>	<u> </u>			).56	0.45	0.4	+/	0.04	0.6	0.00	0.91	]	(34)
(95)m= 268	ins, hmGm .42 279.9	281.04	269.78	242.12	10	90.56	141.61	145	98	194.13	233.16	250.67	261.04	1	(95)
	verage exte	Į	l		<u> </u>			I 1-7-0		107.10	200.10	1 200.07	1 -01.04	]	(00)
(96)m= 4.		6.5	8.9	11.7	_	14.6	16.6	16.	.4	14.1	10.6	7.1	4.2	]	(96)
· · ·	rate for me											1		1	` '
(97)m= 562		495.07	414.5	323.43	_	22.64	153.11	159	<del>'</del> T	239.52	354.83	465.95	558.39	1	(97)
` '		<u> </u>	I	l					!			_!	<u> </u>	1	•

(98)m= 218.58 178.1	159.23	104.2	60.5	0	0	0 Tota	0 I per year	90.52 (kWh/year	155 r) = Sum(9	221.23	1187.36	(98)
Space heating require	ement in	kWh/m²	²/year						, ,	[	33.92	(99)
9a. Energy requiremen	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)			L		
Space heating:							,			,		_
Fraction of space hea				mentary	•					ļ	0	(201)
Fraction of space hea		•	` ,			(202) = 1 -	,	(200)]			1	(202)
Fraction of total heati	•	•				(204) = (20	02) <b>x</b> [1 –	(203)] =		ļ	1	(204)
Efficiency of main spa					- 0/					 	100	(206)
Efficiency of seconda					<del></del>						0	(208)
Jan Feb Space heating require	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
218.58 178.1	159.23	104.2	60.5	0	0	0	0	90.52	155	221.23		
$(211)$ m = { $[(98)$ m x (20	(4)] } x 1	00 ÷ (20	)6)		!			ļ.	ļ.	<u>!</u>		(211)
218.58 178.1	159.23	104.2	60.5	0	0	0	0	90.52	155	221.23		
	-					Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,101</sub>	2=	1187.36	(211)
Space heating fuel (s		• • •	month									
$= \{[(98)m \times (201)] \} \times 1$ $(215)m = 0 \qquad 0$	00 ÷ (20	8) 0	0	0	0	0	0	0	0	0		
(210)111-	Ů							ar) =Sum(2			0	(215)
Water heating										L		
Water heating from se			ty systen	n:						Г		٦
Annual water heating	•										1667.51	(64)
Fraction of heat from		•									1	(303a)
Factor for charging m	ethod fo	r comm	unity wat	er heati	ng						1	(305)
Distribution loss facto	r (Table	12c) for	commu	nity heat	ting syste	em					1.1	(306)
Water heat from CHP	)						(64) x (30	03a) x (305	5) x (306)	= [	1834.27	(310a)
Electricity used for he	at distrib	oution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	18.34	(313)
Annual totals								k\	Wh/yea	r	kWh/year	
Space heating fuel use	ed, main	system	1								1187.36	
Electricity for pumps, f	ans and	electric	keep-ho	t								
mechanical ventilation	n - balan	ced, ext	ract or p	ositive i	nput fron	n outside	Э			138.54		(230a)
Total electricity for the	above, ł	kWh/yea	ır			sum	of (230a).	(230g) =			138.54	(231)
Electricity for lighting											185.19	(232)
12a. CO2 emissions -	– Individ	ual heat	ing syste	ms inclu	uding mi	cro-CHP	•					
					ergy /h/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	

Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating from community system						
		Energy kWh/year	Emission kg CO2/kV		missions g CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	<b>O</b> \ ,	two fuels repeat (363) to (	(366) for the se	econd fuel	329	(367a)
CO2 associated with heat source 1	[(307b)+(3	310b)] x 100 ÷ (367b) x	0.52	=	289.36	(367)
Electrical energy for heat distribution	[(	313) x	0.52	=	9.52	(372)
Total CO2 associated with community systems	(3	363)(366) + (368)(372	)	=	298.88	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	71.9	(267)
Electricity for lighting	(232) x		0.519	=	96.11	(268)
Total CO2, kg/year		sum of (265)	(271) =		1083.13	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			30.95	(273)
El rating (section 14)					82	(274)

Assessor Name: Adam Ritchie Stroma Number: STRO019516 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.4.25  Property Address: Flat Type B - ASHP  Address:
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.4.25  Property Address: Flat Type B - ASHP
Address:
1. Overall dwelling dimensions:  Area(m²)  Av. Height(m)  Volume(m³)
Ground floor $\begin{array}{ c c c c c c c c c c c c c c c c c c c$
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 35 (4)
Dwelling volume $ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 108.15 $ (5)
2. Ventilation rate:
main secondary other total m³ per hour heating heating
Number of chimneys $0 + 0 = 0 \times 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b)
Number of intermittent fans
Number of passive vents $0   x   10 = 0   (7b)$
Number of flueless gas fires $0   x   40 = 0   (7c)$
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.18 (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns)
Additional infiltration $[(9)-1]\times 0.1 = 0 $ (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0
If no draught lobby, enter 0.05, else enter 0 0 (13)
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (14)
Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0                                  $
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 5 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.43 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  (19)
Number of sides sheltered $0   (19)$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 1   (20)$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.43$ $(21)$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 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	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51	]	
Calculate effec		-	rate for t	he appli	cable ca	se	!	!	!	ļ	·	J	
If mechanica			and the NI (O	10h) (00	-) <b>- - -</b> (-		MEN - 11 -		) (00-)			С	
If exhaust air h		•	•	, ,	,	•	,,	,	) = (23a)			C	
If balanced with		-	•	_					21.) (	001 ) [	4 (00.)	4007	(23c)
a) If balance	ed mecha	anical ve	entilation 0	with he	at recove	ery (MVI	HR) (24a 	$\frac{a)m = (22)}{0}$	2b)m + (   0	23b) × [	1 – (23c) 1 <sub>0</sub>	i ÷ 100] 1	(24a)
		<u> </u>		<u> </u>		<u> </u>					0	J	(24a)
b) If balance (24b)m= 0	o mech	anicai ve	o nulation	without 0	neat rec		0 (240	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2b)m + (.	230)	0	1	(24b)
c) If whole h	<u> </u>	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>	<u> </u>				]	(210)
,				•	o); other				.5 × (23b	)		,	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n				•	ve input erwise (2				0.5]				
(24d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63	]	(24d)
Effective air	change	rate - er	nter (24a	) or (24l	b) or (24	c) or (24	d) in bo	x (25)				•	
(25)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(25)
3. Heat losse	s and he	at loss r	naramet	or.	•							•	
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		AXU	Z)	k-value		A X k kJ/K
	arca	(111)											
Doors Type 1									(W/l	N)	kJ/m²-	IX.	
Doors Type 1 Doors Type 2					2.13	x	1	= [	2.13	N)	KJ/III	K.	(26)
Doors Type 2					2.13	x x	1	= [	2.13	N)	KJ/III	· ·	(26) (26)
Doors Type 2 Doors Type 3					2.13 0.94 0.75	x x x	1 1	=	2.13 0.94 0.75		KJ/III	· ·	(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	a 1				2.13 0.94 0.75 0.68	x x x x x	1 1 1 1	= [ = [ = [	2.13 0.94 0.75 0.68	> 	KJ/IIII	· ·	(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type					2.13 0.94 0.75 0.68 1.77	x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35		KJ/IIII		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type	e 2				2.13 0.94 0.75 0.68 1.77 0.92	x x x x x x x 1 x 1	1 1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35 1.22		KJ/IIII		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type	e 2 e 3				2.13 0.94 0.75 0.68 1.77 0.92 0.28	x x x x x x x x x 1 x x 1 x 1	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37		KJ/IIII		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type	e 2 e 3 e 4	10	4.09		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7		KJ/IIII	~ 	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1	2 2 3 4 4 15.4		4.08	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05		KJ/IIII		(26) (26) (26) (26) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2	2 2 2 3 4 4 15.4 2.00	4	0	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	2 2 2 3 4 4 15.4 2.0 2.8	7	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 2 3 4 4 15.4 2.0 2.8 18.3	7	0 0 4.67		2.13 0.94 0.75 0.68 1.77 0.92 0.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	2.04 2.04 2.04 2.85 18.3	7 39	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2.8 18.3 18.3 18.3 18.4 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.5	4 7 89 , m <sup>2</sup>	0 0 4.67	·	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55				(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 18.3 35 elements di roof winders on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55			13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area Fabric heat los	2.04 2.04 2.86 18.3 35 28lements 1 roof winddas on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x (A x k)	0 4.67 0 effective winternal wall	indow U-va	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35 73.78 alue calculatitions	x x x x x1 x1 x1 x1 x1 x1 x2 x x x added using	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in (2) + (32a).	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instea	d of a day	tailad aala	ulation										
Thermal bridge:				usina An	nendix I	<						3.69	(36)
if details of thermal	•	,			•	•						3.09	(00)
Total fabric hea	0 0		, ,	,	,			(33) +	(36) =			23.78	(37)
Ventilation heat	t loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	'		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 23.33	23.12	22.91	21.93	21.75	20.89	20.89	20.73	21.22	21.75	22.12	22.51		(38)
Heat transfer co	oefficier	nt, W/K		-	-	-	_	(39)m	= (37) + (3	38)m	-		
(39)m= 47.11	46.9	46.69	45.71	45.52	44.67	44.67	44.51	45	45.52	45.9	46.28		
Heat loss parar	neter (H	ILP), W/	m²K						Average = = (39)m ÷		12 /12=	45.71	(39)
(40)m= 1.35	1.34	1.33	1.31	1.3	1.28	1.28	1.27	1.29	1.3	1.31	1.32		
Number of days	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.31	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heati	ng ener	gy requi	rement:								kWh/ye	ear:	
Assumed occup	nancy N	N									28		(42)
if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		20		(42)
Annual average	hot wa										.62		(43)
Reduce the annual not more that 125 li					_	-	to achieve	a water us	se target o	f			
		-					Α.	0		NI.	<b>D</b>		
Jan   Hot water usage in	Feb litres per	Mar day for ea	Apr ach month	Vd,m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08		
(11)= 11.00	00.10	00.01	00.02	00.7 1	00.10	00.10	00.7 1		Total = Su	<u> </u>	l	775.4	(44)
Energy content of h	not water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	-	<b></b> ` '
(45)m= 105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08		
									Total = Su	m(45) <sub>112</sub> =	=	1016.67	(45)
If instantaneous wa			,					. ,			ı		
(46)m= 15.81 Water storage I	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	me ves	sel		150		(47)
If community he	, ,					_							
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage I													
a) If manufactu				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost from b) If manufactu		_	-		or is not		(48) x (49)	=		0.	75		(50)
Hot water stora			-								0		(51)
If community he	-			,		· ,					-		()
Volume factor f	rom Tal	hle 2a											(50)
Temperature fa	-4		Ol-							-	0		(52) (53)

Francis last franciscotor atomana LANIII / com	(47) (54) (50) (50)		
Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	0.75	(55)
			(56)
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 [50] If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷		22.58 23.33 (H11) is from Append	(56)
		· · · · · · · · · · · · · · · · · · ·	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	3 23.33 22.58 23.33	22.58 23.33	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	` '	otat)	
(modified by factor from Table H5 if there is solar water heat (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	<del></del>	22.51 23.26	(59)
` '		22.01 20.20	(33)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (4	<del>i ı ı ı </del>		(04)
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	<del></del>	<del>ì ì i</del>	·
(62)m= 152   134.28   141.73   128.03   126.18   113.76   110.2		139.1 148.68	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar		tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see /	<del>'i '' '</del>		(62)
(63)m= 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater		l l	I
(64)m= 152   134.28   141.73   128.03   126.18   113.76   110.2		139.1 148.68	4505.00 (64)
	Output from water heate	,	1565.29 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	<u> </u>	+ (57)m + (59)m	]
(65)m   72 22   64 22   69 01   62 65   62 74   59 01   59 43			(OF)
(65)m= 72.32 64.32 68.91 63.65 63.74 58.91 58.43	_!!	67.33 71.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the	_!!	ļ ļ	` '
	_!!	ļ ļ	` '
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	e dwelling or hot water is fi	rom community h	` '
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	e dwelling or hot water is fi	rom community h	eating
include (57)m in calculation of (65)m only if cylinder is in the second	e dwelling or hot water is find the second of the second o	rom community h	` '
include (57)m in calculation of (65)m only if cylinder is in the state of the state	e dwelling or hot water is find the second of the second o	Nov Dec 64.04	eating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9	rom community h	eating
include (57)m in calculation of (65)m only if cylinder is in the second	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49	Nov Dec 64.04	eating (66)
include (57)m in calculation of (65)m only if cylinder is in the second	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49  5a), also see Table 5  29.4 29.4 29.4	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 8 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 8 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3 -51.23 -51.23 -51.23	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3 -51.23 -51.23 -51.23	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3 3 -51.23 93.51 95.72	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 67.00 Eighting gains (calculated in Appendix L, equation L9 or L9a). (67)m= 10.78 9.57 7.78 5.89 4.41 3.72 4.02  Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49  5a), also see Table 5  29.4 29.4 29.4  3 3 3  3 -51.23 -51.23 -51.23  4 82.74 84.23 88.59  7)m + (68)m + (69)m + (70	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3 3 -51.23 93.51 95.72	(66) (67) (68) (69) (70)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0.92	x	11.28	x	0.63	x	0.7	] =	3.17	(75)
Northeast 0.9	0.77	X	0.28	х	11.28	X	0.63	X	0.7	=	0.97	(75)
Northeast 0.9	0.77	X	0.92	х	22.97	X	0.63	x	0.7	=	6.46	(75)
Northeast 0.9	0.77	X	0.28	x	22.97	x	0.63	x	0.7	=	1.97	(75)
Northeast 0.9	0.77	X	0.92	x	41.38	x	0.63	x	0.7	=	11.63	(75)
Northeast 0.9	0.77	X	0.28	х	41.38	X	0.63	x	0.7	=	3.54	(75)
Northeast 0.9	0.77	X	0.92	х	67.96	x	0.63	x	0.7	<u> </u>	19.11	(75)
Northeast 0.9	0.77	X	0.28	x	67.96	x	0.63	x	0.7	=	5.82	(75)
Northeast 0.9	0.77	X	0.92	x	91.35	X	0.63	x	0.7	=	25.68	(75)
Northeast 0.9	0.77	X	0.28	х	91.35	X	0.63	X	0.7	=	7.82	(75)
Northeast 0.9	0.77	X	0.92	x	97.38	X	0.63	X	0.7	=	27.38	(75)
Northeast 0.9	0.77	X	0.28	x	97.38	X	0.63	x	0.7	=	8.33	(75)
Northeast 0.9	0.77	X	0.92	x	91.1	X	0.63	X	0.7	=	25.61	(75)
Northeast 0.9	0.77	X	0.28	x	91.1	X	0.63	X	0.7	=	7.8	(75)
Northeast 0.9	0.77	X	0.92	x	72.63	x	0.63	x	0.7	] =	20.42	(75)
Northeast 0.9	0.77	X	0.28	х	72.63	x	0.63	x	0.7	<u> </u>	6.21	(75)
Northeast 0.9	0.77	X	0.92	х	50.42	X	0.63	x	0.7	=	14.18	(75)
Northeast 0.9	0.77	X	0.28	x	50.42	x	0.63	x	0.7	=	4.31	(75)
Northeast 0.9	0.77	X	0.92	х	28.07	x	0.63	x	0.7	<u> </u>	7.89	(75)
Northeast 0.9	0.77	X	0.28	x	28.07	x	0.63	x	0.7	=	2.4	(75)
Northeast 0.9	0.77	X	0.92	x	14.2	x	0.63	x	0.7	=	3.99	(75)
Northeast 0.9	0.77	X	0.28	x	14.2	x	0.63	х	0.7	] =	1.21	(75)
Northeast 0.9	0.77	X	0.92	х	9.21	x	0.63	x	0.7	<u> </u>	2.59	(75)
Northeast 0.9	0.77	X	0.28	x	9.21	x	0.63	x	0.7	=	0.79	(75)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	36.79		0.63	X	0.7	=	19.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	36.79		0.63	x	0.7	=	14.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	62.67		0.63	x	0.7	=	33.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	62.67		0.63	X	0.7	=	24.52	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	85.75		0.63	x	0.7	=	46.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	85.75		0.63	x	0.7	=	33.55	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	106.25		0.63	x	0.7	=	57.48	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	106.25		0.63	x	0.7	=	41.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	119.01	Ì	0.63	x	0.7	=	64.38	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	119.01	ĺ	0.63	x	0.7	=	46.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	118.15	ĺ	0.63	x	0.7	=	63.91	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	118.15	j	0.63	x	0.7	] =	46.22	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	113.91	j	0.63	x	0.7	] =	61.62	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	113.91	Ī	0.63	x	0.7	] =	44.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	х	104.39	j	0.63	х	0.7	=	56.47	(79)

Southwestip 9, 0.77																	
Southwest) 98	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	1	04.39	]		0.63	x	0.7	=	40.84	(79)
Southwesto 98	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	9	2.85			0.63	x [	0.7		50.23	(79)
Southwesto section   Southwe	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	g	2.85			0.63	x	0.7		36.32	(79)
Southwesto, as	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	6	9.27	]		0.63	x	0.7		37.47	(79)
Southwest0.3x	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	6	9.27			0.63	x [	0.7	=	27.1	(79)
Solutivesto, sx	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	4	4.07			0.63	x	0.7	=	23.84	(79)
Solar gains in watts, calculated for each month    (83)m = Sum(74)m(82)m	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	4	4.07			0.63	x	0.7	=	17.24	(79)
Solar gains in watts, calculated for each month   (83)m = Sum/74)m(82)m	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	3	1.49			0.63	x	0.7		17.03	(79)
(83)   (83)   (83)   (83)   (83)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (86)   (87)   (87)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (88)   (88)   (89)   (80)   (8	Southw	est <sub>0.9x</sub>	0.77	х	1.2	28	x	3	1.49			0.63	x	0.7	_	12.32	(79)
(83)   (83)   (83)   (83)   (83)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (86)   (87)   (87)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (88)   (88)   (89)   (80)   (8		_															
Total gains – intermal and solar (84)m = (73)m + (83)m, watts  (84)m= 300.83   327.67   348.19   364.86   373.44   363.1   349.05   337.67   324.9   307.05   292.56   289.12   (84)  7. Mean intermal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar	gains in	watts, ca	alculated	I for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
Relima   300.83   327.67   348.19   364.86   373.44   363.1   349.05   337.67   324.9   307.05   292.56   289.12     Relimant   14   14   10.6   7.1   4.2   4.86   14.3   4.9   5.5   8.9   1.8   1.9   1	(83)m=	38.43	66.84	95.11	123.96	144.43	14	45.84	139.59	123.	.94	105.04	74.86	46.29	32.73		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)ms 19.83 20.12 20.45 20.74 20.93 20.98 20.98 20.87 20.52 20.09 19.72 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)ms 19.81 19.81 19.84 19.84 19.86 19.86 19.86 19.85 19.85 19.85 19.84 19.83 19.82 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)ms 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.85 19.75 19.31 18.69 18.16 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)ms 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)ms 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  Sec Table 3ph Sec	Total g	jains – ii	nternal a	and solar	(84)m =	= (73)m ·	+ (8	33)m	, watts		•			!			
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	(84)m=	300.83	327.67	348.19	364.86	373.44	3	63.1	349.05	337	.67	324.9	307.05	292.56	289.12		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	7 Me	an inter	nal temr	oerature	(heating	season	\ \							!			
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (86)me   0.99   0.99   0.97   0.94   0.87   0.71   0.55   0.58   0.8   0.95   0.98   0.99   (86)    Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)					`		<i>'</i>	aroa i	from Tak	مام ۵	Th	1 (°C)				21	(85)
Sep			_	٠.			_			л <del>с</del> э,	, 111	1 ( 0)				21	(00)
(86)me   0.99   0.99   0.97   0.94   0.87   0.71   0.55   0.58   0.8   0.95   0.98   0.99   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)me   19.73   19.88   20.12   20.45   20.74   20.93   20.98   20.98   20.87   20.52   20.09   19.72   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)me   19.8   19.81   19.81   19.84   19.84   19.86   19.86   19.86   19.85   19.84   19.83   19.82   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)me   0.99   0.98   0.97   0.92   0.82   0.61   0.41   0.45   0.72   0.92   0.98   0.99   0.99   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)me   18.16   18.38   18.73   19.21   19.59   19.81   19.85   19.85   19.75   19.31   18.69   18.16   (90)  ### Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)me   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)me   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (93)  8. Spece heating requirement  Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec  Utilisation factor for gains, hmmm   W = (94)m x (84)m   (95)me   296.74   320.86   335.54   337.52   313.51   244.36   173.21   179.87   248.68   284.91   285.55   285.77   (95)  Honthly average external temperature from Table 8  (96)me   4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)  Heat loss rate for mean internal temperature, Lm   W = ((39)m × ((93)m – (96)m)	Utilisa			1	<u>`</u>		Ė			Ι		Con	0 1	Nov	l Daa	٦	
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m= 19.73 19.88 20.12 20.46 20.74 20.93 20.98 20.98 20.98 20.87 20.52 20.09 19.72 (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m= 19.8 19.81 19.81 19.84 19.84 19.84 19.86 19.86 19.86 19.85 19.85 19.84 19.83 19.82 (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m= 0.99 0.98 0.97 0.92 0.82 0.61 0.41 0.45 0.72 0.92 0.98 0.99 (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.75 19.31 18.69 18.16 (90)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2         (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Utilisation factor for gains, hmgm, W = (94)m x (84)m         (95)m= 296.74 320.85 335.54 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77	(0C)m				<del></del>	<del>-</del>	$\vdash$			_	Ť			+		-	(96)
(87)me	(00)111=	0.99	0.99	0.97	0.94	0.67		J. / I	0.55	0.5	00	0.6	0.95	0.98	0.99		(80)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.8 19.81 19.81 19.84 19.84 19.84 19.86 19.86 19.86 19.86 19.85 19.84 19.83 19.82 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.98 0.97 0.92 0.82 0.61 0.41 0.45 0.72 0.92 0.98 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.85 19.85 19.31 18.69 18.16 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 131.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm, W = ((93)m x (93)m x (93)m - (96)m)	Mean		<u>-</u>		<u> </u>	<del></del>	_					9c)		,		_	
(88)m=	(87)m=	19.73	19.88	20.12	20.45	20.74	2	0.93	20.98	20.9	98	20.87	20.52	20.09	19.72		(87)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99  0.98  0.97  0.92  0.82  0.61  0.41  0.45  0.72  0.92  0.98  0.99  (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.16  18.38  18.73  19.21  19.59  19.81  19.85  19.85  19.75  19.31  18.69  18.16  (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.15  19.32  19.61  19.99  20.31  20.51  20.56  20.56  20.46  20.07  19.57  19.14  (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15  19.32  19.61  19.99  20.31  20.51  20.56  20.56  20.46  20.07  19.57  19.14  (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b,	Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Tr	n2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   FLA = Living area ÷ (4) = 0.63   (91)	(88)m=	19.8	19.81	19.81	19.84	19.84	1	9.86	19.86	19.8	86	19.85	19.84	19.83	19.82		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   FLA = Living area ÷ (4) = 0.63   (91)	l Itilie	ation fac	tor for a	aine for	rest of d	welling	h2	m (sc	a Tabla	02)				•			
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.75 19.31 18.69 18.16       (90)         LA = Living area + (4) = 0.63 (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2         (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)         8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Utilisation factor for gains, hm:         (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)         Useful gains, hmGm , W = (94)m x (84)m         (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77       (95)         Monthly average external temperature from Table 8         (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2       (96)         Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m – (96)m]					i	<del></del>	_		1	<u> </u>	15	0.72	0.92	0.98	0.99	٦	(89)
(90)me	, ,			<u>l</u>		<u> </u>								1 333			` '
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]				1	r	1	Ť	<u> </u>		<del>i                                     </del>	$\overline{}$			1		¬	(00)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(90)m=	18.16	18.38	18.73	19.21	19.59	1	9.81	19.85	19.8	85						``´
(92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm: (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]												T	LA = LIVI	ng area ÷ (	4) =	0.63	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) x T2					
(93)   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (93)   8. Space heating requirement    Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec    Utilisation factor for gains, hm:  (94)m= 0.99   0.98   0.96   0.93   0.84   0.67   0.5   0.53   0.77   0.93   0.98   0.99   0.94    Useful gains, hmGm , W = (94)m x (84)m    (95)m= 296.74   320.85   335.54   337.52   313.51   244.36   173.21   179.87   248.68   284.91   285.55   285.77   (95)    Monthly average external temperature from Table 8    (96)m= 4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)    Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(92)m=	19.15	19.32	19.61	19.99	20.31	2	0.51	20.56	20.	56	20.46	20.07	19.57	19.14		(92)
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Apply	adjustn	nent to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(93)m=	19.15	19.32	19.61	19.99	20.31	2	0.51	20.56	20.	56	20.46	20.07	19.57	19.14		(93)
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	8. Sp	ace hea	ting requ	uirement													
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:           (94)m=           0.99         0.98         0.96         0.93         0.84         0.67         0.5         0.53         0.77         0.93         0.98         0.99         (94)           Useful gains, hmGm, W = (94)m x (84)m           (95)m=         296.74         320.85         335.54         337.52         313.51         244.36         173.21         179.87         248.68         284.91         285.55         285.77         (95)           Monthly average external temperature from Table 8           (96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2         (96)           Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m- (96)m]         [93)m- (96)m]					•		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-ca	lculate	
Utilisation factor for gains, hm:	the ut	ilisation		or gains	using Ta	able 9a										_	
(94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]				<u> </u>	<u> </u>	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = $(94)$ m x $(84)$ m (95)m= $296.74$ $320.85$ $335.54$ $337.52$ $313.51$ $244.36$ $173.21$ $179.87$ $248.68$ $284.91$ $285.55$ $285.77$ (95) Monthly average external temperature from Table 8 (96)m= $4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ (96) Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m – $(96)$ m $]$							_									_	
(95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]					l		(	0.67	0.5	0.5	53	0.77	0.93	0.98	0.99		(94)
Monthly average external temperature from Table 8  (96)m= $\begin{bmatrix} 4.3 & 4.9 & 6.5 & 8.9 & 11.7 & 14.6 & 16.6 & 16.4 & 14.1 & 10.6 & 7.1 & 4.2 \end{bmatrix}$ Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]]				<del>`</del>	<del></del>	·	_								-	_	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]				l			<u> </u>		173.21	179.	.87	248.68	284.91	285.55	285.77		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]				ı	i	ı	_		ı	_				1	1	7	(n=1
					<u> </u>				<u> </u>					7.1	4.2		(96)
(97)m= 699.6 676.31 611.88 507.03 392.1 264.19 177.07 185.2 285.97 431.29 572.3 691.6 (97)				r		r	_		<del>-``                                   </del>	<del>- `</del>	<del>_</del> _	<u> </u>		1.		7	(0=)
	(97)m=	699.6	676.31	611.88	507.03	392.1	20	54.19	177.07	185	5.2	285.97	431.29	572.3	691.6		(97)

Total per year (kWh/year) = Sum(188) =   1542.01   (86)	Space heating requirement f	or each r	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	5)m] x (4	1)m			
Space heating requirement in kWh/m²/year  Space heating: Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year  Space heating requirement (calculated above)  299.73   298.87   206.59   122.40   58.47   0   0   0   0   108.9   206.46   301.94    211)m = f([08]m x (2014)] \} x 100 + (206)  320.57   255.48   219.88   30.53   62.54   0   0   0   0   116.47   220.81   322.93    Total (kWh/year) =Sum(211), xm., y* 0   166.29    216;m= 0   0   0   0   0   0   0   0   0   0	(98)m= 299.73 238.87 205.59	122.04	58.47	0	0			<u> </u>	<u> </u>			_
Space heating:						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	1542.01	(98)
Space heating	Space heating requirement i	n kWh/m <sup>2</sup>	²/year								44.06	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s)  Fraction of total heating from main system1  Efficiency of secondary/supplementary heating system1  Efficiency of secondary/supplementary heating system1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  299.73 288.87 205.59 122.04 58.47 0 0 0 0 0 108.9 206.46 301.94  (211) m = {(168) m x (204)} } x 100 ÷ (206)  Space heating fuel (secondary), kWh/month = {(168) m x (201)} } x 100 ÷ (208)  Space heating fuel (secondary), kWh/month = {(169) m x (201)} } x 100 ÷ (208)  Water heating water heating requirement  Annual water heating from separate community system:  Annual water heating fuel used, main system 1  Water heating fuel used, main system 1  Water heating fuel used, main system 1  Water heating fuel used, main system 1  Water heating fuel used, main system 1  Electricity for the above, kWh/year sum of (230a)(230g) = 75 (233 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (230g)) = 100 (236 (236 (230g)) = 100 (236 (236 (230g)) = 100 (236 (236 (236 (236 (236 (236 (236 (236		dividual h	eating sy	/stems i	ncluding	g micro-C	HP)					
Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  299.73   298.87   205.99   122.04   58.47   0   0   0   0   108.9   206.46   301.94    (211) m = {((98)m x (204))} x 100 ÷ (206)  Space heating fuel (secondary), kWh/month = {((98)m x (204))} x 100 ÷ (208)  215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		secondar	v/sunnle	mentary	, system						0	7(201
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (202) × [	-			mornary	oyotom		- (201) <b>=</b>					(202)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)  299.73   238.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94    (211)m = {[(98)m x (204)]}	·	•	, ,			(204) = (20	02) × [1 –	(203)] =				(204
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	_	-									93.5	(206)
Space heating requirement   Calculated   above   299.73   238.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94   (211) m = { (98)m × (204)  }	Efficiency of secondary/supp	lementar	y heating	g systen	າ, %						0	(208)
299.73   28.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94	Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	<b>⊐</b> ar
(211)m = {[(98)m x (204)] } x 100 ÷ (206)   (211)m = {[(198)m x (204)] } x 100 ÷ (206)   (211)m = {[(198)m x (204)] } x 100 ÷ (208)   (211)m = {[(198)m x (201)] } x 100 ÷ (208)   (211)m = {[(198)m x (201)] } x 100 ÷ (208)   (215)m = 0   0   0   0   0   0   0   0   0   0	Space heating requirement (	calculate	d above)					•	•		· ·	
Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel secondary)   Space heating fuel secondary   Space heating fuel secondary   Space heating fuel used   Space heatin	299.73 238.87 205.59	122.04	58.47	0	0	0	0	108.9	206.46	301.94		
Total (kWhyear) = Sum(211),	· · · · · · · · · · · · · · · · · · ·							1,40,47	T 000 04		1	(211)
Space heating fuel (secondary), kWh/month = { { ((98)m x (201)] } x 100 ÷ (208) }	320.57 255.48 219.88	130.53	62.54	0	0						1649.21	7(211)
Carrell   Carr		• •	month/									``
Water heating         Water heating from separate community system:         Annual water heating requirement         1565.29         (64)           Annual water heating requirement         kWh/year         kWh/year         kWh/year         kWh/year         1649.21 </td <td></td> <td>т —</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td>		т —	0	0	0	0	0	0	0	0		
Water heating fuel used  Electricity for pumps, fans and electric keep-hot  central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  Space heating (main system 1)  (211) x  0.216  Emissions kg CO2/year  Space heating (secondary)  (215) x  0.519  Water heating  (230  Emissions kg CO2/year	Water heating from separate		ty systen	n:				k'	Wh/yeaı	•		<b>」</b> ``
Electricity for pumps, fans and electric keep-hot  central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy  kWh/year  Energy  kWh/year  Energy  kWh/year  Space heating (main system 1)  (211) x  0.216  Emissions  kg CO2/kWh  kg CO2/kWh  Space heating (secondary)  (215) x  0.519  0  (263  (261  (262  (262  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (264  (264  (264  (264  (264  (264  (265  (266  (26	Space heating fuel used, mai	n system	1								1649.21	
central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Space heating (main system 1)  (211) x  (215) x  (215) x  (216) =  (256.23  (264)  (264)  Water heating (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (217) x  (218) x  (219) x  (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (217) x  (218) x  (219) x  (219) x  (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (218) x  (218) x  (219) x  (219) x  (219) x  (219) x	Water heating fuel used										1870.3	
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kg CO2/kWh kg CO2/kWh  Energy kg CO2/kWh  Energy kg CO2/kWh  Energy kg CO2/kWh  Energy kg CO2/kWh  Energy kg CO2/kWh  Energy kg CO2/year  Space heating (main system 1)  (211) x  (215) x  (215) x  (216) = 403.98  (264)  Water heating	Electricity for pumps, fans and	d electric	keep-ho	t								
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231 190.32) (232 12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261 Space heating (secondary) (215) x 0.519 = 0 (263 Water heating (219) x 0.216 = 403.98 (264 Water heating (219) x 0.216 = 403.98 (264 Water heating (230a)(230g) = 75 (231	central heating pump:									30		(230
Electricity for lighting  190.32 (232  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261  Space heating (secondary) (215) x 0.519 = 0 (263  Water heating (219) x 0.216 = 403.98 (264	boiler with a fan-assisted fluo	9								45		(230
Energy Emission factor kg CO2/kWh Space heating (main system 1)  Space heating (secondary)  Energy Emission factor kg CO2/kWh  Space heating (secondary)  Emissions kg CO2/year  Space heating (secondary)  (211) x 0.216 = 356.23 (261)  (215) x 0.519 = 0 (263)  (219) x 0.216 = 403.98 (264)	Total electricity for the above,	kWh/yea	ar			sum	of (230a)	(230g) =	:		75	(231)
Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261)  Space heating (secondary) (215) x 0.519 = 0 (263)  Water heating (219) x 0.216 = 403.98 (264)	Electricity for lighting										190.32	(232)
kWh/year         kg CO2/kWh         kg CO2/year           Space heating (main system 1)         (211) x         0.216         = 356.23         (261           Space heating (secondary)         (215) x         0.519         = 0         (263           Water heating         (219) x         0.216         = 403.98         (264	12a. CO2 emissions – Indivi	dual heat	ing syste	ems inclu	uding mi	icro-CHP	,					
Space heating (secondary)  Water heating  (215) x  (215) x  (216) = 0 (263)  (264)										tor		
Space heating (secondary)  (215) x  (215) x  (217) x  (218) x  (219) x  (219) x  (219) x  (219) x	Space heating (main system	1)			-			0.2	16	=	356.23	(261
Water heating (219) x 0.216 = 403.98 (264	Space heating (secondary)			(21	5) x					=		` (263
				(219	9) x					=		_
	Space and water heating					+ (263) + (	264) =	<u> </u>	. •		760.21	(265)

Water heating from community system

		Energy kWh/year	Emissior kg CO2/k			ssions O2/year	
Electrical energy for heat distribution		[(313) x	0		=	0	(372)
Total CO2 associated with community systems		(363)(366) + (368)(3	72)		=	0	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=		38.93	(267)
Electricity for lighting	(232) x		0.519	=		98.78	(268)
Total CO2, kg/year		sum of (26	5)(271) =			897.92	(272)
TER =						37.6	(273)

### **SAP Input**

#### Property Details: Flat type C - ASHP

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 35.12 m<sup>2</sup> 3.09 m

Living area: 23.9 m<sup>2</sup> (fraction 0.681)

Front of dwelling faces: North East

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-	uen	II IU	$\mathbf{I} \mathbf{V} \mathbf{U}$	ES.

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D6_01	Manufacturer	Solid			Metal
Vent_06_01	Manufacturer	Solid			
Vent_06_05	Manufacturer	Solid			
Vent_06_04	Manufacturer	Solid			
Vent_06_06	Manufacturer	Solid			
V_D6_01	Manufacturer	Solid			Metal
Window_06_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D6_01	mm	0	0	1	2.13	1
Vent_06_01	mm	0	0	1	0.72	1
Vent_06_05	mm	0	0	1	0.99	1
Vent_06_04	mm	0	0	1	0.72	1
Vent_06_06	mm	0	0	1	0.72	1
V_D6_01	mm	0	0	1	0.63	1
Window_06_01	6mm	0.7	0.4	1.2	1.08	1
Window_06_04	6mm	0.7	0.4	1.2	1.97	1
Window_06_04	6mm	0.7	0.4	1.2	1.42	1
Window_06_05	6mm	0.7	0.4	1.2	1.45	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D6_01		06_01	North East	0	0
Vent_06_01		06_03	North East	0.6	1.2
Vent_06_05		06_03	South East	0.6	1.65
Vent_06_04		06_05	South West	0.6	1.2

### **SAP Input**

Vent_06_06	06_06	South West	0.6	1.2
V_D6_01	06_01	North East	0.3	2.11
Window_06_01	06_03	North East	0.9	1.2
Window_06_04	06_04	South East	1.195	1.65
Window_06_04	06_05	South West	1.185	1.2
Window_06_05	06_06	South West	1.21	1.2
Fanlight	06_01	North East	1.01	0.315

Overshading: Average or unknown

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
06_01	10.506	3.08	7.43	0.13	0	False	N/A
06_03	8.065	2.79	5.27	0.13	0	False	N/A
06_04	19.498	1.97	17.53	0.13	0	False	N/A
06_05	9.425	2.14	7.29	0.13	0	False	N/A
06_06	9.023	2.17	6.85	0.13	0	False	N/A
R6_01	35.12	0	35.12	0.1	0		N/A
Internal Element	<u>S</u>						

Thermal bridges:

Party Elements

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

### **SAP Input**

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329

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

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: None
Assess Zero Carbon Home: No

Secondary   Seco
Software Name: Stroma FSAP 2012   Software Version: Version: 1.0.4.25
Area(m²)
Area(m²)
Area(m²)   Av. Height(m)   Volume(m³)
Ground floor  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)  Dwelling volume  (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 108.52 (5)  2. Ventilation rate:    Main   Secondary   Other   Itotal   Main   Main   Meating   Heating   Heat
Dwelling volume   (3a)+(3b)+(3c)+(3d)+(3e)+(3n)   =   108.52   (5)
2. Ventilation rate:    main heating   heating
Number of chimneys
Number of chimneys
Number of chimneys
Number of intermittent fans    0
Number of passive vents $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Number of flueless gas fires  O  Air changes per hour  Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = 0 $\div (5)$ = 0 (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  150  161  162  163  165  165  165  166  166  167  168  179  170  170  170  170  170  170  170
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = $0$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  O (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (14)  Window infiltration  0 (15)  Infiltration rate  0 (16)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = $0$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  O (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (14)  Window infiltration  0 (15)  Infiltration rate  0 (16)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  0 (12)  0 (13)  0 (14)  0 (15)  0 (15)  0 (16)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  0 (13)  0 (14)  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) $\div$ 100] =0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)
If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 1$
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ Infiltration rate $0 = (14)$ $0 = (15)$ $0 = (15)$ $0 = (15)$
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)  Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0                                  $
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 2.5 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.12 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  (19)
Number of sides sheltered $0  mtext{(19)}$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 1  mtext{(20)}$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.12 \times (21)$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 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

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se	-		•			'	
If mechanical If exhaust air he			andiv N (S	3h) - (23a	a) v Emy (e	aguation (l	NS)) other	wice (23h	l) = (23a)		[	0.5	(2
If balanced with									) = (25a)			0.5	(2
a) If balance		-		_					2h\m + ('	23h) ∨ [·	 1	75.65	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(2
b) If balance	L1		<u> </u>			<u> </u>			<u>.                                    </u>				·
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extin < 0.5 ×			•	•				.5 × (23b	·)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the			•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(2
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(2
oors Type 2					0.72	Х	1	=	0.72				(:
oors Type 3					0.99	Х	1	=	0.99				(:
oors Type 4					0.72	X	1	= [	0.72				(:
													(:
oors Type 5					0.72	X	1	= [	0.72				
• •					0.72	_	1	= [	0.72				(
oors Type 6	<del>)</del> 1					×		= [					
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				(; (; (;
oors Type 5 oors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				(2
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	2 3 4 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(:
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 falls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type indows Type	2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
pors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				(1)

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity	/ Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass	`	,	P = Cm ÷	- TFA) in	ı kJ/m²K			Indica	tive Value	: Low	`	100	(35)
For design asses	ssments wh	ere the de	tails of the	•			ecisely the				able 1f	100	(00)
Thermal bridg				usina An	nendix k	K						13.75	(36)
if details of therm	`	,		•	•							13.73	(30)
Total fabric he		aro mot nar	omn (00) -	- 0.00 x (0	• /			(33) +	(36) =			36.08	(37)
Ventilation he	eat loss ca	alculated	l monthly	V				(38)m	= 0.33 × (	25)m x (5)			`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 10.07	9.96	9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m		l	
(39)m= 46.15	46.04	45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss par	ameter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	45.34	(39)
(40)m= 1.31	1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
		· · · / <del>-</del> · · ·						,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.29	(40)
Number of da	Feb	nth (Tabl	le 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)
(41)1112	20	01	00	01	00	01	01	00	01	00	01		(**)
4.384 4 1											1.30/1./		
4. Water hea	ating ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occ if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (¯	ΓFA -13.		28		(42)
if TFA > 13 if TFA £ 13	.9, N = 1 .9, N = 1	+ 1.76 x		`	,	·	, <b>-</b>	,	ГҒА -13.	9)			, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu	9, N = 1 9, N = 1 ge hot way	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 64	.68		(42)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	9, N = 1 9, N = 1 ge hot way yal average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, f	ay Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan	9, N = 1 9, N = 1 ge hot way all average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 64			, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot wa ual average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr	es per da 5% if the d rater use, I May Vd,m = fac	y Vd,av welling is not and co Jun ctor from	erage = designed to ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target o	9) 64 Nov	.68 Dec		, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan	9, N = 1 9, N = 1 ge hot way all average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us  Sep  63.39	Oct	9) 64 Nov 68.56	.68  Dec  71.15	776.21	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot wa aal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 7	erage = designed to ld)  Jul Table 1c x  58.22	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44)112 =	.68  Dec  71.15	776.21	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage  (44)m= 71.15	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per proper in litres per 68.56	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 7	erage = designed to ld)  Jul Table 1c x  58.22	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44)112 =	.68  Dec  71.15	776.21	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of  (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per litres per li	+ 1.76 x ater usag hot water person per Mar day for ea 65.98 used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  63.39  73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44)12 = ables 1b, 1	.68  Dec  71.15  c, 1d)  102.19	776.21 1017.73	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per proper in litres per 68.56 of hot water 92.29 water heating	+ 1.76 x  ater usag hot water person per  Mar day for ea  65.98  used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the d vater use, I  May Vd,m = fac 60.8  onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  68.39  73.97  70 to (61)	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous (46)m= 15.83	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per processing litres per processing from 168.56 of hot water 192.29 water heating 13.84	+ 1.76 x ater usag hot water person per Mar day for ea 65.98 used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  63.39  73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per process for	+ 1.76 x  ater usag hot water person per  Mar day for ea 65.98  used - calc 95.23  ng at point 14.28	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no	es per da 5% if the divater use, $I$ May $Vd,m = factors$ 60.8  79.66  hot water 11.95	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to ld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96	+ 36 a water us  Sep  63.39  73.97  70 (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 123  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous (46)m= 15.83  Water storage	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per per per per per per per per	+ 1.76 x  ater usag hot water person per  Mar day for ea  65.98  used - calc  95.23  ng at point  14.28  includin	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 x storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa	+ 36 a water us  Sep  63.39  73.97  70 (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volumes	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per process for	ter usage hot water person per Mar day for ea 65.98 used - calc 95.23 ng at point 14.28 including and no ta	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw	es per da 5% if the divater use, $I$ May $Vd,m = factors$ 60.8 $Onthly = 4$ .  79.66 $Onthly = 11.95$ Dolar or Water velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74 10.31 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if many storage Water storage	.9, N = 1 .9, N = 1 ge hot way and average 5 litres per proper in litres per proper for	+ 1.76 x  ater usag hot water person per  Mar day for ea 65.98  used - calc 95.23  ng at point 14.28  includin and no ta hot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufactors  a) If manufactors	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per per per per per per per per	+ 1.76 x  ater usage hot water person per  Mar day for each of the second person per day for each of the second person per day for each of the second person per day for each of the second person per	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact Temperature	9, N = 1 9, N = 1 ge hot way all average 5 litres per per per per per per per per per per	+ 1.76 x  ater usage hot water person per Mar  Gay for each 65.98  used - calconditions of the person per at point 14.28  including and no tale hot water eclared learned lear	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e ocludes in	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44)12 = ables 1b, 1 94.1 m(45)12 = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact a) If manufact Temperature Energy lost from	9, N = 1 9, N = 1 ge hot way al average 5 litres per p 68.56 of hot water 2 92.29 water heatin 13.84 e loss: me (litres) heating a no stored e loss: cturer's defactor froom water	+ 1.76 x  ater usage hot water person per day for each of the second of	ge in litre usage by s day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the director use, if the director use, if May $Vd,m = factor 0.8$ Onthly = 4.  79.66  Onthly = 4.  11.95  Dolar or Water or Water or Water or Water or Water or Use of the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the conclude in the concludes in the conclude in t	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  11.1  ame vess  ers) ente	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact Temperature	9, N = 1 9, N = 1 ge hot way al average 5 litres per p 68.56 of hot water 2 92.29 water heatin 13.84 e loss: me (litres) heating a no stored e loss: cturer's defactor froom water	+ 1.76 x  ater usage hot water person per day for each of the second of	ge in litre usage by s day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the director use, if the director use, if May $Vd,m = factor 0.8$ Onthly = 4.  79.66  Onthly = 4.  11.95  Dolar or Water or Water or Water or Water or Water or Use of the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the conclude in the concludes in the conclude in t	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47) mbi boil	+ 36 a water us  Sep  63.39  68.39  73.97  11.1  ame vess  ers) ente	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47) (48) (49)

Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month $ 0.02  1.03  (52)  0.6  (53)  1.03  (54)  (54)  (55)$
Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       1.03       (54)         Enter (50) or (54) in (55)       1.03       (55)
Temperature factor from Table 2b 0.6 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Enter (50) or (54) in (55) (55)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54) Enter (50) or (54) in (55)
Enter (50) or (54) in (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 (57)
Primary circuit loss (annual) from Table 3
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (41)m
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$
(62)m= 160.79 142.21 150.51 136.52 134.94 122.24 118.98 128.37 127.46 141.48 147.59 157.46 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (63)
Output from water heater
(64)m= 160.79 142.21 150.51 136.52 134.94 122.24 118.98 128.37 127.46 141.48 147.59 157.46
Output from water heater (annual) <sub>112</sub> 1668.57 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]
(65)m= 79.31 70.63 75.89 70.4 70.71 65.65 65.4 68.53 67.39 72.89 74.08 78.2 (65)
(00)111   70.00   70.00   70.11   00.00   00.4   00.00   71.00
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)  Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)  Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 24.98 22.18 18.04 13.66 10.21 8.62 9.31 12.11 16.25 20.63 24.08 25.67 (67)  Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77

Total internal gai	ns =					(66)m + (67)r	n + (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 364.63 36	2.04 350	0.52	332.83	315.16	298.	92 289.12	294	.42	304.33	322.17	7 342.04	356.63		(73)
6. Solar gains:														
Solar gains are calcu	lated using	g solar	flux from	Table 6a	and as	sociated equa	ations	to co	nvert to the	e applic	able orientat	ion.		
Orientation: Acce		or	Area			Flux		т.	g_ obla 6b		FF		Gains	
Tabl	e oa	_	m²			Table 6a	_		able 6b	_	Table 6c		(W)	
Northeast <sub>0.9x</sub>	0.77	X	1.0	8	x	11.28	X		0.4	X	0.7	=	2.36	(75)
Northeast 0.9x	0.77	X	0.3	32	X	11.28	X		0.4	X	0.7	=	0.7	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	08	X	22.97	X		0.4	X	0.7	=	4.81	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	X	22.97	X		0.4	X	0.7	=	1.43	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	08	x	41.38	X		0.4	X	0.7	=	8.67	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	x	41.38	X		0.4	X	0.7	=	2.57	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	8	x	67.96	X		0.4	X	0.7	=	14.24	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	X	67.96	X		0.4	X	0.7	=	4.22	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	)8	X	91.35	X		0.4	X	0.7	=	19.14	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	X	91.35	X		0.4	×	0.7	=	5.67	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	8	x	97.38	X		0.4	x	0.7	=	20.41	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	x	97.38	X		0.4	x	0.7	=	6.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	)8	x	91.1	X		0.4	X	0.7	=	19.09	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	x	91.1	X		0.4	x	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	)8	x	72.63	X		0.4	X	0.7	=	15.22	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	x	72.63	X		0.4	X	0.7	=	4.51	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	)8	x	50.42	X		0.4	x	0.7	=	10.57	(75)
Northeast <sub>0.9x</sub>	0.77	X	0.3	32	x	50.42	X		0.4	x	0.7	=	3.13	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	)8	x	28.07	X		0.4	x	0.7	=	5.88	(75)
Northeast 0.9x	0.77	X	0.3	32	x	28.07	X		0.4	x	0.7	=	1.74	(75)
Northeast <sub>0.9x</sub>	0.77	X	1.0	8	x	14.2	X		0.4	x	0.7	=	2.98	(75)
Northeast 0.9x	0.77	X	0.3	32	x	14.2	X		0.4	x	0.7	=	0.88	(75)
Northeast 0.9x	0.77	X	1.0	)8	x	9.21	X		0.4	x	0.7	=	1.93	(75)
Northeast 0.9x	0.77	X	0.3	32	x	9.21	X		0.4	x	0.7	=	0.57	(75)
Southeast 0.9x	0.77	X	1.9	97	x	36.79	X		0.4	x	0.7		14.06	(77)
Southeast <sub>0.9x</sub>	0.77	X	1.9	97	x	62.67	X		0.4	x	0.7	=	23.96	(77)
Southeast <sub>0.9x</sub>	0.77	X	1.9	97	x	85.75	X		0.4	x	0.7	=	32.78	(77)
Southeast 0.9x	0.77	X	1.9	97	x	106.25	X		0.4	x	0.7	=	40.62	(77)
Southeast <sub>0.9x</sub>	0.77	x	1.9	97	x	119.01	X		0.4	x	0.7	_	45.49	(77)
Southeast 0.9x	0.77	x	1.9	97	x	118.15	X		0.4	x	0.7		45.16	(77)
Southeast <sub>0.9x</sub>	0.77	x	1.9	97	x	113.91	x		0.4	x	0.7	<u> </u>	43.54	(77)
Southeast <sub>0.9x</sub>	0.77	x	1.9	97	x	104.39	x		0.4	x	0.7		39.9	(77)
Southeast <sub>0.9x</sub>	0.77	x	1.9	97	x	92.85	X		0.4	x	0.7		35.49	(77)
Southeast 0.9x	0.77	X	1.9	97	x	69.27	X		0.4	×	0.7	=	26.48	(77)

								-			_					_
Southeast 0.9x	0.77	X	1.9	)7	X	4	4.07	X		0.4	X	0.7		=	16.85	(77)
Southeast 0.9x	0.77	X	1.9	7	X	3	1.49	X		0.4	X	0.7		=	12.04	(77)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	3	6.79	]		0.4	X	0.7		=	10.14	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>!</b> 5	X	3	6.79	]		0.4	X	0.7		=	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	6	2.67	]		0.4	X	0.7		=	17.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	X	6	2.67			0.4	x	0.7		=	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	8	5.75			0.4	x	0.7		=	23.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	X	8	5.75			0.4	x	0.7		=	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	1	06.25	]		0.4	x	0.7		=	29.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	1	06.25	]		0.4	x	0.7		=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	19.01	Ī		0.4	X	0.7		=	32.79	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	1	19.01	Ī		0.4	x	0.7		=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	18.15	Ī		0.4	X	0.7		=	32.55	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	15	X	1	18.15	Ī		0.4	x	0.7		=	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	2	X	1	13.91	ĺ		0.4	x	0.7		=	31.39	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	ļ5	X	1	13.91	ĺ		0.4	x	0.7		=	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	1	04.39	j		0.4	x	0.7		=	28.76	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	ŀ5	X	1	04.39	ĺ		0.4	x	0.7		=	29.37	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	9	2.85	j		0.4	×	0.7		=	25.58	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	9	2.85	j		0.4	×	0.7		=	26.12	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	6	9.27	ĺ		0.4	x	0.7		=	19.09	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	6	9.27	ĺ		0.4	X	0.7		=	19.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	4	4.07	ĺ		0.4	x	0.7		=	12.14	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	4	4.07	ĺ		0.4	x	0.7		=	12.4	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	3	1.49	ĺ		0.4	X	0.7		=	8.68	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	3	1.49	ĺ		0.4	X	0.7		=	8.86	(79)
_								_								
Solar gains in	watts, ca	lculated	for eac	h month	า			(83)n	n = Sı	um(74)m .	(82)m					
(83)m= 37.62	65.1	91.78	118.25	136.58	1	37.42	131.73	117	7.77	100.9	72.68	3 45.25	32.0	)8		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts					_				
(84)m= 402.25	427.14	442.3	451.07	451.74	4	36.33	420.85	412	2.19	405.23	394.8	5 387.28	388.	71		(84)
7. Mean inter	nal temp	erature (	(heating	seaso	n)											
Temperature	during h	eating p	eriods ir	n the liv	ing	area	from Tal	ble 9	, Th	1 (°C)					21	(85)
Utilisation fac	tor for ga	ains for li	iving are	ea, h1,n	n (s	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug	Sep	Ос	t Nov	De	ЭС		
(86)m= 0.89	0.87	0.83	0.77	0.68	1	0.55	0.43	0.4	45	0.61	0.77	0.86	0.8	9		(86)
Mean internal	tempera	ature in I	iving ar	ea T1 (1	follo	w ste	ns 3 to 7	7 in 7	 Γable	9c)			•		l	
(87)m= 19.01	19.21	19.57	20.03	20.46	_	20.78	20.91	20		20.69	20.19	19.54	18.9	97		(87)
Temperature	during h	ooting n	oriode ir	roct of	f du	olling	from To	hlo i	 0 Th				I			
(88)m= 20.34	20.34	20.35	20.35	20.36	$\overline{}$	20.36	20.36	20.		20.36	20.30	3 20.35	20.3	35		(88)
` '	l l							<u> </u>				1	1			V= =/
Utilisation fac	tor for ga	0.82	0.76	welling, 0.66	$\overline{}$	, <b>m (se</b> 0.51	e Table	9a) 0.	<u>, 1</u>	0.57	0.75	0.84	0.8	ο		(89)
(89)m= 0.88	0.00	0.02	0.76	0.00	<u>L</u> '	U.U I	0.37	1 0.	· <del>·</del>	0.07	0.75	0.84	J 0.8	<b>J</b>		(69)

0)m=	interna 18.48	18.69	19.03	19.49	19.9	20.2	20.31	20.3	20.12	19.65	19.02	18.45		(90
L						l			f	fLA = Livin	g area ÷ (	4) =	0.68	(91
Леап	internal	l temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) x T2					
2)m=	18.84	19.05	19.4	19.86	20.28	20.59	20.72	20.71	20.51	20.01	19.37	18.8		(92
ı Vlqq <i>l</i>	adjustn	nent to tl	ne mean	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate		<u> </u>		
3)m=	18.84	19.05	19.4	19.86	20.28	20.59	20.72	20.71	20.51	20.01	19.37	18.8		(93
B. Spa	ace hea	ting requ	uirement											
			ernal ter or gains i	•		ed at ste	ep 11 of	Table 9b	o, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
ſ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ا Jtilisa	tion fac	tor for g	ains, hm		,									
4)m=	0.86	0.84	0.8	0.74	0.65	0.53	0.4	0.43	0.58	0.74	0.82	0.87		(94
ء Jsefu	I gains,	hmGm .	W = (94	1)m x (84	4)m									
5)m=	345.36	357.5	354.66	334.87	295.24	229.51	169.75	175.2	235.8	290.41	319.02	336.73		(98
ı Ionth/	lly avera	age exte	rnal tem	perature	from Ta	able 8						<u>.                                    </u>		
s)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		(9
leat l	oss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
')m=	671.06	651.2	592.26	497.16	388.12	267.79	184.2	192.09	287.99	426.04	558.19	667.4		(9
pace	heating	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
Г		·				i			· `	<del></del>				
)m=	242.32	197.37	176.77	116.85	69.11	0	0	0	0	100.91	172.2	246.01		
3)m= [	242.32	197.37	176.77	116.85	69.11	0	0					└──┤	1321.54	(9
΄ [						0	0			100.91 (kWh/year		└──┤		닠`
pace	heating	g require	ement in	kWh/m²	?/year			Tota	l per year			└──┤	1321.54 37.63	닠`
Space	e heating	g require	ement in	kWh/m²	?/year				l per year			└──┤		닠`
i. Ene	e heating	g require quiremer	ement in nts – Indi	kWh/m² vidual h	?/year eating sy	ystems i	ncluding	Tota	l per year			└──┤	37.63	(98
Space  Tene	e heating ergy reo e heating on of sp	g require quiremen ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdar	eating sy	ystems i	ncluding system	Tota	I per year			└──┤		(99)
Space  Ene	e heating ergy reo e heating on of sp	g require quiremen ng: pace hea	ement in nts – Indi	kWh/m² vidual h econdar	eating sy	ystems i	ncluding system	Tota	I per year			└──┤	37.63	(9
Space Space Fraction	e heating ergy rec e heating on of sp on of sp	g require quiremen ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdary ain syst	eating sy y/supple em(s)	ystems i	ncluding system	Tota	I per year CHP) - (201) =	(kWh/year		└──┤	37.63	(9)
pace pace raction raction	e heating ergy receive heating on of spon of spon of toton	g require quiremen ng: pace hea pace hea tal heatin	ement in ats – Indi at from se at from m	kWh/m² vidual h econdary ain syst main syst	eating sy y/supple em(s) stem 1	ystems i	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	0 1	(9)
Epace Epace Fraction Fraction Fraction Fraction	e heating ergy rece e heatir on of sp on of tot ency of r	g require quiremen ng: pace hea pace hea tal heatin	ement in ts – Indi t from se t from m	kWh/m² vidual he econdary ain systemain system	eating sy y/supple em(s) stem 1	ystems i mentary	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	0 1	(2)
pace. Energy pace. Fraction raction fraction fra	e heating  e heating  e heating  on of sp  on of total  ency of re	g require quirement ng: pace hea pace hea tal heatin main spa	ement in ats – Indi at from se at from m ag from a ace heati ry/supple	kWh/m² vidual h econdary ain systemain systementary	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary	ncluding system	Tota micro-C (202) = 1 - (204) = (204)	T per year  CHP)  - (201) =  02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	37.63 0 1 1 100 0	(9)
Epace Fraction Fraction Fraction Efficie	e heating e heating on of sp on of total ency of se uncy of se	g require  quiremen  ng:  pace hea  pace hea  tal heatin  main spa  seconda	ement in  outs - Indi  out from secut from mang from outling from outl	kWh/m² vidual h econdary ain systemain systementary Apr	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary g system Jun	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	37.63 0 1 1 100	(9)
pace pace raction raction fraction fraction	e heating ergy receive heating on of spon of total ency of receive of spon of spon of total ency of spon of sp	g require  quiremen  ng:  pace hea  pace hea  tal heatil  main spa  seconda  Feb  g require	ement in  Its – Indi  It from se  It from m  Ing from I  Ing from I  Ing heati  Ing Mar  Ing ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 -  (204) = (204)	I per year  CHP)  - (201) =  02) × [1 -	(kWh/year	Nov	8) <sub>15,912</sub> =	37.63 0 1 1 100 0	(9)
Space  Space Fraction  Fra	e heating requirements on of spon of to ency of spon of spon of to ency of spon of spon of to ency of spon of	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  197.37	ement in  at from set from mag from ace heating  Mar  ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota micro-C (202) = 1 - (204) = (204)	T per year  CHP)  - (201) =  02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	37.63 0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction  Fra	e heating e heating on of sp on of to ency of r ency of s Jan e heating 242.32 = {[(98)	g require  ng: pace hea pace hea tal heatin main spa seconda  Feb g require  197.37	ement in  Its – Indi  It from set from many from in  It from many	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug	per year   CHP)	(kWh/year	Nov	8) <sub>15,912</sub> =	37.63 0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction  Fra	e heating requirements on of spon of to ency of spon of spon of to ency of spon of spon of to ency of spon of	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  197.37	ement in  at from set from mag from ace heating  Mar  ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	I per year   CHP)	(kWh/year	Nov 172.2	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
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Space Fraction Fracti	e heating e heating e heating on of sp on of to ency of r ency of s  Jan 242.32 = {[(98) 242.32	g require  quirement  ng:  pace head  pace head  tal heatin  main space  seconda  Feb  g require  197.37  )m x (20  197.37  g fuel (se	ement in  at from set from mag from ace heating the set of the set	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating on of sp on of too ency of se ncy of se de heating 242.32 e heating e heating 242.32	g require  ruiremen  ruire	ement in  Its – Indi  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from secondary  It from secondary  It from many from the secondary  It from secondary  It	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating syly/supple em(s) stem 1 em 1 y heating May d above 69.11 em 1 em 1 em 1 em 1 em 1 em 1 em 1 e	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
space space fraction	e heating e heating on of sp on of too ency of se ncy of se de heating 242.32 e heating e heating 242.32	g require  ruiremer  rig:  pace head  race h	ement in  Its – Indi  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from secondary  It from secondary  It from many from the secondary  It from secondary  It	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating syly/supple em(s) stem 1 em 1 y heating May d above 69.11 em 1 em 1 em 1 em 1 em 1 em 1 em 1 e	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating e heating on of sp on of sp on of to ency of se de heating 242.32  = {[(98) 242.32  e heating m x (20) neating	g require  ng: pace head pace head pace head tal heatin main space seconda  Feb g require 197.37 )m x (20 197.37  g fuel (so 01)] } x 1 0	ement in  Its – Indi  It from set from many from it from many from it from many from it from many from it from many from it from from from from from from from from	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May dabove) 69.11 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	37.63  0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating e heating on of sp on of sp on of to ency of se de heating 242.32  = {[(98) 242.32  e heating m x (20) neating	g require  ng: pace head pace head pace head tal heatin main space seconda  Feb g require 197.37 )m x (20 197.37  g fuel (so 01)] } x 1 0	ement in  at from set from many from in  ace heating ment (content from many from in  ace heating ment (content from many from in  ace heating ment (content from many from in  ace heating many from in	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May dabove) 69.11 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2

Factor for charging method for commu	unity water heating				1	(305)
Distribution loss factor (Table 12c) for	community heating system				1.05	(306)
Water heat from CHP		(64) x (3	303a) x (305) x (306)	=	1752	(310a)
Electricity used for heat distribution		0.01 × [(307a)	)(307e) + (310a)	(310e)] =	17.52	(313)
Annual totals			kWh/yea	r	kWh/year	- 1
Space heating fuel used, main system					1321.54	_
Electricity for pumps, fans and electric	·				1	
mechanical ventilation - balanced, ext				139.02		(230a)
Total electricity for the above, kWh/yea	r	sum of (230a)	(230g) =		139.02	(231)
Electricity for lighting					176.43	(232)
10a. Fuel costs - individual heating sy	stems:					
	<b>Fuel</b> kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	174.31	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating from CHP	(310a) x		4.24	x 0.01 =	74.28	(342a)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	18.34	(249)
(if off-peak tariff, list each of (230a) to (Energy for lighting	230g) separately as applica (232)	ble and appl	y fuel price acco	rding to x 0.01 =	Table 12a 23.27	(250)
Additional standing charges (Table 12)					60	(251)
Appendix Q items: repeat lines (253) ar	nd (254) as needed					
Total energy cost	(245)(247) + (250)(254) =				350.2	(255)
11a. SAP rating - individual heating sy	rstems					
Energy cost deflator (Table 12)					0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =				1.84	(257)
SAP rating (Section 12)					74.39	(258)
12a. CO2 emissions – Individual heati	ng systems including micro	-CHP				
	<b>Energy</b> kWh/year		Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x		0.519	=	685.88	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating from community system						
		Energy kWh/year	Emission kg CO2/k		Emissions kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)	water heating (not CHP)  If there is CHP using tw	o fuels repeat (3	363) to (366) for the	second fue	329	(367a)

CO2 associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x 0.52	=	276.38	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [	9.09	(372)
Total CO2 associated with community systems	(363)(36	66) + (368)(372)	= [	285.47	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	72.15	(267)
Electricity for lighting	(232) x	0.519	=	91.57	(268)
Total CO2, kg/year		sum of (265)(271) =		1135.07	(272)
CO2 emissions per m²		(272) ÷ (4) =		32.32	(273)
EI rating (section 14)				81	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4057.12	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Water heating from community system					
		ergy Primary h/year factor		nissions Vh/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		s repeat (363) to (366) for the s	second fuel	329	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x 3.07	= [	1634.84	(367)
Electrical energy for heat distribution	[(313) x	2.92	= [	51.16	(372)
Total Energy associated with community systems	(363)(36	66) + (368)(372)	= [	285.47	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	426.78	(267)
Electricity for lighting	(232) x		=	541.64	(268)
		0		0+1.0+	_
'Total Primary Energy		sum of (265)(271) =		6711.54	(272)

Secondary   Seco
Software Name: Stroma FSAP 2012   Software Version: Version: 1.0.4.25
Area(m²)
Area(m²)
Area(m²)   Av. Height(m)   Volume(m³)
Ground floor  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)  Dwelling volume  (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 108.52 (5)  2. Ventilation rate:    Main   Secondary   Other   Itotal   Main   Main   Meating   Heating   Heat
Dwelling volume   (3a)+(3b)+(3c)+(3d)+(3e)+(3n)   =   108.52   (5)
2. Ventilation rate:    main heating   heating
Number of chimneys
Number of chimneys
Number of chimneys
Number of intermittent fans    0
Number of passive vents $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Number of flueless gas fires  O  Air changes per hour  Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = 0 $\div (5)$ = 0 (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  150  161  162  163  165  165  165  166  166  167  168  179  170  170  170  170  170  170  170
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = $0$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  O (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (14)  Window infiltration  0 (15)  Infiltration rate  0 (16)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = $0$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  O (12)  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (14)  Window infiltration  0 (15)  Infiltration rate  0 (16)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  0 (12)  0 (13)  0 (14)  0 (15)  0 (15)  0 (16)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0 (12)  0 (13)  0 (14)  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] =  0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  0 (16)
deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) $\div$ 100] =0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)
If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 1$
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ Infiltration rate $0 = (14)$ $0 = (15)$ $0 = (15)$ $0 = (15)$
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)  Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0                                  $
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 2.5 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.12 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  (19)
Number of sides sheltered $0  mtext{(19)}$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 1  mtext{(20)}$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.12 \times (21)$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 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

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se	-		•			'	
If mechanical If exhaust air he			andiv N (S	3h) - (23a	a) v Emy (e	aguation (l	NS)) other	wice (23h	) <b>–</b> (23a)		[	0.5	(2
If balanced with									) = (25a)			0.5	(2
a) If balance		-		_					2h\m + ('	23h) ∨ [·	 1	75.65	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(2
b) If balance	L1		<u> </u>			<u> </u>			<u>.                                    </u>				·
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extin < 0.5 ×			•	•				.5 × (23b	·)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the				•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(2
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(2
oors Type 2					0.72	Х	1	=	0.72				(:
oors Type 3					0.99	Х	1	=	0.99				(:
oors Type 4					0.72	X	1	= [	0.72				(:
													(:
oors Type 5					0.72	X	1	= [	0.72				
• •					0.72	_	1	= [	0.72				(
oors Type 6	<del>)</del> 1					×		= [					
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				(; (; (;
oors Type 5 oors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				(2
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	2 3 4 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(:
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 falls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type indows Type	2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
pors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				(1)

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity Cr	$m = S(A \times k)$						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass pa	` ,	IP = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assessme	ents where the d	etails of the	,			ecisely the				able 1f	100	(00)
Thermal bridges			usina Ap	pendix I	K						13.75	(36)
if details of thermal b	` ,		• •	•							10.70	(5.5)
Total fabric heat							(33) +	(36) =			36.08	(37)
Ventilation heat I	oss calculate	d monthl	y				(38)m	= 0.33 × (	25)m x (5)			
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 10.07	9.96 9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer coe	efficient, W/K		!	!			(39)m	= (37) + (3	38)m		l	
(39)m= 46.15 4	46.04 45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss parame	eter (HLP), V	//m²K		•	•	•		Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	45.34	(39)
(40)m= 1.31	1.31 1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
Number of days	in month (Ta	ole 1a)	!		•		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.29	(40)
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28 31	30	31	30	31	31	30	31	30	31		(41)
	ļ .	<u>!</u>			<u> </u>							
4. Water heating	a eneray rea	uirement:								kWh/ye	ear:	
	<u> </u>											
Assumed occupa		y [1 <b>-</b> eyn	.( <u>-</u> 0.0003	840 v (TF	=Δ <b>-</b> 13 0	1211 ± 0 (	1013 v (	Γ <b>F</b> Δ <b>-</b> 13		28		(42)
if TFA > 13.9, I	N = 1 + 1.76	х [1 - ехр	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		28		(42)
if TFA > 13.9, I if TFA £ 13.9, I Annual average I	N = 1 + 1.76 N = 1 hot water usa	age in litre	` es per da	ay Vd,av	erage =	(25 x N)	+ 36		9) 64	.68		(42)
if TFA > 13.9, I if TFA £ 13.9, I	N = 1 + 1.76 N = 1 hot water usa everage hot water	age in litre r usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage =	(25 x N)	+ 36		9) 64			` ,
if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litr	N = 1 + 1.76 N = 1 hot water usa everage hot water es per person p	age in litre r usage by er day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is hot and co	rerage = designed ( old)	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` ,
if TFA > 13.9, If TFA £ 13.9, If Annual average Reduce the annual a	N = 1 + 1.76 N = 1 hot water usawerage hot wateres per person p Feb Mar	age in litre r usage by er day (all w Apr	es per da 5% if the d vater use, l	ay Vd,av dwelling is hot and co	erage = designed to bld)	(25 x N) to achieve	+ 36		9) 64			` ,
if TFA > 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litrical Jan Hot water usage in lit	N = 1 + 1.76 N = 1 hot water usawerage hot wateres per person per	age in litre r usage by er day (all w Apr each month	es per da 5% if the da vater use, I May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from	erage = designed to lid)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target o	9) 64 Nov	.68 Dec		` ,
if TFA > 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litrical Jan  Hot water usage in lit	N = 1 + 1.76 N = 1 hot water usawerage hot wateres per person p Feb Mar	age in litre r usage by er day (all w Apr	es per da 5% if the d vater use, l	ay Vd,av dwelling is hot and co	erage = designed to bld)	(25 x N) to achieve	+ 36 a water us  Sep  63.39	Oct	9) 64 Nov 68.56	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litrical Jan Hot water usage in lit	N = 1 + 1.76 N = 1 hot water usaverage hot water es per person p Feb Martres per day for 68.56 65.98	age in litre r usage by er day (all w Apr each month 63.39	es per da 5% if the d vater use, I May Vd,m = fa 60.8	ay Vd,av fwelling is that and co Jun ctor from 1	erage = designed in the designed in the designed in the designed in the design in thed	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	` ,
if TFA > 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litr.  Jan  Hot water usage in lit.  (44)m= 71.15 6	N = 1 + 1.76 N = 1 hot water usaverage hot water es per person p Feb Martres per day for 68.56 65.98	age in litre r usage by er day (all w Apr each month 63.39	es per da 5% if the d vater use, I May Vd,m = fa 60.8	ay Vd,av fwelling is that and co Jun ctor from 1	erage = designed in the design	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litrical Interpretation Interpretatio	N = 1 + 1.76 N = 1 hot water usaverage hot water es per person p Feb Martres per day for et day for	age in litre r usage by er day (all w Apr each month 63.39  alculated me 83.02	es per da $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ in	ay Vd,av Iwelling is that and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 60.8  07m / 3600 73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1	.68  Dec  71.15  c, 1d)  102.19	776.21 1017.73	(43)
if TFA > 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litr.  Jan  Hot water usage in lit.  (44)m= 71.15 6	N = 1 + 1.76 N = 1 hot water usaverage hot water es per person p Feb Martres per day for et day for	age in litre r usage by er day (all w Apr each month 63.39  alculated me 83.02	es per da $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ if the of $5\%$ is the of $5\%$ in	ay Vd,av Iwelling is that and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 60.8  07m / 3600 73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15  c, 1d)  102.19		(43) (44) (45)
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if TFA > 13.9, I if TFA £ 13.9, I if TFA £ 13.9, I Annual average Reduce the annual a not more that 125 litrical Jan Hot water usage in line (44)m= 71.15 6  Energy content of ho (45)m= 105.52 9  If instantaneous water (46)m= 15.83 7  Water storage loss	N = 1 + 1.76 N = 1 hot water usaverage hot water uses per person p Feb Martres per day for a 68.56 65.98 at water used - ca 92.29 95.23 ar heating at points 13.84 14.28 SS:	age in litre r usage by er day (all w Apr each month 63.39  83.02  nt of use (no	es per da 5% if the a vater use, $I$ May $Vd,m = fa$ $60.8$ $79.66$ $O$ hot water $11.95$	ay Vd,av Iwelling is hot and co Jun ctor from 7 58.22 190 x Vd,r 68.74	rerage = designed to sld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96	+ 36 a water us  Sep  63.39  6Wh/more 73.97  1 to (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64  Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
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if TFA > 13.9, I if TFA £ 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litrical Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of Int	N = 1 + 1.76 N = 1 hot water usal verage hot water usal verage hot water es per person p  Feb Martres per day for of 68.56 65.98 of water used - car 92.29 95.23 er heating at point 13.84 14.28 ss: (litres) including and no fatored hot wass:	age in litre r usage by er day (all w Apr each month 63.39  alculated me 83.02  at of use (no 12.45  ang any se ank in dw ter (this in	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  onthly = 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  10.31  IWHRS INTER 110 INSTANTANT	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  10 to (61)  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13.9, I if TFA £ 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litrical Interpretation I in I in I in I in I in I in I in I	N = 1 + 1.76 N = 1 hot water usal verage hot water used res per person p	age in litre r usage by er day (all w Apr each month 63.39  alculated me 83.02  at of use (no 12.45  and in dw ter (this ir loss factor loss factor	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  onthly = 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  10.31  IWHRS INTER 110 INSTANTANT	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  10 to (61)  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44)12 = ables 1b, 1 94.1 m(45)12 = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
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if TFA > 13.9, I if TFA £ 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litrical Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of the Interpretation of Interpretat	N = 1 + 1.76 N = 1 hot water usal everage hot water used res per person	age in litre r usage by er day (all w Apr each month 63.39  alculated me 83.02  at of use (no 12.45  ank in dw ter (this ir loss factor e 2b e, kWh/ye	es per da $5\%$ if the a vater use, I May $Vd,m = fa$ $60.8$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	ay Vd,av Iwelling is hot and co  Jun ctor from 1  58.22  190 x Vd,r  68.74  r storage),  10.31  /WHRS enter 110 nstantar wn (kWh	rerage = designed to designed	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47) mbi boil	+ 36 a water us  Sep  63.39 b kWh/mor  73.97 11.1 ame vess ers) ente	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47) (48) (49)

Hot water stor	•			e 2 (kWl	h/litre/da	ay)				0.	02		(51)
If community I	_		on 4.3									Ī	(==)
Volume factor Temperature	-		2h							_	.03		(52) (53)
·							(47) (54)	··· ( <b>50</b> ) ··· (	EO)		.6	]	` '
Energy lost from Enter (50) or		_	, KVVN/ye	ear			(47) X (51)	x (52) x (	53) =		03		(54) (55)
, ,	. , .	,	or oooh	month			((EG)m - (	EE) (41)	~	1.	.03		(55)
Water storage							· · ·	55) × (41)ı	1	1		1	(==)
(56)m= 32.01 If cylinder contain	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	 	(56)
												X   - 	(EZ)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	,				F0\	(50) . 20	·F (44)				0		(58)
Primary circuit (modified by				•	•	` '	, ,		r tharmo	etat)			
(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	1	(59)
` ′					<u>l</u>	<u> </u>	<u> </u>					l	()
Combi loss ca	1				<del>`</del>	<u> </u>	i	_			I .	1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	128.37	127.46	141.48	147.59	157.46		(62)
Solar DHW input									r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)		,	1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
												,	
(64)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	128.37	127.46	141.48	147.59	157.46		
(64)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	l		l	147.59 r (annual) <sub>1</sub>	l	1668.57	(64)
(64)m= 160.79 Heat gains from					<u> </u>		Outp	out from wa	ater heate	I r (annual)₁	12		(64)
. ,					<u> </u>		Outp	out from wa	ater heate	I r (annual)₁	12		(64) (65)
Heat gains fro	om water 70.63	heating, 75.89	kWh/mo	onth 0.29	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31	70.63 m in calc	heating, 75.89 culation o	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal g	om water 70.63 om in calc ains (see	heating, 75.89 culation of	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)	om water 70.63 om in calc ains (see	heating, 75.89 culation of	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal g	om water 70.63 Im in calc ains (see	heating, 75.89 culation of Table 5 5), Wat	kWh/mo 70.4 of (65)m 5 and 5a	onth 0.29 70.71 only if c	5 ´ [0.85 65.65 ylinder is	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling	out from wa n] + 0.8 x 67.39 or hot w	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08	+ (59)m 78.2 munity h	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal grade Metabolic gain Jan	om water 70.63 om in calc ains (see ns (Table Feb 64.18	heating, 75.89 culation of Table 5 5), Wat Mar 64.18	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18	70.71 only if constant May	5 ´ [0.85 65.65 cylinder is Jun 64.18	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling Aug 64.18	out from wa 67.39 or hot w Sep 64.18	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08 rom com	+ (59)m 78.2 munity h	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan (66)m= 64.18	om water 70.63 om in calc ains (see ns (Table Feb 64.18	heating, 75.89 culation of Table 5 5), Wat Mar 64.18	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18	70.71 only if control is the second of the s	5 ´ [0.85 65.65 cylinder is Jun 64.18	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling Aug 64.18	out from wa 67.39 or hot w Sep 64.18	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08 rom com	+ (59)m 78.2 munity h	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains	om water 70.63 om in calc ains (see ns (Table Feb 64.18 c (calculat 8.87	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46	onth 0.29 70.71 only if c : May 64.18 L, equati 4.08	5 ´ [0.85 65.65 ylinder is Jun 64.18 ion L9 o	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84	Sep 64.18 66.5	ott 64.18	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal grading Jan (66)m= 64.18  Lighting gains (67)m= 9.99	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46	onth 0.29 70.71 only if c : May 64.18 L, equati 4.08	5 ´ [0.85 65.65 ylinder is Jun 64.18 ion L9 o	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84	Sep 64.18 66.5	ott 64.18	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 9.99  Appliances gains  (68)m= 109.48	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 of 3.45 uation L	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Tal 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 3.45 uation L 86.74	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Fable 5 6.5 See Table 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62 c (calculat 29.42	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 Append 101.66 opendix 29.42	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 of 3.45 uation L	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Tal 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 79.31 include (57)  5. Internal graph Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and fa	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ns gains	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66 opendix 29.42	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 of 3.45 uation L 86.74 tion L15	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63	+ (59)m 78.2 munity h Dec 64.18 10.27	]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 79.31 include (57)  5. Internal gram Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gar (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and far (70)m= 0	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ans gains 0	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 101.66 opendix 29.42 5a) 0	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Fable 5 6.5 See Table 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 79.31 include (57)  5. Internal good Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. expenses the same of the same	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62 c (calculat 29.42 ans gains 0 vaporatio	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 n Append 101.66 opendix 29.42 5a) 0 tive valu	onth 0.29 70.71 only if co  May 64.18 L, equati 4.08 dix L, equati 93.97 L, equati 29.42  0 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42 0	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 see Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63  97.42	+ (59)m 78.2 munity h Dec 64.18 10.27 104.65	]	(65) (66) (67) (68) (69) (70)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. even (71)m= -51.34	m water 70.63 m in calculations (see ms (Table Feb 64.18 c (calculations) 110.62 s (calculations) 29.42 ms gains 0 vaporatio -51.34	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 101.66 opendix 29.42 5a) 0	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63	+ (59)m 78.2 munity h Dec 64.18 10.27	]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 79.31 include (57)  5. Internal good Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. expenses the same of the same	m water 70.63 m in calculations (see ms (Table Feb 64.18 c (calculations) 110.62 s (calculations) 29.42 ms gains 0 vaporatio -51.34	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 n Append 101.66 opendix 29.42 5a) 0 tive valu	onth 0.29 70.71 only if co  May 64.18 L, equati 4.08 dix L, equati 93.97 L, equati 29.42  0 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42 0	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 see Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63  97.42	+ (59)m 78.2 munity h Dec 64.18 10.27 104.65	]	(65) (66) (67) (68) (69) (70)

Total inte	ernal	gains =				(60	6)m + (67)n	n + (68)	m + (69)m + (	70)m +	(71)m + (72)	)m		
(73)m= 26	68.32	266.85	259.22	247.16	235.35	223.62	215.79	219.9	7 225.98	238.2	252.2	262.28		(73)
6. Solar	gains	S:												
Solar gain	s are	calculated u	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	convert to the	e applic		tion.		
Orientation		Access F Table 6d	actor	Area m²			ux able 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	X	1.0	8	x	11.28	x	0.4	x	0.7	=	2.36	(75)
Northeast	0.9x	0.77	X	0.3	32	x	11.28	x	0.4	x	0.7	=	0.7	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	22.97	x [	0.4	x	0.7	=	4.81	(75)
Northeast	0.9x	0.77	X	0.3	32	x	22.97	x [	0.4	x	0.7	=	1.43	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	41.38	_ x [	0.4	×	0.7	=	8.67	(75)
Northeast	0.9x	0.77	X	0.3	32	X	41.38	] x [	0.4	×	0.7	=	2.57	(75)
Northeast	0.9x	0.77	X	1.0	)8	X	67.96	x	0.4	x	0.7	=	14.24	(75)
Northeast	0.9x	0.77	X	0.3	32	x	67.96	_ x [	0.4	x	0.7	=	4.22	(75)
Northeast	0.9x	0.77	X	1.0	)8	X	91.35	x	0.4	x	0.7	=	19.14	(75)
Northeast	0.9x	0.77	X	0.3	32	x	91.35	x	0.4	x	0.7	=	5.67	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	97.38	_ x [	0.4	x	0.7	=	20.41	(75)
Northeast	0.9x	0.77	X	0.3	32	x	97.38	x	0.4	X	0.7	=	6.05	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	91.1	x	0.4	X	0.7	=	19.09	(75)
Northeast	0.9x	0.77	X	0.3	32	x	91.1	x [	0.4	x	0.7	=	5.66	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	72.63	_ x	0.4	x	0.7	=	15.22	(75)
Northeast	0.9x	0.77	X	0.3	32	x	72.63	x	0.4	X	0.7	=	4.51	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	50.42	x	0.4	X	0.7	=	10.57	(75)
Northeast	0.9x	0.77	X	0.3	32	x	50.42	x	0.4	x	0.7	=	3.13	(75)
Northeast	0.9x	0.77	X	1.0	)8	x	28.07	x [	0.4	x	0.7	=	5.88	(75)
Northeast	0.9x	0.77	X	0.3	32	x	28.07	x	0.4	X	0.7	=	1.74	(75)
Northeast	L	0.77	X	1.0	)8	x	14.2	x	0.4	X	0.7	=	2.98	(75)
Northeast	L	0.77	X	0.3	32	x	14.2	x [	0.4	x	0.7	=	0.88	(75)
Northeast	L	0.77	X	1.0	)8	x	9.21	x	0.4	x	0.7	=	1.93	(75)
Northeast	0.9x	0.77	X	0.3	32	x	9.21	x	0.4	X	0.7	=	0.57	(75)
Southeast		0.77	X	1.9	97	X	36.79	_ x	0.4	x	0.7	=	14.06	(77)
Southeast	<u> </u>	0.77	X	1.9	97	X	62.67	x	0.4	x	0.7	=	23.96	(77)
Southeast	0.9x	0.77	X	1.9	97	X	85.75	×	0.4	×	0.7	=	32.78	(77)
Southeast	L	0.77	X	1.9	97	X	106.25	×	0.4	X	0.7	=	40.62	(77)
Southeast	L	0.77	X	1.9	97	x	119.01	_ x	0.4	x	0.7	=	45.49	(77)
Southeast	L	0.77	X	1.9	97	х	118.15	] x [	0.4	x	0.7	=	45.16	(77)
Southeast	<u> </u>	0.77	X	1.9	97	х	113.91	] x [	0.4	x	0.7	=	43.54	(77)
Southeast	0.9x	0.77	X	1.9	97	х	104.39	] x [	0.4	x	0.7	=	39.9	(77)
Southeast	L	0.77	X	1.9	7	х	92.85	x [	0.4	x	0.7	=	35.49	(77)
Southeast	0.9x	0.77	X	1.9	97	х	69.27	x	0.4	x	0.7	=	26.48	(77)

Southwesto 3s															_		
Southwesto, six	Southeast <sub>0.9x</sub>	0.77	X	1.9	7	X	4	4.07	X		0.4	X	0.	7	=	16.85	(77)
Southwesto as	Southeast <sub>0.9x</sub>	0.77	X	1.9	7	X	3	1.49	X		0.4	X	0.	7	=	12.04	(77)
Southwesto 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	3	6.79	]		0.4	X	0.	7	=	10.14	(79)
Southwestq 8x	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	3	6.79	]		0.4	X	0.	7	=	10.35	(79)
Southwesto at 0,77	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	6	2.67	]		0.4	x	0.	7	=	17.27	(79)
Southwesto 80, 0.77	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	6	2.67	]		0.4	x	0.	7	=	17.63	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	8	5.75	]		0.4	x	0.	7	=	23.63	(79)
Southwesto, sx	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	8	5.75	]		0.4	X	0.	7	=	24.13	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	10	06.25	]		0.4	X	0.	7	=	29.28	(79)
Southwesto 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	10	06.25	]		0.4	X	0.	7	_ =	29.89	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	19.01	]		0.4	X	0.	7	=	32.79	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	1	19.01	]		0.4	X	0.	7	=	33.48	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	18.15	]		0.4	X	0.	7	=	32.55	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	1	18.15	]		0.4	X	0.	7	=	33.24	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	13.91	]		0.4	X	0.	7	=	31.39	(79)
Southwest0,9x	Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	1	13.91	Ī		0.4	X	0.	7	_ =	32.05	(79)
Southwesto,9x 0.77 x 1.42 x 92.85 0.4 x 0.7 = 25.58 (79) Southwesto,9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.09 (79) Southwesto,9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.09 (79) Southwesto,9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.49 (79) Southwesto,9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.49 (79) Southwesto,9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwesto,9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwesto,9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 12.14 (79) Southwesto,9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwesto,9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwesto,9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwesto,9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(62)m (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08 (83) Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area T1 (follow steps 3 to 7 in Table 9c) (86)m = 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 20.34 20.34 20.35 20.35 20.35 20.36 20.36 20.37 20.36 20.36 20.35 20.35 20.35 (88)	Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	10	04.39	Ī		0.4	X	0.	7	<u> </u>	28.76	(79)
Southwestg, 9x 0.77 x 1.45 x 92.85 0.4 x 0.7 = 26.12 (79) Southwestg, 9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.09 (79) Southwestg, 9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.49 (79) Southwestg, 9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.49 (79) Southwestg, 9x 0.77 x 1.42 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 12.4 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.66 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.34 20.34 20.35 20.35 20.35 20.36 20.36 20.36 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	10	04.39	]		0.4	X	0.	7	=	29.37	(79)
Southwestg, 9x 0.77 x 1.42 x 69.27 0.4 x 0.7 = 19.09 (79) Southwestg, 9x 0.77 x 1.45 x 69.27 0.4 x 0.7 = 19.49 (79) Southwestg, 9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 44.07 0.4 x 0.7 = 12.14 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 12.4 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.68 (79) Southwestg, 9x 0.77 x 1.45 x 31.49 0.4 x 0.7 = 8.66 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9C) (86)m = 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9C) (87)m = 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 20.34 20.34 20.35 20.35 20.35 20.36 20.36 20.36 20.36 20.36 20.35 20.35 (88)	Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	9	2.85	ĺ		0.4	x	0.	7	=	25.58	(79)
Southwest0.9x	Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	9	2.85	ĺ		0.4	x	0.	7	<u> </u>	26.12	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	6	9.27	ĺ		0.4	X	0.	7	=	19.09	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	6	9.27	j		0.4	= x	0.	7	<b>=</b>	19.49	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	4	4.07	j		0.4	X	0.	7	=	12.14	(79)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  (84)m = 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 301.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 301.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 301.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)m = 105.94 301.88 297.45 294.36  (85)m = 105.94 301.88 297.45 294.36  (86)m = 105.94 301.88 297.45 294.36  (87)m = 105.94 301.88 297.45 294.36  (87)m = 105.94 301.88 297.45 294.36  (87)m = 105.94 301.88 297.45 294.36  (88)	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	4	4.07	ĺ		0.4	X	0.	7	<b>=</b>	12.4	(79)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	3	1.49	j		0.4	T x	0.	7	<b>=</b>	8.68	(79)
(83)m= 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 20.35  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	3	1.49	j		0.4	X	0.	7	<b>=</b>	8.86	(79)
(83)m= 37.62 65.1 91.78 118.25 136.58 137.42 131.73 117.77 100.9 72.68 45.25 32.08  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 20.35  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	•			•					•			_					
Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Solar gains in	watts, cal	culated	for eacl	n montl	h			(83)m	n = Su	m(74)m	(82)n	1			_	
(84)m= 305.94 331.95 351 365.4 371.93 361.04 347.52 337.74 326.88 310.88 297.45 294.36 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.34 20.34 20.35 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(83)m= 37.62	65.1	91.78	118.25	136.58	1	37.42	131.73	117	7.77	100.9	72.6	8 45.2	5 3	32.08		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.34 20.34 20.35 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Total gains – i	internal an	d solar	(84)m =	: (73)m	+ (	83)m	, watts	,							•	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(84)m= 305.94	331.95	351	365.4	371.93	3	61.04	347.52	337	7.74	326.88	310.8	8 297.4	5 2	94.36		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	7. Mean inte	rnal tempe	rature (	heating	seaso	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temperature	during he	ating pe	eriods ir	the liv	ing	area 1	from Tab	ole 9	, Th1	(°C)					21	(85)
(86)m= 0.93 0.92 0.89 0.84 0.75 0.62 0.5 0.52 0.69 0.84 0.91 0.94 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Utilisation fac	ctor for gai	ns for li	ving are	ea, h1,r	n (s	ee Ta	ble 9a)									
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 18.66 18.89 19.29 19.82 20.31 20.7 20.88 20.86 20.59 19.98 19.25 18.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oc	t No	v	Dec		
(87)m=       18.66       18.89       19.29       19.82       20.31       20.7       20.88       20.86       20.59       19.98       19.25       18.62       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.34       20.34       20.35       20.35       20.36       20.36       20.37       20.36       20.36       20.35       20.35       20.35       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(86)m= 0.93	0.92	0.89	0.84	0.75		0.62	0.5	0.5	52	0.69	0.84	0.91		0.94		(86)
(87)m=       18.66       18.89       19.29       19.82       20.31       20.7       20.88       20.86       20.59       19.98       19.25       18.62       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.34       20.34       20.35       20.35       20.36       20.36       20.37       20.36       20.36       20.35       20.35       20.35       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Mean interna	al tempera	ture in li	iving are	ea T1 (1	follo	w ste	ps 3 to 7	in T	able	9c)						
(88)m= 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		<del></del>	-			_				-		19.9	8 19.2	5 1	18.62		(87)
(88)m= 20.34 20.34 20.35 20.35 20.36 20.36 20.36 20.37 20.36 20.36 20.35 20.35 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	Temperature	during he	ating pe	eriods ir	rest o	f dw	elling	from Ta	hle (	9 Th	2 (°C)		<b>!</b>			1	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	· · · · · ·	<del></del>	<del></del>			_					<del>` ' </del>	20.3	6 20.3	5 2	20.35		(88)
	` ′								l				1	[		I	
(66)		<del></del> -	-			_	`		<del> </del>	<sub>17</sub> T	0.65	0.82	0.9		0.93		(89)
	(55)	1 1			50					<u> </u>		0.02				I	(/

0)m=	interna 18.14	18.37	18.76	19.29	19.77	20.14	20.29	20.27	20.03	19.45	18.73	18.11		(90
· L						ļ	<u> </u>	<u> </u>	<u>f</u>	LA = Livin	g area ÷ (4	4) =	0.68	(91
/lean	internal	l temper	ature (fo	r the wh	ole dwel	lling) = f	I A 🗴 T1	+ (1 – fL	A) x T2			•		
2)m=	18.5	18.73	19.12	19.65	20.14	20.52	20.69	20.67	20.41	19.81	19.08	18.46		(92
L		nent to t	ne mean	internal	tempera	L ature fro	ı m Table	4e, whe	ere appro	L opriate				·
3)m=	18.5	18.73	19.12	19.65	20.14	20.52	20.69	20.67	20.41	19.81	19.08	18.46		(93
	ace hea	tina reau	uirement				l							
Set Ti	to the r	mean int		nperatur		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Itilisa			ains, hm		Iviay	<u> </u>		_ /tug	ССР		1101			
4)m=	0.91	0.89	0.86	0.8	0.72	0.59	0.47	0.49	0.66	0.8	0.88	0.91		(94
L			W = (94											`
г	277.81	294.91	300.74	293.22	267.19	214.58	162.73	166.89	215.08	249.99	261.98	269.17		(9
Ĺ			rnal tem											•
6)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		(9
L	oss rate	e for mea	an intern	al tempe	erature.	Lm . W :	 =[(39)m :	x [(93)m	L _ (96)m	<u> </u> 				
')m=	655.16	636.48	579.63	487.61	381.9	264.68	182.82	190.44	283.54	416.79	544.89	651.6		(9
L								24 x [(97)						`
paog	riodini	groquire	71110111110			i	i		<u>`</u>	<del></del>				
3)m=	280.75	229.54	207.49	139.96	85.34	I 0	I 0	0	0	I 124.1	203.7	l 284.53 l		
3)m=	280.75	229.54	207.49	139.96	85.34	0	0			124.1 (kWh/year	203.7	284.53	1555 42	
´ L						0	0		l per year	<u> </u>		<u> </u>	1555.42	닠`
´ L			207.49 ement in			0	0			<u> </u>		<u> </u>	1555.42 44.29	닠`
Space	heatin	g require	ement in	kWh/m²	/year				l per year	<u> </u>		<u> </u>		닠`
Space . Ene	heating	g require quiremer	ement in nts – Indi	kWh/m²	/year eating sy	ystems i	ncluding	Tota	l per year	<u> </u>		<u> </u>	44.29	(9
pace Epace raction	heating ergy receive heating on of sp	g require quiremer ng: pace hea	ement in ats – Indi	kWh/m² ividual h	eating sy	ystems i	ncluding	Tota	l per year	<u> </u>		<u> </u>		(9
pace Epace raction	heating ergy receive heating on of sp	g require quiremer ng: pace hea	ement in nts – Indi	kWh/m² ividual h	eating sy	ystems i	ncluding system	Tota	I per year	<u> </u>		<u> </u>	44.29	(9
Space Space Fraction	heating ergy receive heating on of spon of spon of spon of spon of spon of spon of spon erging the heating the hea	g require quiremen ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdary nain syst	eating sy y/supple em(s)	ystems i	ncluding system	Tota	DHP) - (201) =	(kWh/year		<u> </u>	44.29	(9)
Epace  Space  Fraction  Fraction  Fraction	heating receive heating on of spon of total	g require quiremen ng: pace hea pace hea tal heatin	ement in ats – Indi at from se at from m	kWh/m² vidual h econdary nain syst main syst	eating sy y/supple em(s) stem 1	ystems i	ncluding system	Tota    micro-C	DHP) - (201) =	(kWh/year		<u> </u>	0 1	(9)
Space  Description  Ending  Ending  Fraction  Ending  Endind  Endind  Endind  Endind  Endind  Endind  Endind	e heating receive heating on of spon of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin of total negroin neg	g require quiremen ng: pace hea pace hea tal heatin	ement in ts – Indi at from se at from m ag from a	kWh/m² vidual ha econdary nain systemain system	eating sy y/supple em(s) stem 1	ystems i mentary	ncluding system	Tota    micro-C	DHP) - (201) =	(kWh/year		<u> </u>	0 1 1 100	(9)
Epace Epace Fraction Fraction Fraction Fraction	heating receive heating on of spon of too necy of received to the necy of spon	g require quirement ng: pace hea pace hea tal heatin main spa	ement in ats – Indi at from se at from m ag from a ace heati ry/supple	kWh/m² vidual h econdary nain syst main syst ing syste	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)	per year   CHP)  - (201) =   02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	0 1 1 100	(9)
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Space  Space Fraction	heating heating heating heating on of sp on of to ncy of r ncy of s Jan heating 280.75 = {[(98)	g require  ng: pace hea pace hea tal heatin main spa seconda  Feb g require 229.54	ement in  Its – Indi  It from set from many from in  It from many from in  It from many from in  It from many from in  It from set from many from in  It f	kWh/m² vidual h econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 85.34	ystems i mentary g system Jun 0	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	per year   CHP)	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
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Factor for charging method for community water	heating			1	(305)
Distribution loss factor (Table 12c) for community	heating system	l		1.05	(306)
Water heat from CHP		(64) x (303a)	x (305) x (306) =	1752	(310a)
Electricity used for heat distribution		0.01 × [(307a)(30	07e) + (310a)(310e)] =	17.52	(313)
Annual totals Space heating fuel used, main system 1			kWh/year	<b>kWh/year</b> 1555.42	
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or posi	tive input from c	outside	139.02	]	(230a)
Total electricity for the above, kWh/year		sum of (230a)(23	30g) =	139.02	(231)
Electricity for lighting				176.43	(232)
12a. CO2 emissions – Individual heating systems	including micro	-CHP			
	<b>Energy</b> kWh/year	<del></del> -	nission factor CO2/kWh	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.519 =	807.26	(261)
Space heating (secondary)	(215) x		0.519 =	0	(263)
Water heating from community system					
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		vo fuels repeat (363) t	to (366) for the second fue	329	(367a)
CO2 associated with heat source 1	[(307b)+(31	0b)] x 100 ÷ (367b) x	0.52	276.38	(367)
Electrical energy for heat distribution	[(3	13) x	0.52	9.09	(372)
Total CO2 associated with community systems	(36	3)(366) + (368)(3	72) =	285.47	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519 =	72.15	(267)
Electricity for lighting	(232) x		0.519 =	91.57	(268)
Total CO2, kg/year		sum of (26	65)(271) =	1256.45	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4)	=	35.78	(273)
<b>-</b> 1					_

El rating (section 14)

(274)

		Heo	r Details:						
A	A 1 - Div 1 :	USE					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012	)	Stroma Softwa					019516 on: 1.0.4.25	
Software Hame.	Ottoma i Orti 2012		ty Address:			SHP	VCISIO	71. 1.0.4.20	
Address :		· ·		7.					
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(4.5)		ight(m)	<b>1</b> (0-)	Volume(m³	<u>-</u>
	\			(1a) x	3	.09	(2a) =	108.52	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	35.12	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	108.52	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
N. arkana Callana	heating he	eating		, ,			40		_
Number of chimneys	0 +	0 +	0	] = [	0		40 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				L	2	X '	10 =	20	(7a)
Number of passive vents	;			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ovs flues and fans = (6a)	)+(6b)+(7a)+(7b	o)+(7c) =	Г	20		÷ (5) =	0.18	(8)
'	peen carried out or is intended			ontinue fr			. (0) =	0.16	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber francesent, use the value correspond			•	uction			0	(11)
deducting areas of openii		onaing to the gi	ealer wall are	a (aner					
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught stri	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has be				is heina u	sad		0.43	(18)
Number of sides sheltere		been done or a	acgree an per	meability	is being u	3CU		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.43	(21)
Infiltration rate modified f	or monthly wind speed						!		
Jan Feb	Mar Apr May	Jun Ju	I 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	2\m ÷ 4								
	1.23 1.1 1.08	0.95 0.99	5 0.92	1	1.08	1.12	1.18	]	
					<u> </u>	Ц	<u> </u>	J	

0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51		
a <i>lcul<mark>ate effe</mark></i> If mechanic		_	rate for t	he appli	cable ca	se	•	•	•		•	•	
If exhaust air h			andiv N (2	13h) - (23	a) v Emy (e	aguation (	N5N othe	rwica (23h	n) = (23a)			(	
If balanced with									) = (23a)			(	
a) If balance		•	•	_					2h\m + (	23h) <b>√</b> [•	1 _ (23c)	± 1001	) (
a) II balance	0	0	0	0	0	0	0	0	0	0	0		(
b) If balance	ed mech	anical ve	ļ	without	heat rec	overv (I	MV) (24h	l = (2)	2b)m + (	23b)		J	·
b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
c) If whole h if (22b)r				•	•				.5 × (23b	·)		I	
-c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)r	ventilation $n = 1$ , the								0.5]			ı	
d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	ld) in box	(25)	-		-	•	
)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Heat losse	es and he	eat loss	paramet	er:									
EMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K
ors Type 1					2.13	x	1	=	2.13				(
ors Type 2					0.72	X	1	=	0.72				(
ors Type 3													
					0.99	X	1	=	0.99				(
ors Type 4					0.99	=	1	= = =	0.99				·
• •						×		_					(
oors Type 5					0.72	x x	1	=	0.72				( ( (
oors Type 4 pors Type 5 pors Type 6 indows Type	e 1				0.72	x x x	1	= = = =	0.72				(
oors Type 5 oors Type 6 indows Type					0.72 0.72 0.63	x x x x x x1	1 1	= = = 0.04] =	0.72 0.72 0.63				(
oors Type 5 oors Type 6 ndows Type ndows Type	e 2				0.72 0.72 0.63 0.5	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	0.72 0.72 0.63 0.66				(
oors Type 5 oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
oors Type 5	e 2 e 3 e 4				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
pors Type 5 nors Type 6 indows Type indows Type indows Type indows Type indows Type	e 2 e 3 e 4	1	2.91		0.72 0.72 0.63 0.5 0.91 0.65	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89			<b>¬</b> г	
ors Type 5 ors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type ndows Type	e 2 e 3 e 4 e 5		2.91	=	0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2				
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type alls Type1	e 2 e 3 e 4 e 5	6			0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37				()
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type alls Type1 alls Type2	e 2 e 3 e 4 e 5 10.5	6 5	2.21		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4 e 5 10.5 8.06	6 5 3	0.91		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.5 8.00 19.4	6 5 3 2	2.21 0.91		0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35 1.45				

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.88

(33)

	y Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mas		,	P = Cm -	- TFA) ir	n kJ/m²K			., ,	tive Value:	, , ,	,	250	(35)
For design asse	•	`		,			ecisely the				able 1f	250	(00)
can be used ins	tead of a de	tailed calcu	ulation.										
Thermal brid	ges : S (L	x Y) cal	culated (	using Ap	pendix I	K						4.58	(36)
if details of therr Total fabric h	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(22)	(26)				¬(07)
			را ملامر م مص					(33) +	` '	05) m v (5)		27.47	(37)
Ventilation he	1			<del></del>	1	11	A	·	,	25)m x (5)	_		
Jan	Feb 23.18	Mar 22.97	Apr 21.99	May 21.81	Jun 20.95	Jul 20.95	Aug 20.8	Sep 21.28	Oct 21.81	Nov 22.18	22.57		(38)
(38)m= 23.4		<u> </u>	21.99	21.01	20.95	20.95	20.0				22.37		(30)
Heat transfer		·						<u> </u>	= (37) + (3			I	
(39)m= 50.86	50.65	50.44	49.46	49.28	48.42	48.42	48.26	48.75	49.28	49.65	50.04	40.40	<b>—</b> (20)
Heat loss par	rameter (H	HLP), W/	m²K						average = = (39)m ÷	Sum(39) <sub>1.</sub> (4)	12 /12=	49.46	(39)
(40)m= 1.45	1.44	1.44	1.41	1.4	1.38	1.38	1.37	1.39	1.4	1.41	1.42		
						•		A	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.41	(40)
Number of da	<del>i</del>	<del>`</del>				l			0.1			1	
Jan	+	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 he	ating ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	( <u>-</u> 0.0003	)40 v /TI	- 40.0					28		(42)
			[ OAP	(-0.0003	949 X (11	-A -13.9)	)2)] + 0.0	0013 x (T	ΓFA -13.	9)			
	-	ater usad			,			·	ΓFA -13.		68	1	(43)
Annual avera Reduce the ann	nge hot wa ual average	hot water	ge in litre	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		64	.68		(43)
Annual avera Reduce the ann not more that 12	age hot wa ual average 25 litres per p	hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,av Iwelling is thot and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	e target o	64	_		(43)
Annual avera Reduce the ann not more that 12 Jan	age hot wa ual average 25 litres per p	hot water person per Mar	ge in litre usage by : day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t	(25 x N) to achieve	+ 36		64	.68 Dec		(43)
Annual avera Reduce the ann not more that 12 Jan Hot water usage	age hot wa ual average 25 litres per Feb e in litres per	hot water person per Mar day for ea	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed to ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target of	Nov	Dec		(43)
Annual avera Reduce the ann not more that 12 Jan	age hot wa ual average 25 litres per Feb e in litres per	hot water person per Mar	ge in litre usage by : day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us  Sep  63.39	Oct	Nov 68.56	Dec 71.15	776.21	_
Annual avera Reduce the ann not more that 12 Jan Hot water usage	rige hot waverage per litres per	hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Sur	Nov  68.56 m(44) <sub>112</sub> =	Dec 71.15	776.21	(43)
Annual avera Reduce the ann not more that 12 Jan Hot water usage (44)m= 71.15	rige hot waverage per litres per	hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Sur	Nov  68.56 m(44) <sub>112</sub> =	Dec 71.15	776.21	_
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52	rige hot waverage 25 litres per 16 litres pe	Mar Mar 65.98  used - calc	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 73.1	+ 36 a water us  Sep  63.39  6 kWh/mon  73.97	Oct  65.98  Fotal = Sur th (see Ta	Nov  68.56 m(44) <sub>112</sub> = ables 1b, 1	71.15 c, 1d)	776.21 1017.73	_
Annual avera Reduce the ann not more that 12  Jan Hot water usage (44)m= 71.15  Energy content (45)m= 105.52	rige hot waverage 25 litres per 16 litres pe	Mar day for ea  65.98  used - calc 95.23	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no	es per da 5% if the orater use, I May Vd,m = far 60.8 onthly = 4.	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  63.39  73.97  70 to (61)	Oct  65.98  Fotal = Sunth (see Tail 86.21  Fotal = Sunth (see Tail 86.21	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> =	71.15 c, 1d) 102.19		(44) (45)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83	rige hot waverage 25 litres per 16 litres pe	Mar Mar 65.98  used - calc	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 73.1	+ 36 a water us  Sep  63.39  6 kWh/mon  73.97	Oct  65.98  Fotal = Sur th (see Ta	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1	71.15 c, 1d)		(44)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storage	rige hot waverage as litres per less in litres per less 68.56 less 48.29 less 13.84 less	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no	es per da $5\%$ if the a vater use, $I$ May $Vd,m = fa$ $60.8$ $79.66$ $hot water$ $11.95$	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96	+ 36 a water us  Sep  63.39 b kWh/mon  73.97 b to (61)  11.1	Oct  65.98  Fotal = Surth (see Tall 86.21  Fotal = Surth 12.93	Nov  68.56  m(44) <sub>112</sub> = ables 1b, 1  94.1  m(45) <sub>112</sub> =	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volume	rige hot waverage as litres per less in litres per less for hot water less less less less less less less le	Mar day for ea  65.98  used - calc  95.23  ng at point  14.28	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45	es per da 5% if the orater use, I May Vd,m = far 60.8	ay Vd,av Iwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74 storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa	+ 36 a water us  Sep  63.39 b kWh/mon  73.97 b to (61)  11.1	Oct  65.98  Fotal = Surth (see Tall 86.21  Fotal = Surth 12.93	Nov  68.56  m(44) <sub>112</sub> = ables 1b, 1  94.1  m(45) <sub>112</sub> =	71.15 c, 1d) 102.19		(44) (45)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storage	rige hot waverage as litres per less litres per less less less less less less less le	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28  includin	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ng any so nk in dw	es per da 5% if the of water use, I  May  Vd,m = fact 60.8  onthly = 4.  79.66  o hot water 11.95  colar or Water welling, e	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  storage), 10.31  /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = hbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volum If community Otherwise if instantaneous  Water storag	rige hot waverage as litres per less in litres per less less less less less less less le	Mar day for ea  65.98  used - calc  95.23  ng at point  14.28  including and no talchot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in	es per da 5% if the of water use, I  May Vd,m = fact 60.8  onthly = 4.  79.66  o hot water 11.95  olar or W velling, e	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = hbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volumed to the reduc	rige hot waverage (25 litres per per litres	Mar day for ea 65.98  used - cale 95.23  ng at point 14.28  includinated no tale hot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in	es per da 5% if the orater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56 m(44) <sub>112</sub> = hbles 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volu  If community Otherwise if instantaneous a) If manufactory Temperature	rige hot waverage (25 litres per le 168.56)  of hot water (2 92.29)  water heating a no stored e loss: cturer's de factor fro	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28  including and no talchot water eclared lem Table	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 12.45  ag any so nk in dw er (this in  oss facto 2b	es per da 5% if the of water use, I  May Vd,m = fac 60.8  onthly = 4. 79.66  o hot water 11.95  olar or W velling, e ocludes i	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47) mbi boil	+ 36 a water us  Sep  63.39 73.97 11.1 11.1 ame vess ers) ente	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46) (47)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volumed to the reduc	rege hot waverage (25 litres per per per per per per per per per per	Mar Gay for each  95.23  ng at point  14.28  including and no tale hot water eclared learned l	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the a vater use, I May $Vd,m = fa$ $60.8$ onthly = 4. $79.66$ old on the vater $11.95$ old or or Water is known is known ear	ay Vd,av Iwelling is not and co Jun ctor from 1 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 11.1 11.1 ame vess ers) ente	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12  47)	Dec 71.15 = c, 1d) 102.19 = 15.33		(44) (45) (46) (47)

Hot water storag	je loss factor fi	rom Tabl	e 2 (kWl	h/litre/da	ay)					0		(51)
If community he	•	on 4.3									•	
Volume factor from									-	0		(52)
Temperature fac										0		(53)
Energy lost from	•	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (5	, , ,								0.	75		(55)
Water storage lo	ss calculated	for each	month			((56)m = (	55) × (41)ı 	m				
` '	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 of	ledicated solar sto	orage, (57)r	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.33	21.07 23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit lo	oss (annual) fro	om Table	3							0		(58)
Primary circuit lo	ss calculated	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by fa	actor from Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01 23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calc	ulated for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0 0	0	0	0	0	0	0	0	0	0		(61)
Total heat requir	ed for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
	134.37 141.83	128.12	126.26	113.84	110.3	119.69	119.06	132.8	139.19	148.78		(62)
Solar DHW input cal	culated using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	r heating)	l	
(add additional li												
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
Output from wat	er heater											
· -	134.37 141.83	128.12	126.26	113.84	110.3	119.69	119.06	132.8	139.19	148.78		
L L	<b>.</b>			l		Outp	out from wa	ater heate	r (annual)₁	12	1566.35	(64)
Heat gains from	water heating	, kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	_
	64.35 68.94	63.68	63.76	58.93	58.46	61.58	60.67	65.94	67.36	71.25		(65)
include (57)m	in calculation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	ı leating	
5. Internal gair		. ,		,							· · · · · · · · · · · · · · · · · · ·	
	•	<i>'</i>	) •									
Metabolic gains  Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	64.18 64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18		(66)
Lighting gains (c	ļ .							••	00	0	l	()
	10.42 8.47	6.41	4.79	4.05	4.37	5.68	7.63	9.69	11.31	12.05	1	(67)
	ļ .			<u> </u>	<u> </u>		ļ.		11.01	12.00		(0.)
Appliances gains	<u> </u>					, .			07.40	404.05	1	(68)
` '	110.62 107.76	101.66	93.97	86.74	81.91	80.77	83.63	89.73	97.42	104.65		(00)
Cooking gains (d		<del> </del>								I	Ī	(00)
` ′	29.42 29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42		(69)
Pumps and fans	<del>'</del> '	<del> </del>							1		1	
(70)m= 3	3 3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva			es) (Tab	le 5)					1		1	
(71)m= -51.34	-51.34 -51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34		(71)
Water heating g	ains (Table 5)										•	
(72)m= 97.26	95.76 92.66	88.44	85.7	81.85	78.57	82.77	84.26	88.63	93.56	95.77		(72)

Total inter	nal g	gains =						(66)	ım + (67)m	n + (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	ım		
(73)m= 263	.72	262.05	254.14	1	241.77	229.72	2	17.89	210.1	214	.48	220.78	233.3	247.54	257.73	]	(73)
6. Solar g	ains:															•	
Solar gains	are ca	alculated	using so	lar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orientation		ccess F able 6d	actor		Area m²			Flu Tal	x ble 6a		T	g_ able 6b		FF Table 6c		Gains (W)	
Northeast 0.	9x	0.77		х	0.9	5	x	1	1.28	x		0.63	х	0.7	=	1.72	(75)
Northeast 0.	9x	0.77		х	0.1	5	x		1.28	x		0.63	X	0.7		0.52	(75)
Northeast 0.	9x	0.77		x	0.	5	x	2	22.97	x		0.63	x	0.7	=	3.51	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	2	22.97	x		0.63	x	0.7	=	1.05	(75)
Northeast 0.	9x	0.77		X	0.	5	x	4	1.38	X		0.63	x	0.7	=	6.32	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	4	1.38	x		0.63	x	0.7	=	1.9	(75)
Northeast 0.	9x	0.77		x	0.	5	X	6	67.96	X		0.63	x	0.7	=	10.38	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	6	7.96	X		0.63	x	0.7	=	3.12	(75)
Northeast 0.	9x	0.77		x	0.9	5	X	9	1.35	X		0.63	x	0.7	=	13.96	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	9	1.35	X		0.63	x	0.7	=	4.19	(75)
Northeast 0.	9x	0.77		x	0.9	5	X	9	7.38	X		0.63	x	0.7	=	14.88	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	9	7.38	x		0.63	x	0.7	=	4.46	(75)
Northeast 0.	9x	0.77		x	0.9	5	x		91.1	x		0.63	x	0.7	=	13.92	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		91.1	X		0.63	x	0.7	=	4.18	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	7	72.63	x		0.63	x	0.7	=	11.1	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	7	72.63	x		0.63	x	0.7	=	3.33	(75)
Northeast 0.	9x	0.77		x	0.	5	X	5	50.42	X		0.63	x	0.7	=	7.7	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	5	50.42	X		0.63	x	0.7	=	2.31	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	2	28.07	x		0.63	x	0.7	=	4.29	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	2	28.07	x		0.63	x	0.7	=	1.29	(75)
Northeast 0.	9x	0.77		x	0.	5	X		14.2	X		0.63	x	0.7	=	2.17	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		14.2	x		0.63	x	0.7	=	0.65	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	(	9.21	x		0.63	x	0.7	=	1.41	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		9.21	x		0.63	x	0.7	=	0.42	(75)
Southeast 0.	9x	0.77		x	0.9	91	x	3	86.79	x		0.63	x	0.7	=	10.23	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	6	2.67	X		0.63	x	0.7	=	17.43	(77)
Southeast 0.	9x	0.77		x	0.9	)1	x	8	35.75	x		0.63	x	0.7	=	23.85	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	1	06.25	X		0.63	x	0.7	=	29.55	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	1	19.01	X		0.63	x	0.7	=	33.1	(77)
Southeast 0.	9x	0.77		x	0.9	)1	x	1	18.15	x		0.63	x	0.7	=	32.86	(77)
Southeast 0.	9x	0.77		х	0.9	)1	x	1	13.91	x		0.63	x	0.7	=	31.68	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	1	04.39	x		0.63	x	0.7	=	29.03	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	9	2.85	x		0.63	x	0.7	=	25.82	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	6	9.27	x		0.63	X	0.7	=	19.26	(77)

Southeas																		
	느	0.77	X	0.9	)1	X	4	4.07	Х		0.63		× L	0.7		=	12.26	(77)
Southeas	느	0.77	X	0.9	)1	X	3	1.49	X		0.63	)	× L	0.7		=	8.76	(77)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	3	6.79			0.63	)	x [	0.7		=	7.31	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	3	6.79			0.63	)	× [	0.7		=	7.53	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	6	2.67	]		0.63	)	x [	0.7		=	12.45	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	6	2.67			0.63	)	× [	0.7		=	12.83	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	8	5.75			0.63	,	× [	0.7		=	17.03	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	0.6	57	X	8	5.75			0.63	)	x [	0.7		=	17.56	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	1	06.25	]		0.63	)	x [	0.7		=	21.11	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	1	06.25	]		0.63	)	× [	0.7		=	21.76	(79)
Southwe	st <sub>0.9x</sub>	0.77	X	0.6	55	X	1	19.01	]		0.63	)	x [	0.7		=	23.64	(79)
Southwe	st <sub>0.9x</sub>	0.77	X	0.6	57	X	1	19.01	]		0.63	)	× [	0.7		=	24.37	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	1	18.15	]		0.63	)	x [	0.7		=	23.47	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	1	18.15	]		0.63	)	x [	0.7		=	24.19	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	1	13.91	]		0.63	)	x [	0.7		=	22.63	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	0.6	57	X	1	13.91			0.63	)	× [	0.7		=	23.32	(79)
Southwe	est <sub>0.9x</sub>	0.77	х	0.6	55	X	1	04.39	]		0.63	)	×	0.7		=	20.74	(79)
Southwe	est <sub>0.9x</sub>	0.77	х	0.6	57	X	1	04.39	]		0.63	)	×	0.7		=	21.38	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	9	2.85	]		0.63	,	× [	0.7		=	18.44	(79)
Southwe	st <sub>0.9x</sub>	0.77	x	0.6	57	X	9	2.85	]		0.63	,	x [	0.7		=	19.01	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	6	9.27	ĺ		0.63	= ,	× [	0.7		=	13.76	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	6	9.27	ĺ		0.63	= ,	× Ē	0.7		=	14.18	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	4	4.07	ĺ		0.63	= ,	× [	0.7		=	8.75	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	4	4.07	ĺ		0.63	= ,	× [	0.7		=	9.02	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	3	1.49	ĺ		0.63	= ,	× Ī	0.7		=	6.26	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	3	1.49	ĺ		0.63	= ,	× [	0.7		=	6.45	(79)
									•									
Solar ga	ains in v	vatts, ca	lculated	for eac	n month	1			(83)m	ı = Su	m(74)m .	(82)	)m					
(/	27.32	47.28	66.66	85.91	99.25		9.87	95.73	85.	57	73.3	52.	78	32.85	23.	29		(83)
Total ga	ains – in			(84)m =		+ (8	83)m	, watts						1			1	
(84)m=	291.04	309.33	320.8	327.68	328.97	3	17.75	305.83	300	.05	294.08	286	80.8	280.4	281	.02		(84)
7. Mea	an intern	al tempe	erature	(heating	seaso	า)												
Tempe	erature o	during he	eating p	eriods ir	the liv	ing	area t	from Tal	ole 9	, Th1	(°C)						21	(85)
Utilisat	ion fact	or for ga	ins for I	iving are	ea, h1,n	n (s	ee Ta	ble 9a)										
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	0	ct	Nov	D	ес		
(86)m=	0.99	0.99	0.98	0.96	0.92		8.0	0.65	0.6	88	0.86	0.9	96	0.99	0.9	99		(86)
Mean i	internal	tempera	ture in	living are	ea T1 (1	ollo	w ste	ps 3 to 7	7 in T	able	9c)							
_	19.58	19.71	19.94	20.28	20.6	_	20.86	20.96	20.		20.79	20.	.39	19.95	19.	57		(87)
Tempe	erature d	during he	eating p	eriods ir	rest of	dw	ellina	from Ta	hle 9	Th	2 (°C)			•			•	
· –	19.73	19.73	19.74	19.76	19.76	_	9.78	19.78	19.		19.77	19.	.76	19.75	19.	74	]	(88)
	tion fact	or for ga	ine for	ract of d	walling	h?	m /sc	a Tabla	02/					ı			ı	
Julisal	-					_	,111 (SE 0.71	0.49	<del>_</del>	-2	0.70	0.0	24	0.98	0.0	99	l	(89)
(89)m=	0.99	0.99	0.98	0.95	0.88	1 (	U.1 I	0.49	0.5	oo i	0.79	0.9	<del>74</del>	1 0.90	U.:			(00)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.88 18.07 18.42 18.91 19.36 19.68 19.76 19.76 19.6 19.08 18.43 17.88		
(		(90)
fLA = Living area ÷ (4) =	0.68	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2		J
(92)m= 19.04 19.18 19.45 19.84 20.2 20.48 20.58 20.57 20.41 19.97 19.46 19.03		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 19.04 19.18 19.45 19.84 20.2 20.48 20.58 20.57 20.41 19.97 19.46 19.03		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained to the mean internal	te	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:		
(94)m= 0.99 0.98 0.97 0.95 0.89 0.77 0.6 0.63 0.83 0.95 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 287.66 304.32 312.51 311.5 294.4 243.53 182.24 188.18 244.19 271.01 274.96 278.19		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 749.54 723.49 653.43 541.18 418.99 284.86 192.62 201.3 307.59 461.93 613.77 742.08		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		
(98)m= 343.64 281.68 253.65 165.37 92.7 0 0 0 142.04 243.94 345.14	1000.17	1,000
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	1868.17	(98)
Space heating requirement in kWh/m²/year	53.19	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		(201)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =	0	
Tradition of opens that the tradition of	1	] `
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		(202)
	1	(202) (204)
Efficiency of main space heating system 1	93.5	(202) (204) (206)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %		(202) (204)
<u> </u>	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64 281.68 253.65 165.37 92.7 0 0 0 142.04 243.94 345.14  (211)m = {[(98)m x (204)] } x 100 ÷ (206)	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea 1998.04	(202) (204) (206) (208) (211) (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea 1998.04 0	(202) (204) (206) (208) (211) (211)

Water heating fuel used 1862.95	
Electricity for pumps, fans and electric keep-hot	
central heating pump: 30	230c)
boiler with a fan-assisted flue	230e)
Total electricity for the above, kWh/year sum of (230a)(230g) = 75	231)
Electricity for lighting	232)
12a. CO2 emissions – Individual heating systems including micro-CHP	
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	
Space heating (main system 1) (211) × 0.216 = 431.58 (2	261)
Space heating (secondary) (215) $\times$ 0.519 = 0 (2	263)
Water heating (219) x 0.216 = 402.4 (2	264)
Space and water heating (261) + (262) + (263) + (264) = 833.97 (264)	265)
Water heating from community system	
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	
Electrical energy for heat distribution [(313) x 0 = 0	372)
Total CO2 associated with community systems (363)(366) + (368)(372) = 0	373)
Electricity for pumps, fans and electric keep-hot (231) × 0.519 = 38.93 (2	267)
Electricity for lighting $(232) \times 0.519 = 107.49$	268)
Total CO2, kg/year sum of (265)(271) = 980.39 (2	272)

TER =

(273)

40.98

#### **SAP Input**

Address:

**England** Located in: Region: Thames valley

**UPRN**:

Date of assessment: 07 November 2019 Date of certificate: 12 May 2020

New dwelling design stage Assessment type:

New dwelling Transaction type: Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

PCDF Version: 460

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

1.2

0.32

1.01

25 m<sup>2</sup> 3.09 m Floor 0

21.1 m<sup>2</sup> (fraction 0.844) Living area:

West Front of dwelling faces:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D4_01	Manufacturer	Solid			Metal
Vent_04_02	Manufacturer	Solid			
Vent_04_04	Manufacturer	Solid			

Manufacturer Windows Window\_04\_01

6mm

low-E, En = 0.05, soft coat Yes Window\_04\_05 Manufacturer Windows low-E, En = 0.05, soft coat Yes Fanlight Manufacturer Windows low-E, En = 0.05, soft coat

0.7

4\_01

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D4_01	mm	0	0	1	2.13	1
Vent_04_02	mm	0	0	1	0.35	1
Vent_04_04	mm	0	0	1	0.99	1
Window_04_01	6mm	0.7	0.4	1.2	0.7	1
Window_04_05	6mm	0.7	0.4	1.2	1.96	1

0.4

West

Name: Type-Name: Location: Orient: Width: Height: D4\_01 4\_01 West 0 0 West 0.295 1.2 Vent\_04\_02 4\_01 1.65 Vent\_04\_04 4\_05 East 0.6 Window\_04\_01 4\_01 West 0.585 1.2 Window\_04\_05 4\_05 East 1.185 1.65

Average or unknown Overshading:

Fanlight

Fanlight

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
4_01	10.073	3.5	6.57	0.13	0	False	N/A
4_05	12.978	2.95	10.03	0.13	0	False	N/A
4_03	1.869	0	1.87	0.13	0	False	N/A
4_04	2.905	0	2.9	0.13	0	False	N/A

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

0.315

#### **SAP Input**

R4\_01 25 0 25 0.1 0 N/A

Internal Elements
Party Elements

Thermal bridges:

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system:

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature  $>45\,^{\circ}\text{C}$ 

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329 Piping>=1991, pre-insulated, medium temp, variable flow

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: None
Assess Zero Carbon Home: No

		Hear F	Details:						
	A.I. D'.I.	USELL					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Hame.		Property				SHP	VCISIO	71. 1.0.4.20	
Address :				, , , , , , , , , , , , , , , , , , ,	•				
1. Overall dwelling dime	ensions:								
Ground floor		Are	a(m²)	(4 -)		ight(m)	7(0-)	Volume(m <sup>3</sup>	<u>^</u>
	\ \( \lambda \)			(1a) x	3	3.09	(2a) =	77.25	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	in)	25	(4)			·		
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	77.25	(5)
2. Ventilation rate:	main seconda	\ <b>P</b> \./	other		total			m³ per hou	<b>.</b>
	heating heating		other		lotai			m per nou	_
Number of chimneys	0 + 0	+	0	] = [	0		40 =	0	(6a)
Number of open flues	0 + 0	+	0	_ = _	0	X :	20 =	0	(6b)
Number of intermittent fa	ns				0	X	10 =	0	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							A ! l.		
				_			ı	nanges per ho	_
'	ys, flues and fans = (6a)+(6b)+ neen carried out or is intended, proce			continuo fi	0		÷ (5) =	0	(8)
Number of storeys in the		eu 10 (17),	ou iei wise t	onunae n	om (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 fo	r masoni	y consti	ruction			0	(11)
if both types of wall are po deducting areas of openio	resent, use the value corresponding	to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	,	•	,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic met	-	•	•	etre of e	envelope	area	2.5	(17)
	lity value, then $(18) = [(17) \div 20] + (18)$ if a pressurisation test has been do				io hoina u	and		0.12	(18)
Number of sides sheltere		one or a de	gree an pe	ппеаышу	is being u	seu		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
·								I	

Adjusted infiltra	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effect		-	rate for t	he appli	cable ca	ise	•	•	•	•	•	,	
If mechanica			andiv N. (2	3h) - (23	a) v Emy (	oguation (	NEV otho	nuico (22h	) - (232)			0.5	(23a
If balanced with		•		, ,	,	•		,	) = (23a)			0.5	(23b
		-	-	_					Ola \	00h) [	4 (00-)	75.65	(23c)
a) If balance (24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	$\frac{1 - (230)}{0.27}$	) ÷ 100] ]	(24a
b) If balance		<u> </u>					<u> </u>	<u> </u>			0.27	J	(214
(24b)m= 0	0	o 0	0	0 Williout	0	overy (	0	0	0	0	0	1	(24b
		<u> </u>			ļ		<u>!</u>					J	(=
c) If whole he if (22b)m				•	•				.5 × (23b	o)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0	1	(24c
d) If natural v	ventilatio	on or wh	ole hous	e positi	ve input	ventilati	on from l	oft			<u>.                                    </u>	J	
if (22b)m				•	•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	ld) in box	(25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losses	s and he	eat loss i	naramete	ər.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doors Type 1					2.13	х	1		2.13				(26)
Doors Type 2					0.35	x	1		0.35	一			(26)
Doors Type 3					0.99	x	1	<del>-</del>	0.99				(26)
Windows Type	: 1				0.7	x1	/[1/( 1.2 )+	0.04] =	0.8	Ħ			(27)
Windows Type	2				1.96	x1	/[1/( 1.2 )+	0.04] =	2.24	Ħ			(27)
Windows Type					0.32	ऱ .	/[1/( 1.2 )+	0.04] =	0.37	=			(27)
Walls Type1	10.0	7	3.5	$\neg$	6.57		0.13		0.85	=			(29)
Walls Type2	12.9				10.03	=	0.13	=	1.3	믁 ¦		<b>-</b>	(29)
Walls Type3		=	2.95	<u>'</u>				_		륵 片		$\dashv$ $\vdash$	_
Walls Type3	1.87		0	_	1.87		0.13	=	0.24	믁 ¦		╡	(29)
• •	2.9	=	0	<b>=</b>	2.9	X	0.13	=	0.38	닠 ¦			(29)
Roof	25		0		25	×	0.1	=	2.5				(30)
Total area of el					52.82								(31)
* for windows and ** include the area						lated usin	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat los				,			(26)(30)	) + (32) =				12.16	(33)
Heat capacity (		•	•					((28).	(30) + (32	2) + (32a).	(32e) =	225	(34)
Thermal mass		,	= Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Low		100	(35)
For design assess can be used instea	: ments wh	ere the de	tails of the	•			recisely the	e indicative	e values of	TMP in Ta	able 1f		` ′
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix I	K						7.92	(36)

Total fabric heat los	s						(33) +	(36) =			20.08	(37)
Ventilation heat los		d monthl	V						(25)m x (5)		20.00	(0,)
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 7.17 7.0	7.01	6.61	6.53	6.13	6.13	6.05	6.29	6.53	6.69	6.85		(38)
Heat transfer coeffi	cient, W/K	•	•	•	•	•	(39)m	= (37) + (	38)m	•		
(39)m= 27.25 27.3	7 27.09	26.69	26.61	26.22	26.22	26.14	26.37	26.61	26.77	26.93		
Heat loss paramete	r (HLP), W	//m²K	•	•	•	•		Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	26.67	(39)
(40)m= 1.09 1.0	9 1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of days in	nonth (Tab	ole 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.07	(40)
Jan Fe	b 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 heating e	nergy requ	ıirement:								kWh/ye	ear:	
Assumed occupand if TFA > 13.9, N = if TFA £ 13.9, N =	1 + 1.76	х [1 - ехр	0.0003	349 x (TI	FA -13.9	)2)] + 0.0	)013 x (	ΓFA -13.		09		(42)
Annual average hot Reduce the annual aver not more that 125 litres	age hot water	r usage by	5% if the $c$	lwelling is	designed			se target o		.05		(43)
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres	per day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-		•			
(44)m= 66.06 63.6	6 61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		
Energy content of hot w	ater used - ca	lculated m	onthly = 4.	190 x Vd,ı	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		720.62	(44)
(45)m= 97.96 85.6	8 88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
								Total = Su	m(45) <sub>112</sub> =		944.85	(45)
If instantaneous water h		·				1	) to (61)	1			i	
(46)m= 14.69 12.8 Water storage loss:	5 13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Storage volume (liti	es) includi	ng any s	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heating	•	•			_							,
Otherwise if no stor	•		•			` '	ers) ente	er '0' in (	47)			
a) If manufacturer's	declared	loss fact	or is kno	wn (kWl	n/day):					0		(48)
Temperature factor	from Table	e 2b								0		(49)
Energy lost from wa	iter storage	e, kWh/y	ear			(48) x (49)	=		1	10		(50)
b) If manufacturer's Hot water storage le	oss factor f	rom Tab							0.	02		(51)
If community heating	•	ion 4.3									Ī	
Volume factor from Temperature factor		2h							<b>—</b>	03		(52) (53)
Energy lost from wa			oor			(47) x (51)	v (52) v /	53) –		.6		` '
Enter (50) or (54) i	•	J, KVVII/Y	Cai			( <del>TI)</del> X (31)	A (UZ) X (	<i>-</i>	-	03 03		(54) (55)
(, (, -	· -/								<u>'</u>		I	()

	alculated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m= 32.01 28.9	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedic	ited solar sto	rage, (57)	m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.9	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss	annual) fro	om Table	3							0		(58)
Primary circuit loss	alculated	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by facto	from Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.0	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculate	d for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required t	or water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 153.24 135.	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		(62)
Solar DHW input calculat	ed using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines	if FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)				_	
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	eater			-	-		-	-	-	-	•	
(64)m= 153.24 135.	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		
<u> </u>						Outp	out from wa	ater heate	r (annual)₁	12	1595.69	(64)
Heat gains from wat	er heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	]	_
(65)m= 76.79 68.4	73.62	68.42	68.81	64.02	63.89	66.79	65.63	70.83	71.84	75.77		(65)
include (57)m in c	alculation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	ı ıeating	
5. Internal gains (s						•				•		
	cc rabic c	5 and 5a	):									
Metabolic gains (Tal			):									
Metabolic gains (Tal	ole 5), Wa	tts	): May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ole 5), Wat Mar			Jun 65.31	Jul 65.31	Aug 65.31	Sep 65.31	Oct 65.31	Nov 65.31	Dec 65.31		(66)
Jan         Fe           (66)m=         65.31         65.3	ole 5), Wat Mar 65.31	Apr 65.31	May 65.31	65.31	65.31	65.31	65.31					(66)
Jan Fe	ole 5), War Mar 65.31	Apr 65.31	May 65.31	65.31	65.31	65.31	65.31					(66) (67)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0	ole 5), War o Mar 65.31 lated in A 5 15.49	Apr 65.31 opendix 11.73	May 65.31 L, equat 8.77	65.31 ion L9 o	65.31 r L9a), a	65.31 Iso see	65.31 Table 5	65.31	65.31	65.31		, ,
Jan     Fe       (66)m=     65.31     65.3       Lighting gains (calcumate)     (67)m=     21.45     19.0       Appliances gains (calcumate)	ole 5), War Mar 65.31 lated in A 5 15.49	Apr 65.31 opendix 11.73	May 65.31 L, equat 8.77	65.31 ion L9 o	65.31 r L9a), a	65.31 Iso see	65.31 Table 5	65.31	65.31	65.31		, ,
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in	Apr 65.31 oppendix 11.73 Appendix	May 65.31 L, equat 8.77 dix L, eq 110.56	65.31 ion L9 of 7.4 uation L 102.05	65.31 r L9a), a 8 13 or L1 96.37	65.31 Iso see 10.39 3a), also	65.31 Table 5 13.95 see Tal 98.4	65.31 17.72 ble 5 105.57	65.31 20.68	65.31 22.04		(67)
Jan     Fe       (66)m=     65.31     65.3       Lighting gains (calcumants)     67)m=     21.45     19.0       Appliances gains (calcumants)	ole 5), War o Mar 65.31 lated in A o 15.49 alculated in 5 126.78	Apr 65.31 oppendix 11.73 Appendix	May 65.31 L, equat 8.77 dix L, eq 110.56	65.31 ion L9 of 7.4 uation L 102.05	65.31 r L9a), a 8 13 or L1 96.37	65.31 Iso see 10.39 3a), also	65.31 Table 5 13.95 see Tal 98.4	65.31 17.72 ble 5 105.57	65.31 20.68	65.31 22.04		(67)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in 5 126.78 ulated in A 2 42.62	Apr 65.31 ppendix 11.73 Append 119.61 ppendix 42.62	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat	65.31 ion L9 of 7.4 uation L 102.05 ion L15	65.31 r L9a), a 8 13 or L1 96.37 or L15a)	65.31 lso see 10.39 3a), also 95.03	65.31 Table 5 13.95 See Tal 98.4	65.31 17.72 ble 5 105.57	65.31 20.68 114.62	65.31 22.04 123.13		(67) (68)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate)	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in 5 126.78 ulated in A 2 42.62	Apr 65.31 ppendix 11.73 Append 119.61 ppendix 42.62	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat	65.31 ion L9 of 7.4 uation L 102.05 ion L15	65.31 r L9a), a 8 13 or L1 96.37 or L15a)	65.31 lso see 10.39 3a), also 95.03	65.31 Table 5 13.95 See Tal 98.4	65.31 17.72 ble 5 105.57	65.31 20.68 114.62	65.31 22.04 123.13		(67) (68)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in 5 126.78 allated in A 2 42.62 as (Table s	Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62	65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	65.31 lso see 10.39 3a), also 95.03 , also se 42.62	65.31 Table 5 13.95 see Tal 98.4 ee Table 42.62	65.31 17.72 ble 5 105.57 5 42.62	65.31 20.68 114.62 42.62	65.31 22.04 123.13 42.62		(67) (68) (69)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0  Losses e.g. evapora	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in 5 126.78 ulated in A 2 42.62 ns (Table solution (negative)	Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62	65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	65.31 lso see 10.39 3a), also 95.03 , also se 42.62	65.31 Table 5 13.95 see Tal 98.4 ee Table 42.62	65.31 17.72 ble 5 105.57 5 42.62	65.31 20.68 114.62 42.62	65.31 22.04 123.13 42.62		(67) (68) (69)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0  Losses e.g. evapora (71)m= -43.54 -43.5	ble 5), War 65.31 lated in A 5 15.49 alculated in A 126.78 alated in A 2 42.62 alated in A 2 42.62 alated in A 2 42.62 alated in A 42.62 alated in A 42.62 alated in A 42.62 alated in A 42.62	Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0 tive valu	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62  0 es) (Tab	65.31 ion L9 of 7.4 uation L 102.05 ion L15 42.62 0	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	65.31 Iso see 10.39 3a), also 95.03 , also se 42.62	65.31 Table 5 13.95 see Tal 98.4 ee Table 42.62	65.31 17.72 ble 5 105.57 5 42.62	65.31 20.68 114.62 42.62	65.31 22.04 123.13 42.62		(67) (68) (69) (70)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0  Losses e.g. evapora (71)m= -43.54 -43.5  Water heating gains	ole 5), War o Mar 65.31 lated in A 15.49 alculated in A 126.78 allated in A 2 42.62 as (Table solution (negal 4 -43.54 (Table 5)	Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0 tive valu	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62  0 es) (Tab	65.31 ion L9 of 7.4 uation L 102.05 ion L15 42.62 0	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	65.31 Iso see 10.39 3a), also 95.03 , also se 42.62	65.31 Table 5 13.95 see Tal 98.4 ee Table 42.62	65.31 17.72 ble 5 105.57 5 42.62	65.31 20.68 114.62 42.62	65.31 22.04 123.13 42.62		(67) (68) (69) (70)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0  Losses e.g. evapora (71)m= -43.54 -43.5  Water heating gains (72)m= 103.22 101.8	ole 5), War o Mar 65.31 lated in A i 15.49 alculated in 5 126.78 ulated in A 2 42.62 ns (Table solution (negation (ne	Apr 65.31 ppendix 11.73 Append 119.61 ppendix 42.62 5a) 0 tive valu -43.54	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62  0 es) (Tab	65.31 ion L9 of 7.4 uation L 102.05 ion L15 42.62  0 le 5) -43.54	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62 0	65.31 Iso see 10.39 3a), also 95.03 , also se 42.62 0	65.31 Table 5 13.95 See Tal 98.4 ee Table 42.62 0 -43.54	65.31 17.72 ble 5 105.57 5 42.62 0 -43.54	65.31 20.68 114.62 42.62 0 -43.54	65.31 22.04 123.13 42.62 0 -43.54		(67) (68) (69) (70) (71)
Jan Fe (66)m= 65.31 65.3  Lighting gains (calcumate) (67)m= 21.45 19.0  Appliances gains (calcumate) (68)m= 128.81 130.1  Cooking gains (calcumate) (69)m= 42.62 42.6  Pumps and fans gain (70)m= 0 0  Losses e.g. evapora (71)m= -43.54 -43.5  Water heating gains	ble 5), War by Mar 65.31  lated in A 15.49  sloculated in A 2 126.78  slated in A 2 42.62  ns (Table slated in A 4 -43.54  (Table 5) 3 98.95	Apr 65.31 ppendix 11.73 Append 119.61 ppendix 42.62 5a) 0 tive valu -43.54	May 65.31 L, equat 8.77 dix L, eq 110.56 L, equat 42.62  0 es) (Tab	65.31 ion L9 of 7.4 uation L 102.05 ion L15 42.62  0 le 5) -43.54	65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	65.31 Iso see 10.39 3a), also 95.03 , also se 42.62 0	65.31 Table 5 13.95 See Tal 98.4 ee Table 42.62 0 -43.54	65.31 17.72 ble 5 105.57 5 42.62 0 -43.54	65.31 20.68 114.62 42.62 0 -43.54	65.31 22.04 123.13 42.62 0 -43.54		(67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientat		Access Fac Table 6d	tor	Area m²		Flu Tal	x ole 6a		g_ Table 6l	b	T	FF able 6c			Gains (W)	
East	0.9x	0.77	X	1.96	X	1	9.64	x	0.4	×		0.7		=	7.47	(76)
East	0.9x	0.77	x	1.96	X	3	8.42	x	0.4	X		0.7		=	14.61	(76)
East	0.9x	0.77	X	1.96	X	6	3.27	x	0.4	X		0.7		=	24.06	(76)
East	0.9x	0.77	x	1.96	X	9	2.28	x	0.4	X		0.7		=	35.1	(76)
East	0.9x	0.77	X	1.96	X	1	13.09	x	0.4	X		0.7		=	43.01	(76)
East	0.9x	0.77	X	1.96	X	1	15.77	x	0.4	X		0.7		=	44.03	(76)
East	0.9x	0.77	x	1.96	X	1	10.22	X	0.4	X		0.7		=	41.92	(76)
East	0.9x	0.77	x	1.96	X	9	4.68	x	0.4	X		0.7		=	36.01	(76)
East	0.9x	0.77	x	1.96	X	7	3.59	x	0.4	X		0.7		=	27.99	(76)
East	0.9x	0.77	x	1.96	X	4	5.59	x	0.4	X		0.7		=	17.34	(76)
East	0.9x	0.77	x	1.96	X	2	4.49	x	0.4	X		0.7		=	9.31	(76)
East	0.9x	0.77	x	1.96	X	1	6.15	x	0.4	x		0.7		=	6.14	(76)
West	0.9x	0.77	x	0.7	X	1	9.64	x	0.4	x		0.7		=	2.67	(80)
West	0.9x	0.77	x	0.32	X	1	9.64	x	0.4	X		0.7		=	1.22	(80)
West	0.9x	0.77	x	0.7	X	3	8.42	x	0.4	X		0.7		=	5.22	(80)
West	0.9x	0.77	x	0.32	X	3	8.42	x	0.4	X		0.7		=	2.39	(80)
West	0.9x	0.77	x	0.7	X	6	3.27	X	0.4	×		0.7		=	8.59	(80)
West	0.9x	0.77	×	0.32	x	6	3.27	x	0.4	×		0.7		=	3.93	(80)
West	0.9x	0.77	×	0.7	X	9	2.28	x	0.4	×		0.7		=	12.53	(80)
West	0.9x	0.77	×	0.32	X	9	2.28	x	0.4	×		0.7		=	5.73	(80)
West	0.9x	0.77	×	0.7	= x	1	13.09	x	0.4	×	Ē	0.7		=	15.36	(80)
West	0.9x	0.77	×	0.32	T	1	13.09	x	0.4	×	┌	0.7		=	7.02	(80)
West	0.9x	0.77	×	0.7	X	1	15.77	x	0.4	×		0.7		=	15.72	(80)
West	0.9x	0.77	×	0.32	x	1	15.77	x	0.4	×		0.7		=	7.19	(80)
West	0.9x	0.77	x	0.7	X	1	10.22	x	0.4	×		0.7		=	14.97	(80)
West	0.9x	0.77	x	0.32	x	1	10.22	x	0.4	×		0.7		=	6.84	(80)
West	0.9x	0.77	x	0.7	X	9	4.68	x	0.4	X		0.7		=	12.86	(80)
West	0.9x	0.77	x	0.32	X	9	4.68	x	0.4	×		0.7		=	5.88	(80)
West	0.9x	0.77	x	0.7	x	7	'3.59	x	0.4	×		0.7		=	10	(80)
West	0.9x	0.77	×	0.32	X	7	'3.59	x	0.4	×		0.7		=	4.57	(80)
West	0.9x	0.77	×	0.7	X	4	5.59	x	0.4	X		0.7		=	6.19	(80)
West	0.9x	0.77	x	0.32	x	4	5.59	x	0.4	×		0.7		=	2.83	(80)
West	0.9x	0.77	×	0.7	X	2	4.49	x	0.4	×		0.7		=	3.33	(80)
West	0.9x	0.77	×	0.32	X	2	4.49	x	0.4	×		0.7		=	1.52	(80)
West	0.9x	0.77	×	0.7	x	1	6.15	x	0.4	×		0.7		=	2.19	(80)
West	0.9x	0.77	x	0.32	X	1	6.15	x	0.4	×		0.7		=	1	(80)
Solar ga	ains in	ı watts, calcı	ulated	for each mo	onth_			(83)m	ı = Sum(74)n	n(82)	m			•		
(83)m=	11.36		6.59	53.36 65.		66.94	63.73	54.	75 42.55	26.3	36	14.16	9.0	34		(83)
		internal and		<del></del>								, ,			Ī	
(84)m=	329.22	337.63 3	42.2	344.12 341	1.6	329.69	318.35	314	.33 310.44	4 309.	.24	313.63	320	).73		(84)

7. Me	an inter	nal temp	perature	(heating	season	)								
				· ·		•	from Tal	ole 9, Th	1 (°C)				21	(85)
-		_	ains for			_			,			ļ		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.83	0.82	0.78	0.71	0.61	0.47	0.35	0.37	0.52	0.69	0.79	0.84		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.68	19.82	20.08	20.42	20.7	20.9	20.97	20.96	20.85	20.53	20.09	19.66		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	0.83	0.81	0.77	0.69	0.58	0.44	0.31	0.33	0.49	0.67	0.78	0.83		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)	-	-		
(90)m=	19.22	19.36	19.61	19.95	20.22	20.4	20.45	20.45	20.36	20.06	19.63	19.21		(90)
			•		•		•	•	1	fLA = Livin	g area ÷ (4	4) =	0.84	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			·		
(92)m=		19.75	20	20.34	20.63	20.82	20.89	20.88	20.77	20.46	20.02	19.59		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.61	19.75	20	20.34	20.63	20.82	20.89	20.88	20.77	20.46	20.02	19.59		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains	•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
uie u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		l	ains, hm	<u> </u>			<u> </u>	19	<u> </u>					
(94)m=	0.81	0.79	0.75	0.69	0.59	0.46	0.34	0.36	0.51	0.67	0.77	0.82		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	266.46	267.15	258.1	236.5	201.57	150.41	108.21	112.24	157.93	207.19	240.4	261.97		(95)
Mont			rnal tem	perature	from Ta	able 8	1	1			1		I	
(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)
		i e	î .	· ·	i e	1	<del>-``</del>	x [(93)m		r –	0.45.00	444.50		(07)
(97)m=	417.28	403.38	365.81	305.48	237.59	163.05	112.37	117.12	176.05	262.43	345.82	414.53		(97)
Spac (98)m=	112.21	91.55	80.14	49.67	26.8	/vn/mon 0	$\ln = 0.02$	24 x [(97]	)m – (95 0	41.1	75.9	113.51		
(50)111=	112.21	01.00	00.14	40.07	20.0				l per year		l	l	590.87	(98)
Cnaa	o bootin	a roauir	omont in	Is\A/b/pp3	2h cor			7010	ii poi youi	(KVVII) your	) = Gam(o	O)15,912 —		_
•		• .	ement in		•								23.63	(99)
		•	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	<b>e heatir</b> ion of sp	_	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain svst	em(s)			(202) = 1	- (201) =				1	(202)
					( . )			(/	,					,
Fract	ion of to	tal heati	ng from	-	, ,			(204) = (2		(203)] =			1	(204)
				main sys	stem 1					(203)] =			1	=  ` ` `
Effici	ency of r	main spa	ng from	main syste	stem 1 em 1	g systen				(203)] =				(204)

								-	
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Space heating requirement (calculated above)	<u> </u>			0	44.4	75.0	140.54	1	
112.21 91.55 80.14 49.67 26.8	0	0	0	0	41.1	75.9	113.51		(044)
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 112.21  91.55  80.14  49.67  26.8 $	0	0	0	0	41.1	75.9	113.51	1	(211)
11221   1100   1001   1001   1001				I (kWh/yea				590.87	(211)
Space heating fuel (secondary), kWh/month									J
= {[(98)m x (201)] } x 100 ÷ (208)						•	•	1	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		٦
			Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	2	0	(215)
Water heating Water heating from separate community system:									
Annual water heating requirement								1595.69	(64)
Fraction of heat from community CHP								1	(303a)
Factor for charging method for community water	heatin	g						1	(305)
Distribution loss factor (Table 12c) for community	/ heati	ng syste	em					1.1	(306)
Water heat from CHP				(64) x (30	03a) x (305	5) x (306)	=	1755.26	(310a)
Electricity used for heat distribution			0.01	× [(307a).	(307e) +	(310a)	(310e)] =	17.55	(313)
Annual totals					k\	Wh/yeaı	r	kWh/year	7
Space heating fuel used, main system 1								590.87	_
Electricity for pumps, fans and electric keep-hot								1	
mechanical ventilation - balanced, extract or posi	itive in	put from			(222.)		98.96		(230a)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			98.96	(231)
Electricity for lighting								151.5	(232)
100 Final coots in dividual booting									
10a. Fuel costs - individual heating systems:									
Tua. Fuel costs - Individual heating systems:	Fue kW	el h/year			Fuel P (Table			Fuel Cost £/year	
Space heating - main system 1		h/year				12)	x 0.01 =		(240)
	kW	h/year ) x			(Table	12)	x 0.01 = x 0.01 =	£/year	](240) ](241)
Space heating - main system 1	kW (211)	h/year ) x ) x			(Table	12)		£/year 77.94	- -
Space heating - main system 1 Space heating - main system 2	(211) (213) (215)	h/year ) x ) x			(Table	12)	x 0.01 =	£/year 77.94	(241)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary	(211) (213) (215)	h/year ) x ) x ) x a) x			(Table 13.: 0 13.:	12)	x 0.01 = x 0.01 =	£/year  77.94  0	(241)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating from CHP	(211) (213) (215) (310) (231)	h/year ) x ) x ) x a) x a) x as appl	icable a	nd apply	(Table  13.1  0  13.1  4.2  13.1	12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	£/year  77.94  0  0  74.42  13.05	](241) ](242) ](342a)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating from CHP Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230g) separations.	kW (211) (213) (215) (310) (231) arately	h/year ) x ) x ) x a) x a) x as appl	icable a	nd apply	(Table  13.  0  13.  4.2  13.  fuel prior	12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x = 0.01 = 0.001 = 0	£/year  77.94  0  0  74.42  13.05  Table 12a	(241) (242) (342a) (249)
Space heating - main system 1  Space heating - main system 2  Space heating - secondary  Water heating from CHP  Pumps, fans and electric keep-hot  (if off-peak tariff, list each of (230a) to (230g) separency for lighting  Additional standing charges (Table 12)	kW (211) (213) (215) (310) (231) (232)	h/year ) x ) x a) x a) x ) as appl	icable a	nd apply	(Table  13.  0  13.  4.2  13.  fuel prior	12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x = 0.01 = 0.001 = 0	£/year  77.94  0  0  74.42  13.05  Table 12a  19.98	](241) ](242) ](342a) ](249) ](250)
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating from CHP Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230g) separency for lighting	kW (211) (213) (215) (310) (231) (232) (232)	h/year ) x ) x ) x a) x ) as appl )		nd apply	(Table  13.  0  13.  4.2  13.  fuel prior	12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x = 0.01 = 0.001 = 0	£/year  77.94  0  0  74.42  13.05  Table 12a  19.98	](241) ](242) ](342a) ](249) ](250)

Energy cost deflator (Table 12)			0.42 (256)
3,	55) x (256)] ÷ [(4) + 45.0] =		1.47 (257)
SAP rating (Section 12)			79.46 (258)
12a. CO2 emissions – Individual heating s	ystems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	306.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating from community system			
		ergy Emission facto h/year kg CO2/kWh	r Emissions kg CO2/year
CO2 from other sources of space and water Efficiency of heat source 1 (%)		repeat (363) to (366) for the second f	uel 329 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	00 ÷ (367b) x 0.52	= 276.89 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 9.11 (372)
Total CO2 associated with community systematics	ems (363)(36	66) + (368)(372)	= 286 (373)
Electricity for pumps, fans and electric keep	o-hot (231) x	0.519 =	51.36 (267)
Electricity for lighting	(232) x	0.519 =	78.63 (268)
Total CO2, kg/year		sum of (265)(271) =	722.65 (272)
CO2 emissions per m²		(272) ÷ (4) =	28.91 (273)
EI rating (section 14)			86 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	Primary factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	3.07	1813.97 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Water heating from community system			
		ergy Primary h/year factor	Emissions kWh/year
CO2 from other sources of space and wate Efficiency of heat source 1 (%)		repeat (363) to (366) for the second f	uel 329 (367a)
Energy associated with heat source 1	[(307b)+(310b)] x 1	00 ÷ (367b) x 3.07	= 1637.89 (367)
Electrical energy for heat distribution	[(313) x	2.92	= 51.25 (372)
Total Energy associated with community sy	stems (363)(36	66) + (368)(372)	= 286 (373)
Electricity for pumps, fans and electric keep	o-hot (231) x	3.07	303.8 (267)
Electricity for lighting	(232) x	0 =	465.09 (268)
'Total Primary Energy		sum of (265)(271) =	4272 (272)

Primary energy	kWh/	/m²/	'year
----------------	------	------	-------

 $(272) \div (4) =$ 

170.88

(273)

		l lear I	Details:						
Assessor Name:	Adam Ritchie	USGI^L	Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property	Address	Flat Ty	pe D - A	SHP			
Address :									
1. Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m	3)
Ground floor				(1a) x		3.09	(2a) =	77.25	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	25	(4)			_		
Dwelling volume		· L			)+(3c)+(3c	d)+(3e)+	(3n) =	77.25	(5)
2. Ventilation rate:									
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		<b>-</b> + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	<b>-</b>   +	0	j = [	0	x	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	0	x ·	10 =	0	(7a)
Number of passive vents				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per he	our —
•	ys, flues and fans = (6a)+(6b)+( een carried out or is intended, proce			continue fr	0		÷ (5) =	0	(8)
Number of storeys in the		ou to (11),	ouror wide (	onunae n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
it both types of wall are pl deducting areas of openii	resent, use the value corresponding angs); if equal user 0.35	o tne grea	ter wall are	a (atter					
•	floor, enter 0.2 (unsealed) or (	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Percentage of windows Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) · 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es ner h					area	0	(16)
•	ity value, then $(18) = [(17) \div 20] +$		•	•	cuc or c	лисюрс	arca	2.5 0.12	(17)
· ·	es if a pressurisation test has been do				is being u	sed			` ′
Number of sides sheltere	ed		(0.0)					0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	) X (20) =				0.12	(21)
Infiltration rate modified f	<del>- 1                                   </del>	Jul	Aug	Sep	Oct	Nov	Dec	1	
L	1 ' 1 ' 1	Jui	Aug	Sep	I Oct	INOV	Dec	J	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
		1	1	<u> </u>	1	1	I	J	
Wind Factor (22a)m = (22	<del>·                                      </del>		1		l	T		1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltr	ration rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	= (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	ise	•			!	•	• -	<del></del>
If mechanic			and the NI (O	10l-) (00·	-) <b>- -</b> (	C (	NEW - de-		) (00-)			0.5	(238
If exhaust air h									)) = (23a)			0.5	(23)
If balanced wit		-	-	_								75.65	(230
a) If balance	1	i	1	i —	1		<del>-                                    </del>	<del></del>	<del> </del>	<del> </del>	<del> </del>	) ÷ 100] 1	(0.4)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(24
b) If balance	1	1		ı —	1	<del>,                                    </del>	<del>1 ^ `                                  </del>	<del>í `</del>	<del>r ´       `</del>	<del>– ´ –                                  </del>	1 .	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole h									E (22k	.)			
(24c)m = 0	0.57	0	0	0 = (231)	0	0	$\frac{\text{lc}) = (22)}{1}$	0	0	0	0	1	(24
` '												J	(2.1
d) If natural if (22b)r							on from 0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	change	rate - er	nter (24a	) or (24	o) or (24	c) or (24	1d) in bo	x (25)				1	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
0 11								1				7	
3. Heat losse	es and ne Gro				Net Ar		U-val		AXU		k-value	•	ΑΧk
ELEMENT		(m²)	Openin m		A,r		W/m2		(W/	K)	kJ/m².		kJ/K
Doors Type 1					2.13	X	1	=	2.13				(26)
Doors Type 2					0.35	x	1	<del></del>	0.35	=			(26)
Doors Type 3					0.99	X	1	<u> </u>	0.99				(26)
Windows Type	e 1				0.7	x1	  /[1/( 1.2 )+	0.04] =	0.8	一			(27)
Windows Type					1.96	x1	I/[1/( 1.2 )+	0.04] =	2.24	$\dashv$			(27)
Windows Type					0.32	=	·  /[1/( 1.2 )+		0.37	=			(27)
Walls Type1	10.0	77	3.5	$\neg$	6.57		0.13		0.85	╡ ,			(29)
Walls Type1				<u> </u>		_		=				_	==
	12.9		2.95		10.03	=	0.13	=	1.3	믁 ¦			(29)
Walls Type3	1.8		0	<b>=</b>	1.87		0.13	=	0.24	닠 ¦		$\exists$ $\vdash$	(29)
Walls Type4	2.9	9	0	_	2.9	×	0.13	=	0.38	ᆜ !			(29)
Roof	25		0		25	X	0.1	=	2.5				(30)
Total area of e					52.82								(31)
* for windows and ** include the are						lated usin	g formula 1	!/[(1/U-valu	ıe)+0.04] á	as given in	n paragraph	h 3.2	
Fabric heat los				io aira par			(26)(30	) + (32) =				12.16	(33)
Heat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	225	(34)
Thermal mass		` ,	⊃ = Cm ÷	: TFA) ir	n kJ/m²K				itive Value			100	(35)
For design asses can be used inste	sments wh	nere the de	tails of the	,			recisely the	e indicative	e values of	TMP in T	able 1f		\```
Thermal bridg	es : S (L	x Y) cal	culated i	using Ap	pendix l	K						7.92	(36)

Total fabric he	at loss							(33) +	(36) =		ı	20.08	(37)
Ventilation hea		alculated	d monthl	V					, ,	25)m x (5)		20.00	(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 7.17	7.09	7.01	6.61	6.53	6.13	6.13	6.05	6.29	6.53	6.69	6.85		(38)
Heat transfer of	coefficier	nt, W/K	<u>I</u>	l .	I.			(39)m	= (37) + (37)	38)m	ı	l	
(39)m= 27.25	27.17	27.09	26.69	26.61	26.22	26.22	26.14	26.37	26.61	26.77	26.93		
Heat loss para	meter (H	HLP), W	/m²K	•	•	•			Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	26.67	(39)
(40)m= 1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of day	ys in mor	nth (Tab	le 1a)	•	•	•		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.07	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
			ı		ı				<u> </u>			l	
4. Water hea	ting ener	rgy requi	irement:								kWh/ye	ear:	
												ı	
Assumed occu if TFA > 13.5			[1 - exp	(-0 0003	849 x (TF	FA -13 9	1211 + 0 (	0013 x (	ΓFA -13		.09		(42)
if TFA £ 13.		11.70 %	i OAP	( 0.0000	) 10 X (11	71 10.0	<i>/</i> 2/] · O.(	) 10 10 11 (		.0)			
Annual averag											0.05		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	t			
				·	<u> </u>	•	A	Can	0-4	Nav	Dag		
Jan Hot water usage i	Feb in litres per	Mar dav for ea	Apr ach month	May   Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		
(11)	00.00	01.20	00.00	00.10	01.00	0 1.00	00.10			m(44) <sub>112</sub> =		720.62	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600					. 20.02	` ′
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
	•	•		•		•	•		Total = Su	m(45) <sub>112</sub> =	=	944.85	(45)
If instantaneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)	) to (61)				•	
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage Storage volum		includir	na anv e	olar or M	WHDC	etorago	within so	me vec	col			1	(47)
If community h	, ,		•			_		airie ves	361		0		(47)
Otherwise if no	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			(					,		,			
a) If manufact	turer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/y	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-									! !	
Hot water stor	-			ie 2 (KVV	n/litre/da	ay)				0.	.02		(51)
Volume factor	_		011 4.3							1	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				, , ,	. , ,	•		03		(55)
												•	

Water	storage	loss cal	culated t	or each	month			((56)m = (	(55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	m Table	3			•				0		(58)
	•	•				59)m = (	(58) ÷ 36	65 × (41)	m				l	
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	a cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	: 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		(62)
Solar DF		calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	l	
(add a	dditiona	l lines if	FGHRS	and/or \	vwhrs	applies	, see Ap	pendix (	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•	•	•	•	•	•	•	'	
(64)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		
-								Outp	out from w	ater heate	r (annual) <sub>1</sub>	l12	1595.69	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	า] + 0.8 ว	x [(46)m	+ (57)m	+ (59)m	1	_
(65)m=	76.79	68.43	73.62	68.42	68.81	64.02	63.89	66.79	65.63	70.83	71.84	75.77	_	(65)
inclu	ude (57)	m in cal	culation (	of (65)m	only if c	vlinder i	s in the	dwellina	or hot w	ater is f	rom com	munity h	eating	
			e Table 5		•	,		J				,	<u> </u>	
	Ĭ	,			, <b>.</b>									
Metabl	Jan	Feb	5), Wat Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43		(66)
` ′	n nains	(calcula	L ted in Ar	nendix	L equat	ion L9 o	L rl9a)a	<u> </u>		<u> </u>	<u> </u>			
(67)m=	8.58	7.62	6.2	4.69	3.51	2.96	3.2	4.16	5.58	7.09	8.27	8.82		(67)
						uation L		<u> </u>		ļ.	1 3.2.	1 0.02		(- )
(68)m=	86.3	87.2	84.94	80.14	74.07	68.37	64.56	63.67	65.93	70.73	76.8	82.5		(68)
			<u> </u>			ļ.	ļ.	<u>!</u>	ļ.	Į	70.0	02.5		(00)
(69)m=	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44		(69)
` '			(Table 5		20.44	20.44	20.44	20.44	20.44	20.44	20.44	20.44		(00)
(70)m=	0	o gairis	0	0 0	0	0	0	0	0	0	0	0		(70)
														(10)
	<del>_</del>		n (nega			<del>-                                    </del>	12.54	40.54	10.54	10.54	10.54	12.54	1	(71)
(71)m=	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54		(71)
1		gains (T	· · · · ·	0= 1=	00.5	00.51	0-5-	00 ==		l	1 00 ==	1,61 - 1		(70)
(72)m=	103.22	101.83	98.95	95.03	92.49	88.91	85.87	89.77	91.15	95.2	99.78	101.84		(72)
1		gains =	r								'1)m + (72)	1	I	
(73)m=	237.43	235.98	229.42	219.19	209.4	199.57	192.96	196.92	201.99	212.35	224.18	232.48		(73)
	lar gains	S. 1												

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientat	ion:	Access Facto Table 6d	r	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	1.96		X	19.64	X	0.4	x	0.7	=	7.47	(76)
East	0.9x	0.77	x	1.96		X	38.42	x	0.4	х	0.7	=	14.61	(76)
East	0.9x	0.77	x	1.96		X	63.27	x	0.4	x	0.7	=	24.06	(76)
East	0.9x	0.77	x	1.96		X	92.28	X	0.4	x	0.7	_ =	35.1	(76)
East	0.9x	0.77	x	1.96		X	113.09	X	0.4	x	0.7	=	43.01	(76)
East	0.9x	0.77	x	1.96		X	115.77	X	0.4	x	0.7	=	44.03	(76)
East	0.9x	0.77	x	1.96		X	110.22	X	0.4	х	0.7	=	41.92	(76)
East	0.9x	0.77	X	1.96		X	94.68	X	0.4	х	0.7	=	36.01	(76)
East	0.9x	0.77	x	1.96		X	73.59	X	0.4	х	0.7	=	27.99	(76)
East	0.9x	0.77	x	1.96		X	45.59	X	0.4	X	0.7	=	17.34	(76)
East	0.9x	0.77	x	1.96		X	24.49	X	0.4	X	0.7	=	9.31	(76)
East	0.9x	0.77	x	1.96		X	16.15	X	0.4	x	0.7	=	6.14	(76)
West	0.9x	0.77	x	0.7		X	19.64	X	0.4	X	0.7	=	2.67	(80)
West	0.9x	0.77	x	0.32		X	19.64	X	0.4	X	0.7	=	1.22	(80)
West	0.9x	0.77	x	0.7		X	38.42	X	0.4	X	0.7	=	5.22	(80)
West	0.9x	0.77	x	0.32		X	38.42	X	0.4	X	0.7	=	2.39	(80)
West	0.9x	0.77	x	0.7		X	63.27	X	0.4	x	0.7	=	8.59	(80)
West	0.9x	0.77	x	0.32		X	63.27	X	0.4	X	0.7	=	3.93	(80)
West	0.9x	0.77	x	0.7		X	92.28	X	0.4	X	0.7	=	12.53	(80)
West	0.9x	0.77	x	0.32		X	92.28	X	0.4	X	0.7	=	5.73	(80)
West	0.9x	0.77	x	0.7		X	113.09	X	0.4	x	0.7	=	15.36	(80)
West	0.9x	0.77	X	0.32		X	113.09	X	0.4	X	0.7	=	7.02	(80)
West	0.9x	0.77	x	0.7		X	115.77	X	0.4	X	0.7	=	15.72	(80)
West	0.9x	0.77	x	0.32		X	115.77	X	0.4	x	0.7	=	7.19	(80)
West	0.9x	0.77	x	0.7		X	110.22	X	0.4	X	0.7	=	14.97	(80)
West	0.9x	0.77	x	0.32		X	110.22	X	0.4	X	0.7	=	6.84	(80)
West	0.9x	0.77	x	0.7		X	94.68	X	0.4	x	0.7	=	12.86	(80)
West	0.9x	0.77	x	0.32		X	94.68	X	0.4	x	0.7	=	5.88	(80)
West	0.9x	0.77	X	0.7		X	73.59	X	0.4	X	0.7	=	10	(80)
West	0.9x	0.77	x	0.32		X	73.59	X	0.4	x	0.7	=	4.57	(80)
West	0.9x	0.77	X	0.7		X	45.59	X	0.4	X	0.7	=	6.19	(80)
West	0.9x	0.77	X	0.32		X	45.59	X	0.4	X	0.7	=	2.83	(80)
West	0.9x	0.77	X	0.7		X	24.49	X	0.4	X	0.7	=	3.33	(80)
West	0.9x	0.77	X	0.32		X	24.49	X	0.4	X	0.7	=	1.52	(80)
West	0.9x	0.77	X	0.7		X	16.15	X	0.4	X	0.7	=	2.19	(80)
West	0.9x	0.77	X	0.32		X	16.15	X	0.4	X	0.7	=	1	(80)
<b>—</b>		watts, calcula	$\overline{}$			$\overline{}$	6.04 60.70	<del></del>	n = Sum(74)m		4440	0.24	1	(83)
` '	11.36 ins –	internal and s			5.39 73)m		6.94 63.73 83)m watts	54.	75 42.55	26.36	14.16	9.34	J	(03)
	248.78			<u>`                                    </u>	74.79	Ť	66.51 256.69	251	.67 244.54	238.7	1 238.34	241.81	1	(84)
(= 1)=	0.70	1 -00.10   20			3	1-	200.00	1 -01	2.4.04	L_00.7			J	(- ')

7. Me	an inter	nal temr	perature	(heating	season	)								
			neating p			•	from Tal	ole 9. Th	1 (°C)				21	(85)
•		_	ains for			•		,	( - )					`
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.9	0.89	0.85	0.79	0.69	0.55	0.42	0.44	0.62	0.78	0.87	0.91		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.31	19.47	19.79	20.21	20.58	20.84	20.95	20.94	20.77	20.34	19.79	19.29		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	0.89	0.88	0.84	0.78	0.67	0.52	0.38	0.4	0.59	0.77	0.86	0.9		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.87	19.02	19.33	19.75	20.11	20.35	20.44	20.43	20.29	19.88	19.34	18.85		(90)
		-				-	-	-	1	fLA = Livin	g area ÷ (4	1) =	0.84	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.24	19.4	19.72	20.14	20.51	20.77	20.87	20.86	20.7	20.27	19.72	19.22		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.24	19.4	19.72	20.14	20.51	20.77	20.87	20.86	20.7	20.27	19.72	19.22		(93)
			uirement											
			ternal ter or gains	•		ned at sto	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.88	0.86	0.83	0.77	0.67	0.54	0.41	0.43	0.6	0.76	0.84	0.88		(94)
			, W = (94											
(95)m=	218.25	222.32	220.22	208.85	184.65	142.87	105.23	108.67	146.76	181.29	201.1	213.65		(95)
(96)m=	11y avera	age exte	ernal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			I o.s an intern			l	l		ļ	ļ	7.1	4.2		(00)
(97)m=	407.24	394.09	358.04	299.99	234.37	161.71	111.86	116.5	174	257.32	337.79	404.53		(97)
	heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	1 <u> </u>	ı )m – (95	)m] x (4	1)m			
(98)m=	140.61	115.42	102.54	65.62	36.99	0	0	0	0	56.57	98.41	142.02		
			•			•	•	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	758.17	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								30.33	(99)
9a. En	ergy rec	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	_			ما مصروار									(204)
			at from s			mentary	system		(204)				0	(201)
			at from m	-	` ,			(202) = 1	` '	(000)7			1	(202)
			ng from	-				(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
	-	•	ace heat										100	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	າ, %						0	(208)

				-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating	<del>`</del>	<u> </u>		Í	0	0		0	50.57	00.44	4.40.00		
140.61	115.42	102.54	65.62	36.99	0	0	0	0	56.57	98.41	142.02		(044)
$(211)m = \{[(98)]$ 140.61	)m x (20 115.42	4)] } X 1	65.62	36.99	0	0	0	0	56.57	98.41	142.02		(211)
							_	I (kWh/yea				758.17	(211)
Space heating	g fuel (s	econdary	y), kWh/	month									
$= \{[(98)m \times (20)]\}$	)1)]}x1	00 ÷ (20	8)										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		<b>¬</b>
Material and and	_						Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water heating Water heating	•	oarate co	ommunit	v svstem	n:								
Annual water				, 0,01011								1595.69	(64)
Fraction of he	at from	commun	ity CHP									1	(303a)
Factor for cha	arging m	ethod fo	r commu	unity wat	er heatii	ng						1	(305)
Distribution lo	ss facto	r (Table	12c) for	commur	nity heat	ing syst	em					1.1	(306)
Water heat fro	om CHP							(64) x (30	03a) x (30	5) x (306) :	=	1755.26	(310a)
Electricity use	ed for he	at distrib	oution				0.01	× [(307a).	(307e) +	(310a)(	310e)] =	17.55	(313)
Annual totals									k\	Wh/year	,	kWh/yea	_
Space heating	fuel use	ed, main	system	1								758.17	
Electricity for p	oumps, fa	ans and	electric	keep-hot							•		
Electricity for p	•			•		nput fron	n outside	e			98.96		(230a)
	entilatior	n - balan	ced, ext	ract or p		nput fron		e of (230a).	(230g) =		98.96	98.96	(230a) (231)
mechanical ve	entilation  for the	n - balan	ced, ext	ract or p		nput fron			(230g) =		98.96	98.96 151.5	_
mechanical vo	entilation  for the ghting	n - balan above, k	ced, ext xWh/yea	ract or p	ositive ir		sum	of (230a).	(230g) =		98.96		(231)
mechanical von	entilation  for the ghting	n - balan above, k	ced, ext xWh/yea	ract or p	ositive ir		sum	of (230a).		ion fac			(231)
mechanical von	entilation  for the ghting	n - balan above, k	ced, ext xWh/yea	ract or p	ositive in ms inclu	ıding mi	sum	of (230a).		ion fac		151.5	(231)
mechanical von	entilation for the ghting issions -	n - balan above, k - Individe	ced, ext kWh/yea ual heati	ract or p	ositive in oms inclu En kW	uding mi	sum	of (230a).	Emiss	ion fac 2/kWh		151.5	(231)
mechanical volume Total electricity Electricity for li 12a. CO2 em	entilation for the ghting issions -	n - balan above, k - Individu ystem 1)	ced, ext kWh/yea ual heati	ract or p	ems inclu En kW	uding mi ergy 'h/year	sum	of (230a).	Emiss kg CO	ion fac 2/kWh	tor	151.5  Emissions kg CO2/ye	(231) (232)
mechanical volume Total electricity For li 12a. CO2 em	entilation  for the ghting issions -  (main s	n - balan above, k - Individe ystem 1) dary)	ced, ext	ract or p	ems inclu En kW	uding mi ergy /h/year	sum	of (230a).	Emiss kg CO	ion fac 2/kWh	tor =	Emissions kg CO2/ye	(231) (232) (232) (261)
mechanical volume Total electricity for linguistricity ntilation  for the ghting issions -  (main s	n - balan above, k - Individe ystem 1) dary)	ced, ext	ract or p	ems inclu En kW	uding mi ergy /h/year	sum cro-CHP	of (230a).	Emiss kg CO 0.5	ion fac 2/kWh 19 19	tor = = factor	Emissions kg CO2/ye 393.49 0 Emissions	(231) (232) (232) (261)	
mechanical volume Total electricity for line 12a. CO2 em  Space heating Space heating Water heating	entilation  for the ghting issions -  (main s (second	n - balan above, k - Individu ystem 1) dary) mmunity	ced, ext	ract or por	ems inclu En kW (214 (215	uding mi ergy /h/year ) x i) x	sum cro-CHP Ene kW	of (230a).	Emiss kg CO 0.5	<b>ion fac</b> 2/kWh 19	tor = = factor	Emissions kg CO2/ye	(231) (232) (232) (261)
mechanical volume Total electricity for linguistricity ntilation  for the ghting issions -  (main s (second from con	n - balan above, k - Individu ystem 1) dary) mmunity	ced, ext  kWh/yea  ual heati  system  ace and	ract or por	eating (r	ergy /h/year ) × 5) ×	sum cro-CHP Ene kW	of (230a).	Emiss kg CO: 0.5	ion fac 2/kWh 19 19 mission g CO2/k	tor = = factor	Emissions kg CO2/ye 393.49 0 Emissions kg CO2/year	(231) (232) (232) (261)	
mechanical volume Total electricity for line 12a. CO2 em  Space heating Space heating Water heating CO2 from oth	entilation  for the ghting issions -  (main s (second from conter source eat source	n - balan above, k - Individu ystem 1) dary) mmunity ees of space 1 (%)	ced, ext kWh/yea ual heati system ace and	ract or por	eating (r	ergy /h/year ) × 5) × not CHP	sum cro-CHP Ene kW	ergy h/year	Emiss kg CO: 0.5 0.5 0.5 E kg	ion fac 2/kWh 19 19 mission g CO2/k	tor = = factor Wh	Emissions kg CO2/ye 393.49 0 Emissions kg CO2/year	(231) (232) (232) (261) (263)
mechanical volume Total electricity for line 12a. CO2 em  Space heating Space heating Water heating CO2 from oth Efficiency of heating to the control of the	entilation  for the ghting issions -  (main s (second from con er source eat source ted with	n - balan above, k - Individu ystem 1) dary) mmunity ses of space 1 (%) heat sou	ced, ext kWh/yea ual heati system ace and	ract or por	eating (r	ergy /h/year ) × s) × not CHP CHP usin [(307b)+	Ene kW	ergy h/year	Emiss kg CO: 0.5 0.5 0.5 E kg	ion fac 2/kWh 19 19 mission g CO2/k	tor  = factor Wh econd fuel	Emissions kg CO2/ye 393.49 0 Emissions kg CO2/year	(231) (232) (232) (261) (263) (367a)
mechanical volume Total electricity for li 12a. CO2 em  Space heating Space heating Water heating CO2 from oth Efficiency of he CO2 association	entilation  for the ghting issions -  (main s (second from context er source ted with ergy for h	n - balan above, k - Individe ystem 1) dary) mmunity ses of space 1 (%) heat southeat distri	ced, ext kWh/yea ual heati system ace and arce 1 ribution	ract or por	eating (r	ergy /h/year / x s) x not CHP CHP usin [(307b)+	Ene kWi ) g two fuels	ergy h/year s repeat (3	Emiss kg CO: 0.5 0.5 0.5 63) to (366 b) x	ion fac 2/kWh 19 19 mission g CO2/k	tor  = factor Wh econd fuel	Emissions kg CO2/ye 393.49 0 Emissions kg CO2/year	(231) (232) (232) (261) (263) (367a) (367)
mechanical verification of the control of the contr	entilation  for the ghting issions -  (main s (second from context source ted with origy for h ociated	n - balan above, k - Individe ystem 1) dary) mmunity ses of spo ce 1 (%) heat southeat distriction	ced, ext Wh/yea  ual heati system  ace and irce 1 ribution munity s	ract or por	eating (r	ergy /h/year / x s) x not CHP CHP usin [(307b)+	Ene kWi ) g two fuels c(310b)] x 1	ergy h/year s repeat (3	Emiss kg CO: 0.5 0.5 0.5 63) to (366 b) x	ion fac 2/kWh 19 19 mission g CO2/k	tor  =   factor Wh  econd fuel	151.5  Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year  329  276.89  9.11	(231) (232) (232) (261) (263) (367a) (367) (372)
mechanical verification of the control of the contr	entilation  for the ghting issions -  (main s (second from con er source eat source ted with ergy for h ociated source toumps, fa	n - balan above, k - Individe ystem 1) dary) mmunity ses of spo ce 1 (%) heat southeat distriction	ced, ext Wh/yea  ual heati system  ace and irce 1 ribution munity s	ract or por	eating (r	ergy /h/year / x s) x not CHP CHP usin [(307b)+	Ene kWi ) g two fuels c(310b)] x 1	ergy h/year s repeat (3	Emiss kg CO:  0.5  0.5  E kg  63) to (366  b) x	ion fac 2/kWh 19 19 mission g CO2/k 6) for the s 0.52 0.52	tor  =   factor Wh  econd fuel   =	151.5  Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year  329  276.89  9.11  286	(231) (232) (232) (261) (263) (367a) (367) (372) (373)

Total CO2, kg/year \$sum of (265)...(271) = \$809.48 (272) **Dwelling CO2 Emission Rate**  $(272) \div (4) = 32.38 (273)$ El rating (section 14)

		l lear I	Details:						
Assessor Name:	Adam Ritchie	– USEI L	Strom	a Nium	bor		STDO	019516	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.4.25	
		Property	Address			SHP			
Address :									
Overall dwelling dime	ensions:	•	4 0						•
Ground floor		Are	<b>a(m²)</b> 25	(1a) x		ight(m) :.09	(2a) =	<b>Volume(m</b> <sup>2</sup>	<b>°)</b> (3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	25	(4)			](==)	77.23	(00)
	a) 1 (15) 1 (16) 1 (16) 1 (1	'''	25		) <del>+</del> (3c)+(3c	d)+(3e)+	(3n) -		<b>—</b> (5)
Dwelling volume				(30)1(30	71(30)1(30	a)	.(31) =	77.25	(5)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating	_ +	0	7 <sub>=</sub> F	0	x 4	40 =	0	(6a)
Number of open flues		╡╻┝	0	]	0	x	20 =	0	(6b)
Number of intermittent fa			0	J L	2	x .	10 =		(7a)
Number of passive vents				Ļ			10 =	20	= ' '
·				Ļ	0		40 =	0	(7b)
Number of flueless gas fi	162				0	^	<del>10</del> –	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.26	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise o	continue fr	rom (9) to	(16)			_ 
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame of	r 0.35 fo	r masoni	y constr	ruction	[(0)	1]XO.1 =	0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding	o the grea	ter wall are	a (after					
deducting areas of openii  If suspended wooden t	ngs);	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	,	`	,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	50		(8) + (10)					0	(16)
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.51	(18)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	) x (20) =				0.51	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	1 ' 1 ' 1	Jul	Aug	Оер	1 001	1407	Dec		
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
			1	<u> </u>	1	ı	1	I	
Wind Factor (22a)m = $(23a)$ m =	<del></del>	1 0 05	1 0.00	4	1 4 00	1 4 4 2	4.40	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.65	0.64	0.62 0.50	6 0.55	0.48	0.48	0.47	0.51	0.55	0.57	0.6		
alculate effe		-	or the appl	cable ca	se	!					_	
If mechanica			I (00h) (00	-)		.IE\\ - (b -		) (OO - )			0	(2
If exhaust air h								) = (23a)			0	(2
If balanced with								21.) (4	201 \ [	4 (00	0	(2
a) If balance		<u> </u>	i	1	<del>-                                    </del>	<del>-                                    </del>	ŕ	<del>r `</del>		<del>'</del>	) ÷ 100] 7	10
4a)m= 0	0	0 0	0	0	0 (1	0	0	0	0	0	_	(2
b) If balance				1		r ``	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	<del>' `</del>		Ι ,	1	(2
4b)m= 0	0	0 0	0	0	0	0		0	0	0	_	(2
c) If whole h if (22b)r	ouse extra n < 0.5 × (2		-	•				.5 × (23b	)			
4c)m= 0	0	0 0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation n = 1, then		•					0.51			_	
II (225)I		$0.69 \qquad 0.60$	<del></del>	0.62	0.62	0.5 + [(2	0.63	0.65	0.66	0.68	]	(2
Effective air	<u> </u>	!	ļ	<u> </u>		<u> </u>		1		1	_	· ·
i)m= 0.71	<del></del>	0.69 0.60	<del>-                                    </del>	0.62	0.62	0.61	0.63	0.65	0.66	0.68	1	(
,	I " I	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1 0.00	1 0.02	0.02	0.01	1 0.00	0.00	0.00	1 0.00		`
. Heat losse		•										
_EMENT	Gross area (m		nings m²	Net Ar A ,n		U-valı W/m2		A X U (W/ł	۲)	k-valu kJ/m²-		A X k kJ/K
ors Type 1				2.13	X	1	= [	2.13				(2
ors Type 2				0.35	X	1	=	0.35				(:
ors Type 3				0.99	x	1	<u> </u>	0.99				(2
ndows Type	e 1			0.65	<u></u>	/[1/( 1.4 )+	0.04] =	0.86				(:
indows Type	e 2			1.83	X1,	/[1/( 1.4 )+	0.04] =	2.43				(2
indows Type	e 3			0.3		/[1/( 1.4 )+	0.04] =	0.4				(:
	10.07	7 [	3.43	6.64	x	0.18	i	1.2	7 7		$\neg$ $\vdash$	(:
alls Type1		= =		10.16	=	0.18	<u> </u>	1.83	=		<b>-</b>	(2
	12.98		7.82 I			1 0			륵 ;		╡ 누	(2
alls Type2	12.98	╡	2.82	1.87		0.18		0.34			1 1	ν.
alls Type2	1.87		0	1.87	=	0.18	= [	0.34	<u> </u>		<b>=</b> =	(
alls Type2 alls Type3 alls Type4	2.9		0	2.9	X	0.18	=	0.52				
alls Type3 alls Type4 oof	1.87 2.9 25		0	2.9	x x		_					(:
alls Type2 alls Type3 alls Type4 oof tal area of e	1.87 2.9 25 elements, m		0 0	2.9 25 52.82	x x x	0.18	= [	0.52 3.25		naragran	h 32	(:
alls Type2 alls Type3 alls Type4 oof stal area of e	1.87 2.9 25 elements, m	n <sup>2</sup>	0 0 0	2.9 25 52.82	x x x	0.18	= [	0.52 3.25	s given in	) paragrap	h 3.2	(:
alls Type2 alls Type3 alls Type4 oof stal area of e	1.87  2.9  25  Elements, market as on both sides.	n <sup>2</sup> s, use effective es of internal	0 0 0	2.9 25 52.82	x x	0.18	= [ = [ /[(1/U-valu	0.52 3.25	s given in	n paragrap	h 3.2	(;
alls Type1 alls Type2 alls Type3 alls Type4 oof otal area of e or windows and include the area abric heat lose eat capacity	1.87  2.9  25  Elements, m  I roof windows as on both sid ss, W/K = S	s, use effectives of internal is (A x U)	0 0 0	2.9 25 52.82	x x	0.18 0.13	= [ = [ /[(1/U-valu ) + (32) =	0.52 3.25				(:
alls Type2 alls Type3 alls Type4 oof otal area of ear windows and include the area	1.87  2.9  25  elements, many proof windows as on both sides, W/K = S  Cm = S(A)	n <sup>2</sup> s, use effective es of internal s (A x U) x k)	0 0 0 e window U-v walls and par	2.9 25 52.82 alue calculatitions	x x x 2 ated using	0.18 0.13	= [ = [ /[(1/U-valu ) + (32) = ((28)	0.52 3.25 se)+0.04] a	?) + (32a).		14.29	()
alls Type2 alls Type3 alls Type4 oof tal area of ear windows and include the area bric heat lose eat capacity	1.87  2.9  25  elements, many proof windows as on both sides, W/K = S  Cm = S(A in a parameter sements where	as, use effective es of internal as (A x U) ax k)  (TMP = Cithe details of	0 0 0 e window U-v walls and par	2.9 25 52.82 alue calculatitions	x x 2 ated using	0.18 0.13 formula 1 (26)(30)	= [ = [ /[(1/U-valu ) + (32) = ((28)	0.52 3.25 se)+0.04] a (30) + (32 tive Value:	?) + (32a). Medium	(32e) =	14.29	(; (; ) (;

											,		_
Total fabric he								. ,	(36) =	,,		16.93	(37)
Ventilation hea	1	1	1	í		l	١,			25)m x (5)			
Jan	Feb 17.9	Mar 17.7	Apr 16.74	May 16.56	Jun 15.73	Jul 15.73	Aug 15.57	Sep 16.05	Oct 16.56	Nov 16.92	Dec 17.3		(38)
(38)m= 18.11	L	<u> </u>	10.74	10.50	15.75	15.75	15.57			<u> </u>	17.3		(50)
Heat transfer (		· ·	00.07	00.40	00.00	00.00	00.5		= (37) + (3	<u> </u>	04.00		
(39)m= 35.04	34.83	34.63	33.67	33.49	32.66	32.66	32.5	32.98	33.49	33.85 Sum(39) <sub>1</sub> .	34.23	33.67	(39)
Heat loss para	ameter (I	HLP), W	/m²K						= (39)m ÷		12 / 12=	33.07	(00)
(40)m= 1.4	1.39	1.39	1.35	1.34	1.31	1.31	1.3	1.32	1.34	1.35	1.37		
								,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.35	(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 requ	irement:								kWh/ye	ear:	
Assumed occu											09		(42)
if TFA > 13.	•	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.	9)			
if TFA £ 13.5 Annual average	•	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		60	.05		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	lwelling is	designed i			se target o		.00		(10)
not more that 125	litres per	person pei	r 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	· ·	· ·			1		· <i>′</i>						
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06	700.00	7(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		720.62	(44)
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
. ,			l	ļ		!	<u> </u>	-	Γotal = Su	<u>l</u> m(45) <sub>112</sub> =		944.85	(45)
If instantaneous v	vater heati	ng at point	t of use (ne	o hot water	storage),	enter 0 in	boxes (46)	) to (61)					
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage		الماريطة		olor or M	WHDC	otoro ao	within or	.m.o. 1/00	- al				(47)
Storage volum	` '		•			ŭ		ine ves	sei		150		(47)
If community hotherwise if no	•			_			• •	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			. (					o. o, o	. • (	,			
a) If manufact	turer's d	eclared I	oss fact	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)	=		0.	75		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-								0		(51)
If community h	-			16 Z (KVV	11/11116/02	iy <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	om wate	r storage	, kWh/y	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or	(54) in (	55)								0.	75		(55)

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 144.56 127.76 135.01 122.17 120.55 108.91 105.73 114.46 113.77 126.63 132.45 141.46	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 144.56 127.76 135.01 122.17 120.55 108.91 105.73 114.46 113.77 126.63 132.45 141.46	
Output from water heater (annual) 112 1493.47	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	_
(65)m= 69.85 62.16 66.67 61.7 61.87 57.29 56.94 59.84 58.91 63.89 65.12 68.82	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43 54.43	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 8.68 7.71 6.27 4.75 3.55 3 3.24 4.21 5.65 7.17 8.37 8.93	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	` ,
(68)m= 86.3 87.2 84.94 80.14 74.07 68.37 64.56 63.67 65.93 70.73 76.8 82.5	(68)
	()
Cooking going (coloulated in Appondix L. aguation L1E ar L1Ea), also aco Tabla E	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44	(69)
(69)m= 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44 28.44	(69)
(69)m= 28.44	` ,
(69)m=     28.44	(69) (70)
(69)m=     28.44	(70)
(69)m=     28.44	` ,
(69)m=       28.44 <t< td=""><td>(70)</td></t<>	(70)
(69)m= 28.44	(70) (71)
(69)m= 28.44	(70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation		Access Fact Table 6d	or	Area m²			Flu: Tab	x ole 6a			)_ ble 6b		F Table			Gai (\	ns N)	
East 0	).9x	0.77	X	1.8	3	x	1:	9.64	x	(	0.63	X	C	.7	] =		10.98	(76)
East 0	).9x	0.77	X	1.8	3	x	3	8.42	х	(	0.63	×	C	.7	<u></u>	:	21.49	(76)
East 0	).9x	0.77	X	1.8	3	x	6	3.27	х	(	0.63	x	C	.7	<b>=</b>	;	35.39	(76)
East 0	).9x	0.77	X	1.8	3	x	9:	2.28	x	(	0.63	×	C	.7	<u> </u>	;	51.61	(76)
East 0	).9x	0.77	X	1.8	3	x	11	3.09	x	(	0.63	x	С	.7	] =	(	63.25	(76)
East 0	).9x	0.77	X	1.8	3	x	11	5.77	x	(	0.63	x	С	.7	=	(	64.75	(76)
East 0	).9x	0.77	X	1.8	3	x	11	0.22	x	(	0.63	X	С	.7	=	(	61.64	(76)
East 0	).9x	0.77	X	1.8	3	x	9.	4.68	X	(	0.63	X	С	.7	=		52.95	(76)
East 0	).9x	0.77	X	1.8	3	x	7	3.59	x	(	0.63	X	С	.7	] =		41.16	(76)
East 0	).9x	0.77	X	1.8	3	x	4	5.59	X	(	0.63	X	C	.7	=		25.5	(76)
East 0	).9x	0.77	X	1.8	3	x	2	4.49	X	(	0.63	X	С	.7	=		13.7	(76)
East 0	).9x	0.77	X	1.8	3	x	1	6.15	x	(	0.63	X	C	.7	=		9.03	(76)
West 0	).9x	0.77	X	0.6	5	x	1	9.64	X	(	0.63	X	С	.7	=		3.9	(80)
West 0	).9x	0.77	X	0.0	3	x	1	9.64	x	(	0.63	X	C	.7	=		1.8	(80)
West 0	).9x	0.77	X	0.6	5	x	3	8.42	x	(	0.63	X	C	.7	=		7.63	(80)
West 0	).9x	0.77	X	0.0	3	x	3	8.42	X	(	0.63	X	С	.7	=		3.52	(80)
West 0	).9x	0.77	X	0.6	5	x	6	3.27	X	(	0.63	X	С	.7	=		12.57	(80)
West 0	).9x	0.77	X	0.0	3	x	6	3.27	x	(	0.63	X	C	.7	=		5.8	(80)
West 0	).9x	0.77	X	0.6	5	x	9:	2.28	X	(	0.63	X	C	.7	=		18.33	(80)
West 0	).9x	0.77	X	0.0	3	x	9:	2.28	x	(	0.63	X	C	.7	=		8.46	(80)
West 0	).9x	0.77	X	0.6	5	x	11	3.09	x	(	0.63	X	C	.7	=	:	22.47	(80)
West 0	).9x	0.77	X	0.0	3	x	11	3.09	X	(	0.63	X	С	.7	=		10.37	(80)
West 0	).9x	0.77	X	0.6	5	x	11	5.77	x	(	0.63	X	C	.7	=		23	(80)
West 0	).9x	0.77	X	0.0	3	x	11	5.77	x	(	0.63	X	С	.7	=		10.61	(80)
West 0	).9x	0.77	X	0.6	5	X	11	0.22	X	(	0.63	X	C	.7	=	:	21.89	(80)
West 0	).9x	0.77	X	0.3	3	X	11	0.22	X	(	0.63	X	С	.7	] =		10.11	(80)
West 0	).9x	0.77	X	0.6	5	x	9.	4.68	X	(	0.63	X	С	.7	=		18.81	(80)
West 0	).9x	0.77	X	0.3	3	X	9	4.68	X	(	0.63	X	С	.7	] =		8.68	(80)
West 0	).9x	0.77	X	0.6	5	X	7	3.59	X	(	0.63	X	С	.7	] =		14.62	(80)
West 0	).9x	0.77	X	0.3	3	X	7	3.59	X	(	0.63	X	С	.7	=		6.75	(80)
West 0	).9x	0.77	X	0.6	5	X	4	5.59	X	(	0.63	X	С	.7	] =		9.06	(80)
West 0	).9x	0.77	X	0.3	3	X	4	5.59	X	(	0.63	X	С	.7	=		4.18	(80)
West 0	).9x	0.77	X	0.6	5	X	2	4.49	X	(	0.63	X	C	.7	=		4.86	(80)
West 0	).9x	0.77	X	0.3	3	X	2	4.49	X	(	0.63	X	С	.7	] =		2.25	(80)
West 0	).9x	0.77	X	0.6	5	X	1	6.15	X	(	0.63	X	С	.7	=		3.21	(80)
West 0	).9x	0.77	X	0.3	3	X	1	6.15	X		0.63	X	С	.7	=		1.48	(80)
<b>—</b>		watts, calcu	$\overline{}$			$\overline{}$	0.65		<del> </del>		n(74)m				0 = 5	1		(00)
` '	6.69	32.64 53 internal and	3.76 Solar	78.4	96.08		8.36	93.64	80.4	44	62.52	38.73	20.	81   1	3.72	]		(83)
	5 – 7.88		6.91	291.31	299.19	<u> </u>	91.63	280.3	271.	07   1	258.24	244.8	3 238	75 2	39.97	1		(84)
(07)111- 241	00	202.30 21	0.91	201.01	233.18	<u> </u>	71.00	200.0	211.	.0, ,	200.24	∠ <del>11</del> .0	230	.,,, 2	JJ.31	j		(3.)

7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.92 0.83 0.66 0.5 0.53 0.76 0.93 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.78 19.91 20.15 20.5 20.77 20.94 20.99 20.98 20.89 20.56 20.14 19.78 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.3 20.3 20.31 20.33 20.33 20.35 20.35 20.35 20.35 20.34 20.33 20.32 20.32 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.98 0.98 0.96 0.91 0.8 0.61 0.43 0.47 0.72 0.91 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.34 20.26 19.96 19.54 19.18 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2  (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
(86)m= 0.99 0.98 0.96 0.92 0.83 0.66 0.5 0.53 0.76 0.93 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.78 19.91 20.15 20.5 20.77 20.94 20.99 20.98 20.89 20.56 20.14 19.78 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.3 20.3 20.31 20.33 20.33 20.35 20.35 20.35 20.35 20.34 20.33 20.32 20.32 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.8 0.61 0.43 0.47 0.72 0.91 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.34 20.26 19.96 19.54 19.18 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       19.78       19.91       20.15       20.5       20.77       20.94       20.99       20.98       20.89       20.56       20.14       19.78       19.78         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m=       20.3       20.31       20.33       20.33       20.35       20.35       20.35       20.34       20.33       20.32       20.32       (88         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (89)m=       0.98       0.98       0.96       0.91       0.8       0.61       0.43       0.47       0.72       0.91       0.97       0.99         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       19.16       19.29       19.54       19.89       20.15       20.31       20.34       20.34       20.26       19.96       19.54       19.18       (90         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)m=       19.68       19.81       20.06       20.4       20.68       20.84       20.89       20.88       20.79       2
(87)m= 19.78 19.91 20.15 20.5 20.77 20.94 20.99 20.98 20.89 20.56 20.14 19.78  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.3 20.3 20.31 20.33 20.33 20.33 20.35 20.35 20.35 20.35 20.34 20.33 20.32 20.32  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.98 0.98 0.96 0.91 0.8 0.61 0.43 0.47 0.72 0.91 0.97 0.99  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.34 20.26 19.96 19.54 19.18 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.3 20.3 20.31 20.33 20.33 20.33 20.35 20.35 20.35 20.34 20.33 20.32 20.32 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.98 0.98 0.96 0.91 0.8 0.61 0.43 0.47 0.72 0.91 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.26 19.96 19.54 19.18 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
(88)m= 20.3 20.3 20.31 20.33 20.33 20.35 20.35 20.35 20.34 20.33 20.32 20.32 (88)m= 20.98 20.98 20.96 20.91 20.91 20.91 20.99 (89)m= 20.98 20.98 20.96 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 20.98 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 20.98 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93) 8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.98 0.98 0.96 0.91 0.8 0.61 0.43 0.47 0.72 0.91 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.26 19.96 19.54 19.18 (90)  ### Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2  (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
(89)m=
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.26 19.96 19.54 19.18 (90)  ### FLA = Living area ÷ (4) = 0.84 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
(90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.26 19.96 19.54 19.18 (90)m= 19.16 19.29 19.54 19.89 20.15 20.31 20.34 20.34 20.34 20.26 19.96 19.54 19.18 (91)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)m= 19.68 19.81 20.
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
(92)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
(93)m= 19.68 19.81 20.06 20.4 20.68 20.84 20.89 20.88 20.79 20.47 20.05 19.68 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm:
(94)m= 0.98   0.97   0.96   0.91   0.82   0.65   0.49   0.52   0.75   0.92   0.97   0.98   (94)m= 0.98   0.97   0.97   0.98   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.97   0.
Useful gains, hmGm , W = $(94)$ m x $(84)$ m $(95)$ m= $243.07$ $255.41$ $265.41$ $265.41$ $244.94$ $189.93$ $136.93$ $141.6$ $193.4$ $224.12$ $231.04$ $235.83$ $(95)$ m= $243.07$ $255.41$ $265.4$
Monthly average external temperature from Table 8
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]
(97)m= 538.94 519.44 469.51 387.33 300.64 203.93 139.98 145.7 220.67 330.43 438.25 530.09 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
(98)m= 220.13 177.43 152.37 87.78 41.44 0 0 0 79.09 149.19 218.93
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 1126.36 (98)
Space heating requirement in kWh/m²/year 45.05 (99
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating: Fraction of space heat from secondary/supplementary system 0 (20
Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1 (20
, , , , , , , , , , , , , , , , , , , ,
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (20

	_	_				_				_	_	_	
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heat	<del></del>	ement (c	alculate	d above) 41.44	0	0	0	0	79.09	149.19	218.93	٦	
$(211)m = \{[(9)]$								0	79.09	149.19	210.93		(211)
235.4	<del>-i</del>	162.96	93.88	44.32	0	0	0	0	84.59	159.57	234.15	7	(211)
							Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	1204.66	(211)
Space heat	•		• /	month									
$= \{[(98)m \times ((215)m) = 0\}$	201)] } x 1	00 ÷ (20	8) 0	0	0	0	0	0	0	0	0	7	
(213)111-										215) <sub>15,1012</sub>		0	(215)
Water heati	ng												
Water heatin	-	•		ty system	n:								
Annual wat	_	requirer	nent									1493.47	(64)
Annual tota Space heatir		ed, main	system	1					K	Wh/year	•	1204.66	ar
Water heatin	· ·											1794.5	=
Electricity for			electric	keep-hot	t								
central hea				·							30	7	(230c)
boiler with a	a fan-assis	sted flue									45	<u> </u>	(230e)
Total electric	city for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for	r lighting											153.37	(232)
Electricity for 12a. CO2 e		– Individ	ual heat	ing syste	ms inclu	uding mi	cro-CHP					153.37	(232)
•		– Individ	ual heat	ing syste			cro-CHP	)	Emiss	ion fac	for		
•		– Individ	ual heat	ing syste	En	uding mi <b>ergy</b> /h/year	cro-CHP	•	<b>Emiss</b> kg CO	<b>ion fac</b> 2/kWh	tor	Emission kg CO2/y	ns
•	emissions			ing syste	<b>E</b> n kW	ergy	cro-CHP			2/kWh	tor =	Emission	ns
12a. CO2 e	emissions	system 1		ing syste	<b>En</b> kW (21	<b>ergy</b> /h/year	cro-CHP		kg CO	2/kWh		Emission kg CO2/y	is ear
12a. CO2 e	emissions on the second of the	system 1		ing syste	En kW (21	ergy /h/year	cro-CHP		kg CO:	2/kWh	=	Emission kg CO2/y	ear (261)
12a. CO2 e Space heatin	emissions on the second of the	ystem 1 dary)		ing syste	En kW (21) (21)	ergy /h/year i) x 5) x	cro-CHP + (263) + (		0.2 0.5	2/kWh	=	Emission kg CO2/y	ear (261) (263)
Space heating Space heating Water heating	emissions on a magerial (main son a magerial second and a magerial	ystem 1 dary) ing	)	ing syste	En kW (21) (21)	ergy /h/year i) x 5) x			0.2 0.5	2/kWh	=	Emissior kg CO2/y 260.21 0	(261) (263) (264)
Space heating Space heating Water heating Space and w	emissions on a magerial (main son a magerial second and a magerial	ystem 1 dary) ing	)	ing syste	En kW (21) (21)	ergy /h/year i) x 5) x	+ (263) + ( <b>Ene</b>	264) = ergy	0.2 0.5 0.2	2/kWh 16 19 16 mission	= = =	Emission kg CO2/y  260.21  0  387.61  647.82	(261) (263) (264) (265)
Space heating Space heating Water heating Space and water heating	emissions and (main some second mag) water heating from co	eystem 1 dary) ing mmunity	) system	ing syste	En kW (21) (21)	ergy /h/year 1) x 5) x 9) x	+ (263) + ( Ene kWl	264) =	0.2 0.5 0.2	2/kWh 16 19	= = = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year	(261) (263) (264) (265)
Space heating Space heating Space and water heating Sp	emissions  ng (main s  ng (second  ng  vater heati  ng from co  nergy for h	eystem 1 dary) ing mmunity	system		En kW (21) (21)	ergy /h/year 1) x 5) x 9) x	+ (263) + ( <b>Ene</b>	264) = ergy	0.2 0.5 0.2	2/kWh 16 19 16 mission	= = = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82	(261) (263) (264) (265) (372)
Space heating Space heating Space and water heating Sp	emissions  ng (main s  ng (second  ng  vater heati  ng from co  nergy for h  ssociated	dary)  ing  mmunity  neat distriction	system ribution nmunity	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year	0.2 0.5 0.2	2/kWh 16 19 16 mission g CO2/k	= = = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year	(261) (263) (264) (265) (372) (373)
Space heating Space heating Space heating Space and with Water heating Space and with Water heating Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and Water heating Electr	emissions  ng (main s  ng (second  ng  vater heati  ng from co  nergy for h  ssociated  r pumps, f	dary)  ing  mmunity  neat distriction	system ribution nmunity	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year	0.2 0.5 0.2	2/kWh 16 19 16 mission g CO2/k	= = = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year	(261) (263) (264) (265) (372)
Space heating Space heating Water heating Space and we water heating Electrical end Total CO2 as Electricity for Electricity f	emissions  ang (main s  ang (second  ang  vater heati  ang from co  nergy for h  ssociated  r pumps, f  r lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg  (372)  0.5  0.5	2/kWh 16 19 16 mission g CO2/k 0	= = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year  0  0	(261) (263) (264) (265) (372) (373)
Space heating Space heating Space heating Space and with Water heating Space and with Water heating Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and with Electrical engagement of the Space and Water heating Electr	emissions  ang (main s  ang (second  ang  vater heati  ang from co  nergy for h  ssociated  r pumps, f  r lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg (372)	2/kWh 16 19 16 mission g CO2/k 0	= = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year  0  38.93	(261) (263) (264) (265) (372) (373) (267)
Space heating Space heating Water heating Space and we water heating Electrical end Total CO2 as Electricity for Electricity f	emissions  ang (main s  ang (second  ang  vater heati  ang from co  nergy for h  ssociated  r pumps, f  r lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg  (372)  0.5  0.5	2/kWh 16 19 16 mission g CO2/k 0	= = factor Wh	Emission kg CO2/y  260.21  0  387.61  647.82  Emissions kg CO2/year  0  38.93  79.6	(261) (263) (264) (265) (265) (372) (373) (267) (268)

#### Property Details: Flat Type E - ASHP

Address:

Located in: Wales

Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 49.68 m<sup>2</sup> 3.09 m

Living area: 24.05 m<sup>2</sup> (fraction 0.484)

Front of dwelling faces: South

	types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D9_01	Manufacturer	Solid			
Vent_09_01	Manufacturer	Solid			
Vent_09_09	Manufacturer	Solid			
Vent_09_04	Manufacturer	Solid			
Vent_09_10	Manufacturer	Solid			
Window_09_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_03	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_11	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_07	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
D9_01	mm	0	0	1	2.13	1
Vent_09_01	mm	0	0	1	0.7	1
Vent_09_09	mm	0	0	1	0.96	1
Vent_09_04	mm	0	0	1	0.7	1
Vent_09_10	mm	0	0	1	0.7	1
Window_09_02	6mm	0.7	0.4	1.2	1.1	1
Window_09_03	6mm	0.7	0.4	1.2	0.19	1
Window_09_05	6mm	0.7	0.4	1.2	2.01	1
Window_09_11	6mm	0.7	0.4	1.2	1.46	1
Window_09_07	6mm	0.7	0.4	1.2	1.46	1
Window_09_08	6mm	0.7	0.4	1.2	0.99	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name: Type-Name: Location: Orient: Width: Height: D9\_01 9\_01 South 0 n 9\_01 Vent\_09\_01 0.58 South 1.2

Vent_09_09	9_09	East	0.58	1.65
Vent_09_04	9_06	North	1.2	0.58
Vent_09_10	9_07	North	0.58	1.2
Window_09_02	9_01	South	0.92	1.2
Window_09_03	9_01	South	0	0
Window_09_05	9_06	North	1.22	1.65
Window_09_11	9_07	North	1.22	1.2
Window_09_07	9_08	North	1.22	1.2
Window_09_08	9_09	East	0.6	1.65
Fanlight	9_01	South	1.01	0.315

Overshading: Average or unknown

and the second second second							
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>ts</u>						
9_01	12.36	4.44	7.92	0.13	0	False	N/A
9_02	5.871	0	5.87	0.13	0	False	N/A
9_03	5.84	0	5.84	0.13	0	False	N/A
9_04	2.812	0	2.81	0.13	0	False	N/A
9_06	8.498	2.71	5.79	0.13	0	False	N/A
9_07	8.019	2.16	5.86	0.13	0	False	N/A
9_08	10.521	1.46	9.06	0.13	0	False	N/A
9_09	19.467	1.95	17.52	0.13	0	False	N/A
R9_01	49.68	0	49.68	0.1	0		N/A
Internal Flament							

Internal Elements
Party Elements

Thermal	hridaes.

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

#### Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

Approved Installation Scheme: False

#### Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

#### Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329

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

No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights:

Terrain type:

EPC language:
Wind turbine:

Photovoltaics:

Assess Zero Carbon Home:

Dense urban
English
No
No
None
No

		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	ber:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property A	Address	Flat Ty	pe E - A	SHP			
Address :									
1. Overall dwelling dime	ensions:	_	>						
Ground floor		Area	` '	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\			(1a) x	3	3.09	(2a) =	153.51	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 49	9.68	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	153.51	(5)
2. Ventilation rate:	main seconda	W1. /	other		40401			m³ nor hou	•
	main seconda heating heating		otner		total		ı	m³ per hou	r 
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	X	10 =	0	(7a)
Number of passive vents	1			Ī	0	X	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	<b>X</b>	40 =	0	(7c)
				_					
							Air ch	anges per ho	our —
·	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in the	een carried out or is intended, proce he dwelling (ns)	9d to (17), o	therwise (	continue tr	om (9) to	(16)		0	(9)
Additional infiltration	ino arronning (ino)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	r 0.35 for	masoni	y constr	uction			0	(11)
•••	resent, use the value corresponding	to the greate	er wall are	a (after			!		
deducting areas of opening If suspended wooden f	ngs);	).1 (seale	d), else	enter 0				0	(12)
If no draught lobby, en	,	(	-,,					0	(13)
• ,	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	ur per s	quare m	etre of e	envelope	area	2.5	(17)
•	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a deg	ree air pe	rmeability	is being u	sed	1		<b>_</b>
Number of sides sheltere Shelter factor	<b>2</b> 0		(20) = 1 -	0.075 x (1	19)1 =			0	(19) (20)
Infiltration rate incorporat	ting shelter factor		(21) = (18		/,1			0.12	(21)
Infiltration rate modified f	_		(= -) ()	(==)				0.12	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	'	_	-	•			•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (00-) (01	2)					-	-	-	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	]	
(ΔΔα)ΠΙ- 1.Δ1 1.Δ0	1.20 1.1 1.00 0.95	0.95	0.32	'	1.00	1.12	1.10	I	

Adjusted infiltration rate (allowing for shelter ar	nd wind speed) :	= (21a) x (22a)m					
0.16 0.16 0.15 0.14 0.13	0.12 0.12	0.12 0.12	0.13	0.14	0.15		
Calculate effective air change rate for the appli	cable case	ļ ļ					_
If mechanical ventilation:	-) Fa (a aatia.a.	(NIC)\ _athamiia = (22	h) (22-)		[	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a			b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing			201.) (6	201 ) [4	(00.)	73.95	(23c)
a) If balanced mechanical ventilation with he	<del> </del>	<del>1 ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '</del>	<del> </del>		<del>`</del>	÷ 100]	(24a)
(24a)m= 0.29   0.29   0.28   0.27   0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(24a)
b) If balanced mechanical ventilation without	<del> </del>	<del></del>	<del>T ` `</del>				(24b)
` '	<u> </u>	0 0	0	0	0		(240)
c) If whole house extract ventilation or positive if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•		) 5 × (23h)	١			
(24c)m= 0 0 0 0 0 0	0 0		0	0	0		(24c)
d) If natural ventilation or whole house positi	ve input ventilat	ion from loft	_				
if (22b)m = 1, then (24d)m = (22b)m other	•		( 0.5]				
(24d)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	o) or (24c) or (2	4d) in box (25)					
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(25)
3. Heat losses and heat loss parameter:							
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-value W/m2K	A X U (W/k	()	k-value kJ/m²-k		X k /K
Doors Type 1	2.13 ×	1 =	2.13				(26)
Doors Type 1 Doors Type 2	2.13 x		2.13				(26) (26)
• •		1 =					
Doors Type 2	0.7 ×	1 =	0.7				(26)
Doors Type 2 Doors Type 3	0.7 × 0.96 ×	1 =	0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 x 0.96 x 0.7 x 0.7 x	1 =	0.7 0.96 0.7 0.7				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x	1 = 1 = 1 = 1 = 1	0.7 0.96 0.7 0.7 1.26				(26) (26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 x 0.96 x 0.7 x 0.7 x 1.1 x 0.19 x	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04]	0.7 0.96 0.7 0.7 1.26 0.22				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7	1 = 1	0.7 0.96 0.7 0.7 1.26 0.22 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 0.13 = 0.13 = 0.13	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81 0 Walls Type5 8.5 2.71	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.03 0.76 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Aug Sep Oct Nov Dec Apr May Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:	
a) If manufacturer's declared loss factor is known (kWh/day):	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year (48) x (49) = 110	(50)
b) If manufacturer's declared cylinder loss factor is not known:	
Hot water storage loss factor from Table 2 (kWh/litre/day)  0.02	(51)
If community heating see section 4.3  Volume factor from Table 2a	(50)
Volume factor from Table 2a 1.03  Temperature factor from Table 2b 0.6	(52) (53)
(47) × (54) × (50) × (50)	(54)
Energy lost from water storage, kwn/year $(47) \times (51) \times (52) \times (53) = 1.03$ Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	()
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(56)
If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50)$ – $(H11)]$ ÷ $(50)$ , else $(57)$ m = $(56)$ m where $(H11)$ is from Appendix H	()
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (50)m $	61)m
(62)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25 154.05 161.32 172.37	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25 154.05 161.32 172.37	
Output from water heater (annual) <sub>112</sub> 1816.9	8 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m + (57)m + (59)m]	
(65)m= 84.42 75.1 80.5 74.43 74.57 68.99 68.49 72.07 70.98 77.06 78.65 83.15	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 34.46 30.6 24.89 18.84 14.08 11.89 12.85 16.7 22.42 28.46 33.22 35.41	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 218.51 220.78 215.07 202.9 187.55 173.11 163.47 161.21 166.92 179.08 194.44 208.87	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76	
	(69)
Pumps and fans gains (Table 5a)	(69)
	(69) (70)

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)	1
Water	heating	gains (T	able 5)										-	
(72)m=	113.47	111.76	108.2	103.37	100.23	95.81	92.06	96.87	98.58	103.58	109.23	111.77	(72)	1
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	446.82	443.52	428.54	405.49	382.24	361.2	348.76	355.15	368.29	391.51	417.27	436.43	(73)	1
6. Sol	ar gains	S:												

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

		Access Facto Table 6d		Area m²	a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	=	4.15	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	X	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	x	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	X	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	=	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	=	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	X	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	X	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	X	2.01	X	24.19	x	0.4	X	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	x	24.19	x	0.4	X	0.7	=	6.85	(74)

North			7		1		1		ı		ı		7
North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	= 	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East -	0.9x	0.77	X	0.99	X	38.42	X	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	X	63.27	X	0.4	X	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	X	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	X	113.09	Х	0.4	X	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	X	115.77	X	0.4	X	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	X	110.22	X	0.4	X	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	X	94.68	X	0.4	X	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	X	73.59	X	0.4	X	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	X	45.59	X	0.4	X	0.7	=	8.76	(76)
East	0.9x	0.77	X	0.99	X	24.49	х	0.4	X	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	X	16.15	X	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	X	46.75	x	0.4	X	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	X	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	X	0.32	X	46.75	x	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	X	0.7	=	16.34	(78)
South	0.9x	0.77	X	0.19	X	76.57	X	0.4	X	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	X	76.57	x	0.4	X	0.7	=	4.75	(78)
South	0.9x	0.77	X	1.1	X	97.53	X	0.4	X	0.7	=	20.82	(78)
South	0.9x	0.77	X	0.19	X	97.53	X	0.4	X	0.7	=	3.6	(78)
South	0.9x	0.77	X	0.32	X	97.53	X	0.4	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	X	0.7	=	23.53	(78)
South	0.9x	0.77	X	0.19	X	110.23	x	0.4	X	0.7	=	4.06	(78)
South	0.9x	0.77	X	0.32	X	110.23	X	0.4	X	0.7	=	6.84	(78)
South	0.9x	0.77	X	1.1	X	114.87	X	0.4	X	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	X	114.87	X	0.4	X	0.7	=	4.24	(78)
South	0.9x	0.77	X	0.32	X	114.87	x	0.4	X	0.7	=	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	=	23.6	(78)
South	0.9x	0.77	X	0.19	X	110.55	x	0.4	x	0.7	=	4.08	(78)
South	0.9x	0.77	X	0.32	x	110.55	x	0.4	x	0.7	=	6.86	(78)
South	0.9x	0.77	X	1.1	×	108.01	x	0.4	x	0.7	=	23.05	(78)
South	0.9x	0.77	X	0.19	x	108.01	x	0.4	x	0.7	=	3.98	(78)
South	0.9x	0.77	X	0.32	x	108.01	x	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	×	1.1	x	104.89	x	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	x	0.19	x	104.89	x	0.4	x	0.7	=	3.87	(78)

South	0.9x	0.77	X	0.3	32	X	1	04.89	X		0.4	x [	0.7	=	6.51	(78)
South	0.9x	0.77	X	1.	1	X	1	01.89	X		0.4	x [	0.7	=	21.75	(78)
South	0.9x	0.77	X	0.1	19	X	1	01.89	x		0.4	x [	0.7	=	3.76	(78)
South	0.9x	0.77	X	0.3	32	X	1	01.89	x		0.4	x [	0.7	=	6.33	(78)
South	0.9x	0.77	X	1.	1	X	8	32.59	x		0.4	x [	0.7	=	17.63	(78)
South	0.9x	0.77	X	0.1	19	X	8	32.59	x		0.4	x [	0.7	=	3.04	(78)
South	0.9x	0.77	X	0.3	32	X	8	32.59	x		0.4	x [	0.7	=	5.13	(78)
South	0.9x	0.77	X	1.	1	X	5	55.42	X		0.4	x [	0.7	=	11.83	(78)
South	0.9x	0.77	X	0.1	19	X	5	55.42	x		0.4	x [	0.7	=	2.04	(78)
South	0.9x	0.77	X	0.3	32	X	5	5.42	X		0.4	x [	0.7	=	3.44	(78)
South	0.9x	0.77	X	1.	1	X		40.4	x		0.4	x [	0.7	=	8.62	(78)
South	0.9x	0.77	X	0.1	19	X		40.4	X		0.4	x [	0.7	=	1.49	(78)
South	0.9x	0.77	X	0.3	32	X		40.4	x		0.4	x [	0.7	=	2.51	(78)
Solar g	í –		alculated	1	r	$\overline{}$			r <del>`</del>		ım(74)m .	(82)m			7	
(83)m=	28.55	50.74	75.66	105.22	129.09		33.29	126.35	107	.63	85.68	57.7	34.57	24.2		(83)
Ĭ			and solar	<u> </u>	<u> </u>	<del>-</del>							1		1	(0.4)
(84)m=	475.37	494.26	504.19	510.71	511.33	4	94.49	475.11	462	.79	453.97	449.2	451.83	460.63		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	า)										_
Temp	erature	during h	neating p	eriods ir	n the liv	ing	area	from Tal	ole 9,	Th1	1 (°C)				21	(85)
Utilisa			ains for		ı —	Ť							_		1	
	Jan	Feb	Mar	Apr	May	+	Jun	Jul	<del>                                     </del>	ug	Sep	Oct	Nov	Dec		(0.0)
(86)m=	0.91	0.9	0.88	0.83	0.74		0.61	0.48	0.5	51	0.67	0.82	0.89	0.92	]	(86)
Mean		· ·	ature in	living ar	r `	$\overline{}$		ps 3 to 7	7 in T	able	9c)			1	7	
(87)m=	19.01	19.18	19.51	19.97	20.41	2	20.76	20.91	20.	89	20.66	20.14	19.52	18.98		(87)
Temp	erature	during h	neating p	eriods ir	rest of	fdw	elling	from Ta	able 9	9, Th	n2 (°C)		_	_	-	
(88)m=	20.4	20.4	20.4	20.41	20.41	2	20.42	20.42	20.4	42	20.42	20.41	20.41	20.4		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	ee Table	9a)							
(89)m=	0.91	0.89	0.87	0.81	0.72	(	0.57	0.43	0.4	16	0.64	0.8	0.88	0.91		(89)
Mean	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m=	18.52	18.69	19.02	19.48	19.9	Ť	20.23	20.36	20.		20.14	19.65	19.04	18.5	]	(90)
•		•	•	•	•			•	•		f	LA = Liv	ng area ÷ (	4) =	0.48	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	a) = fl	LA × T1	+ (1	– fL	A) x T2					
(92)m=	18.76	18.93	19.26	19.72	20.15	_	20.49	20.62	20.0		20.4	19.89	19.27	18.73	]	(92)
ا Apply	adjustn	nent to t	he mear	interna	l tempe	ratu	re fro	m Table	4e,	whe	re appro	priate	1		1	
(93)m=	18.76	18.93	19.26	19.72	20.15	2	20.49	20.62	20.0	61	20.4	19.89	19.27	18.73		(93)
8. Spa	ace hea	ting requ	uirement													
			ternal ter or gains			ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	): 		_		_		,				_	1	
(94)m=	0.89	0.87	0.85	0.79	0.71	(	0.58	0.45	0.4	17	0.64	0.78	0.86	0.89	]	(94)
I		r	W = (94)	ŕ	<del></del>	T -	05.5-	0.5-			000 5 . 1	0=0=	000		1	(05)
(95)m=	422.07	431.48	426.16	404.95	362.01	2	85.55	212.2	218	.54	290.21	352.53	388.33	411.91	j	(95)

Mont	hly aver	age exte	rnal tem	nerature	from Ta	able 8								
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature, l	_m , W =	=[(39)m :	x [(93)m	– (96)m	]	ļ	<u> </u>		
(97)m=	864.59	836.71	758.87	635.01	494.63	339.85	232.3	242.37	365.5	543.62	716.26	859.67		(97)
Spac		<del></del>			nonth, kV	Vh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	1824.81	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year							l	36.73	(99)
			nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
-	e heating	_	it from se	econdar	v/sunnle	mentarv	svstem					[	0	(201)
	•		it from m	-		montary	•	(202) = 1 -	- (201) =			l I	1	(202)
			ng from i	•	` '			(204) = (20	02) × [1 –	(203)] =		 	1	(204)
			ace heati	•								l [	100	(206)
	•		ry/supple			g system	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ar
Spac	e heatin	g require	ement (c						•		l .		,	
	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		
(211)n	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		_
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	1824.81	(211)
•		• ,	econdar		month									
$= \{[(98)$ (215)m=		01)] } X 1	00 ÷ (20 0	8)	0	0	0	0	0	0	0	0		
(210)111-			Ů	U		U	Ů				215) <sub>15.1012</sub>		0	(215)
Water	heating	1									710,1012			
	•	•	parate co	ommunit	y systen	า:						_		
Annu	ıal water	heating	requirer	nent										_
Fract	ion of he	_											1816.98	(64)
		eat from	commur	nity CHP								[	1816.98	(64) (303a)
Facto			commur ethod fo	•		er heatii	ng					[ [		=
	or for cha	arging m		r commu	unity wat		•	em				[ [ [	1	(303a)
Distri	or for cha	arging m	ethod fo r (Table	r commu	unity wat		•	em	(64) x (30	03a) x (305	5) x (306) =	    -  -	1	(303a) (305)
Distri Wate	or for charbution lo	arging m oss facto om CHP	ethod fo r (Table	r commu	unity wat		•				5) x (306) = · (310a)(	l r	1 1 1.05	(303a) (305) (306)
Distri Wate Elect	or for charbution lo	arging moss factoom CHP	ethod fo r (Table	r commu	unity wat		•			(307e) +		[310e)] =	1 1 1.05 1907.83	(303a) (305) (306) (310a) (313)
Distri Wate Elect	or for charbution lo r heat fr ricity use al totals	arging moss factoom CHP	ethod fo r (Table	r commu 12c) for	unity wat		•			(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space	br for char bution lover heat from ricity use al totals theating	arging moss factoom CHP ed for he	ethod fo r (Table at distrib	r commu 12c) for oution system	unity wat commur	nity heat	•			(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri	br for char bution lover heat from ricity use al totals heating licity for p	arging moss factors om CHP ed for he fuel use pumps, fa	ethod for (Table at distributed, main ans and	r community of the comm	unity wat commur 1 keep-hot	nity heat	ing syste		× [(307a).	(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri mech	or for char bution lover heat from ricity used al totals to heating licity for pananical v	arging moss factorom CHP ed for he fuel use bumps, facentilation	ethod for (Table at distributed, main ans and	r community of the comm	unity wat commur  1 keep-hot ract or p	nity heat	ing syste	0.01 n outside	× [(307a).	(307e) +	(310a)( <b>Wh/year</b>	[310e)] = [	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri mech	or for char bution lover heat from ricity used al totals to heating licity for pananical v	arging moss factorom CHP ed for he fuel use bumps, facentilation of the formal entilation of the formal entitle entilation of the formal entitle entite entite entitle entite entite entite entite entit	ethod for (Table at distributed, main ans and	r community of the comm	unity wat commur  1 keep-hot ract or p	nity heat	ing syste	0.01 n outside	× [(307a).	(307e) +	(310a)( <b>Wh/year</b>	[310e)] = [	1 1.05 1907.83 19.08 <b>kWh/year</b> 1824.81	(303a) (305) (306) (310a) (313) (230a)

10a. Fuel costs - individual heating systems:			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	13.19 × 0.01	= 240.69 (240)
Space heating - main system 2	(213) x	0 x 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	= 0 (242)
Water heating from CHP	(310a) x	4.24 × 0.01	= 80.89 (342a)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 28.36 (249)
(if off-peak tariff, list each of (230a) to (230g) sep Energy for lighting	parately as applicable and a	apply fuel price according t	
Additional standing charges (Table 12)			60 (251)
Appendix Q items: repeat lines (253) and (254) at Total energy cost (245)(2	as needed 47) + (250)(254) =		442.05 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255) x (	256)] ÷ [(4) + 45.0] =		1.96 (257)
SAP rating (Section 12)			72.65 (258)
120 CO2 omissions Individual hosting a reter	ns including micro-CHP		
12a. CO2 emissions – Individual heating syster	no mercang mero er n		
12a. CO2 emissions – maividuai nealing system	Energy kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	Energy		
	<b>Energy</b> kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	Energy kWh/year (211) x	kg CO2/kWh	kg CO2/year  947.08 (261)
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x	kg CO2/kWh  0.519 =  0.519 =	kg CO2/year  947.08 (261)  0 (263)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he	Energy kWh/year (211) x (215) x  Energy kWh/ye	kg CO2/kWh  0.519 =  0.519 =	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he	Energy kWh/year (211) x (215) x  Energy kWh/ye	kg CO2/kWh  0.519 =  0.519 =  Emission factor kg CO2/kWh  eat (363) to (366) for the second (	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)	Energy kWh/year (211) x (215) x  Energy kWh/yeating (not CHP) f there is CHP using two fuels rep	kg CO2/kWh  0.519 =  0.519 =  Emission factor kg CO2/kWh  eat (363) to (366) for the second (	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year  fuel 329 (367a)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/year  (211) x  (215) x  Energy kWh/ye ating (not CHP) f there is CHP using two fuels rep  [(307b)+(310b)] x 100 -	kg CO2/kWh  0.519 =  0.519 =  Wear Emission factor kg CO2/kWh  eat (363) to (366) for the second to	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/year  (211) x  (215) x  Energy kWh/ye ating (not CHP) f there is CHP using two fuels rep  [(307b)+(310b)] x 100 - [(313) x	kg CO2/kWh  0.519 =  0.519 =  Wear Emission factor kg CO2/kWh  eat (363) to (366) for the second to	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)  = 9.9 (372)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/year (211) x (215) x Energy kWh/yeating (not CHP) f there is CHP using two fuels rep [(307b)+(310b)] x 100 - [(313) x (363)(366) +	kg CO2/kWh  0.519 =  0.519 =  Wear kg CO2/kWh  eat (363) to (366) for the second to th	kg CO2/year  947.08 (261)  0 (263)  or Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)  = 9.9 (372)  = 310.86 (373)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-hot	Energy kWh/year  (211) x  (215) x  Energy kWh/ye  ating (not CHP) f there is CHP using two fuels rep  [(307b)+(310b)] x 100 -  [(313) x  (363)(366) +  (231) x  (232) x	kg CO2/kWh  0.519 =  0.519 =  Wear kg CO2/kWh  eat (363) to (366) for the second to th	kg CO2/year  947.08 (261)  0 (263)  Per Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)  = 9.9 (372)  = 310.86 (373)  111.59 (267)
Space heating (main system 1)  Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year  (211) x  (215) x  Energy kWh/ye  ating (not CHP) f there is CHP using two fuels rep  [(307b)+(310b)] x 100 -  [(313) x  (363)(366) +  (231) x  (232) x	kg CO2/kWh  0.519 =  0.519 =  (y Emission factor kg CO2/kWh  eat (363) to (366) for the second f	kg CO2/year  947.08 (261)  0 (263)  Per Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)  = 9.9 (372)  = 310.86 (373)  111.59 (267)  126.33 (268)
Space heating (main system 1) Space heating (secondary) Water heating from community system  CO2 from other sources of space and water he Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year	Energy kWh/year  (211) x  (215) x  Energy kWh/ye  ating (not CHP) f there is CHP using two fuels rep  [(307b)+(310b)] x 100 -  [(313) x  (363)(366) +  (231) x  (232) x	kg CO2/kWh  0.519 =  0.519 =  (y Emission factor kg CO2/kWh  eat (363) to (366) for the second f	kg CO2/year  947.08 (261)  0 (263)  Per Emissions kg CO2/year  fuel 329 (367a)  = 300.96 (367)  = 9.9 (372)  = 310.86 (373)  111.59 (267)  126.33 (268)  1495.85 (272)

	<b>Energy</b> kWh/year		Primary factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x		3.07	=	5602.18	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Water heating from community system						
		Energy kWh/year	Primary factor		Emissions kWh/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	<b>O</b> \ ,	wo fuels repeat (36	63) to (366) for the s	econd fuel	329	(367a)
Energy associated with heat source 1	[(307b)+(3	10b)] x 100 ÷ (367b	o) x 3.07	=	1780.25	(367)
Electrical energy for heat distribution	[(3	313) x	2.92	=	55.71	(372)
Total Energy associated with community systems	(3)	63)(366) + (368).	(372)	=	310.86	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	660.06	(267)
Electricity for lighting	(232) x		0	=	747.25	(268)
'Total Primary Energy		sum of	(265)(271) =		8845.44	(272)
Primary energy kWh/m²/year		(272) ÷	- (4) =		178.05	(273)

		User D	otaile:						
	A 1 - D'( 1 :						OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Stroma Softwa					019516 on: 1.0.4.25	
Software Name.		Property A				SHP	VEISIO	ni. 1.0.4.23	
Address :									
1. Overall dwelling dime	ensions:								
0 10		Area	a(m²)			ight(m)	1	Volume(m³	_
Ground floor			9.68	(1a) x	3	3.09	(2a) =	153.51	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)4	9.68	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	153.51	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	x ′	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
							Air ch	anges per ho	ur
'	ys, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)
	peen carried out or is intended, proced	ed to (17), o	otherwise o	ontinue fr	om (9) to	(16)	ı		7.00
Number of storeys in the Additional infiltration	ne dweiling (ris)					[(9)-	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 for	r masonr	y constr	uction	[(0)	17.0.1 -	0	(11)
	resent, use the value corresponding t	o the great	er wall are	a (after					<b>」</b> ` ′
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (coalc	nd) alsa	ontor O			ı		(12)
If no draught lobby, en	,	7.1 (Scale	iu), eise	enter o				0	(13)
• ,	s and doors draught stripped							0	(14)
Window infiltration	3 11		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 cubic metro	es per ho	our per so	quare m	etre of e	envelope	area	2.5	(17)
	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has been do	ne or a deg	gree air pei	meability	is being u	sed	ı		7(40)
Shelter factor	eu		(20) = 1 -	0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m <i>÷ 1</i>								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
, ==,		1		<u> </u>		L <u>-</u>		I	

Adjusted infiltration rate (allowing for shelter ar	nd wind speed) = (21a) :	( (22a)m		
0.16 0.16 0.15 0.14 0.13	0.12 0.12 0.12	0.12 0.13	0.14 0.15	
Calculate effective air change rate for the appl	icable case			· · · · · · · · · · · · · · · · · · ·
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23)	a) × Emy (aguation (NE)) ath	orwico (23h) – (23a)		0.5 (23a)
If balanced with heat recovery: efficiency in % allowing				0.5 (23b)
a) If balanced mechanical ventilation with he			22b) + [1 (22b)	73.95 (23c)
(24a)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	$0.26 \qquad 0.26$	$\frac{230) \times [1 - (230)}{0.27}$	(24a)
b) If balanced mechanical ventilation without	<del>                                     </del>			1
(24b)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24b)
c) If whole house extract ventilation or positi	ve input ventilation from	outside	I	ı
if (22b)m < 0.5 x (23b), then (24c) = (23	•		)	
(24c)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other				
(24d)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (24d) in bo	ox (25)	!	1
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	0.26 0.26	0.27 0.28	(25)
3. Heat losses and heat loss parameter:			·	
<b>ELEMENT</b> Gross Openings area (m²) m²	Net Area U-va A ,m² W/m		k-value () kJ/m²-l	
• •			<u>^</u>	
Doors Type 1	2.13 X 1	= 2.13		(26)
Doors Type 2	2.13 X 1	= 2.13		(26) (26)
• •				
Doors Type 2	0.7 × 1	= 0.7		(26)
Doors Type 2 Doors Type 3	0.7 x 1 0.96 x 1	= 0.7		(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 x 1 0.96 x 1 0.7 x 1	= 0.7 = 0.96 = 0.7 = 0.7		(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$ $+ 0.04] = 2.3$		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7       x       1         0.96       x       1         0.7       x       1         0.7       x       1         1.1       x1/[1/(1.2)         0.19       x1/[1/(1.2)         2.01       x1/[1/(1.2)         1.46       x1/[1/(1.2)         0.99       x1/[1/(1.2)         0.32       x1/[1/(1.2)         7.92       x         5.87       x         5.84       x         2.81       x	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 2.3 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.75		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5	0.7       x       1         0.96       x       1         0.7       x       1         0.7       x       1         1.1       x1/[1/(1.2)         0.19       x1/[1/(1.2)         2.01       x1/[1/(1.2)         1.46       x1/[1/(1.2)         0.99       x1/[1/(1.2)         0.32       x1/[1/(1.2)         7.92       x         0.1       5.87         5.84       x         0.1       5.79	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 2.3 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.76		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.2 1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				(15)
a) If manufacturer's declared loss factor is known (kWh/day):		0		(48)
Temperature factor from Table 2b		0		(49)
Energy lost from water storage, kWh/year (48) x (49) = b) If manufacturer's declared cylinder loss factor is not known:	11	10		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0	02		(51)
If community heating see section 4.3				
Volume factor from Table 2a  Temperature factor from Table 2b		03		(52)
·	0.			(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times ($	1	03 03		(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)r)$		00		(00)
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98	32.01 30.98	32.01		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)ii			x H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98	32.01 30.98	32.01		(57)
Primary circuit loss (annual) from Table 3		0		(58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m				,
(modified by factor from Table H5 if there is solar water heating and a cylinder	thermostat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51	23.26		(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$				
(61)m= 0 0 0 0 0 0 0 0 0	0 0	0		(61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (	45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25	154.05 161.32	172.37		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar	contribution to wate	er heating)		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)				
(63)m= 0 0 0 0 0 0 0 0	0 0	0		(63)
Output from water heater				
(64)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25	154.05 161.32	172.37	4040.00	1(64)
	ater heater (annual) <sub>1.</sub>	L	1816.98	(64)
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times (65)m = 84.42                                  $	77.06 78.65	+ (59)m 83.15	J	(65)
				(00)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot w	ater is from comi	munity n	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov	Dec		
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep	84.03 84.03	84.03		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	000	000		()
(67)m= 13.78 12.24 9.96 7.54 5.63 4.76 5.14 6.68 8.97	11.39 13.29	14.17		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Tal				, ,
(68)m= 146.4 147.92 144.09 135.94 125.66 115.99 109.53 108.01 111.84	119.99 130.27	139.94		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table				
(69)m= 31.4 31.4 31.4 31.4 31.4 31.4 31.4 31.4	31.4 31.4	31.4		(69)
Pumps and fans gains (Table 5a)				
(70)m= 0 0 0 0 0 0 0 0 0	0 0	0		(70)

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23		(71)
Water heating gains (Table 5)													•	
(72)m=	113.47	111.76	108.2	103.37	100.23	95.81	92.06	96.87	98.58	103.58	109.23	111.77		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	321.87	320.13	310.46	295.06	279.73	264.77	254.93	259.77	267.59	283.16	301	314.08		(73)
6. Sol	ar gains	S:												
Solar a	aine ara a	salculated i	ucina colo	r flux from	Table 6a	and accor	intod ogun	tions to co	nyort to th	o applicab	lo orientat	ion		

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

		Access Facto Table 6d		Area m²	a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	=	4.15	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	X	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	X	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	X	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	=	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	=	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	X	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	X	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	X	2.01	X	24.19	x	0.4	X	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	x	24.19	x	0.4	X	0.7	=	6.85	(74)

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North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	=	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East	0.9x	0.77	X	0.99	x	38.42	x	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	x	63.27	X	0.4	x	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	x	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	x	113.09	x	0.4	x	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	x	115.77	X	0.4	x	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	x	110.22	x	0.4	x	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	x	94.68	x	0.4	x	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	x	73.59	X	0.4	x	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	x	45.59	X	0.4	x	0.7	=	8.76	(76)
East	0.9x	0.77	x	0.99	x	24.49	X	0.4	x	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	x	16.15	x	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	x	46.75	X	0.4	x	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	x	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	x	0.32	x	46.75	X	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	x	0.7	] =	16.34	(78)
South	0.9x	0.77	x	0.19	x	76.57	x	0.4	x	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	x	76.57	x	0.4	x	0.7	] =	4.75	(78)
South	0.9x	0.77	х	1.1	x	97.53	x	0.4	x	0.7	=	20.82	(78)
South	0.9x	0.77	х	0.19	x	97.53	x	0.4	x	0.7	] =	3.6	(78)
South	0.9x	0.77	X	0.32	x	97.53	x	0.4	x	0.7	] =	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	x	0.7	] =	23.53	(78)
South	0.9x	0.77	X	0.19	×	110.23	x	0.4	x	0.7	] =	4.06	(78)
South	0.9x	0.77	X	0.32	x	110.23	x	0.4	x	0.7	j =	6.84	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.4	x	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	x	114.87	X	0.4	x	0.7	j =	4.24	(78)
South	0.9x	0.77	x	0.32	x	114.87	x	0.4	x	0.7	j =	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	j =	23.6	(78)
South	0.9x	0.77	j x	0.19	x	110.55	x	0.4	x	0.7	j =	4.08	(78)
South	0.9x	0.77	j x	0.32	×	110.55	x	0.4	x	0.7	j =	6.86	(78)
South	0.9x	0.77	×	1.1	x	108.01	x	0.4	x	0.7	j =	23.05	(78)
South	0.9x	0.77	×	0.19	x	108.01	x	0.4	x	0.7	i =	3.98	(78)
South	0.9x	0.77	i x	0.32	x	108.01	X	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	X	1.1	x	104.89	X	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	i x	0.19	x	104.89	X	0.4	x	0.7	=	3.87	(78)
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South	0.9x	0.77	X	0.3	32	X	10	04.89	X		0.4	X	0.7		=	6.51	(78)
South	0.9x	0.77	X	1.	1	X	10	01.89	X		0.4	X	0.7		=	21.75	(78)
South	0.9x	0.77	X	0.1	9	X	10	01.89	X		0.4	X	0.7		=	3.76	(78)
South	0.9x	0.77	X	0.3	32	X	10	01.89	X		0.4	x	0.7		=	6.33	(78)
South	0.9x	0.77	X	1.	1	X	8	2.59	x		0.4	x	0.7		=	17.63	(78)
South	0.9x	0.77	X	0.1	9	X	8	2.59	X		0.4	×	0.7		=	3.04	(78)
South	0.9x	0.77	X	0.3	32	X	8	2.59	x		0.4	X	0.7		=	5.13	(78)
South	0.9x	0.77	X	1.	1	X	5	5.42	X		0.4	X	0.7		=	11.83	(78)
South	0.9x	0.77	X	0.1	9	X	5	5.42	X		0.4	x	0.7		=	2.04	(78)
South	0.9x	0.77	X	0.3	32	X	5	5.42	X		0.4	X	0.7		=	3.44	(78)
South	0.9x	0.77	X	1.	1	X		40.4	X		0.4	X	0.7		=	8.62	(78)
South	0.9x	0.77	X	0.1	9	X		40.4	X		0.4	x	0.7		=	1.49	(78)
South	0.9x	0.77	X	0.3	32	X		40.4	X		0.4	X	0.7		=	2.51	(78)
Ť		watts, ca				1			<del>` ´</del>		um(74)m .	<del>`</del>	1			1	(00)
(83)m=	28.55	50.74	75.66	105.22	129.09		33.29	126.35	107	.63	85.68	57.7	34.57	24	.2		(83)
r	1	nternal a				<del>-</del>	-			1	050.07					1	(0.4)
(84)m=	350.42	370.87	386.12	400.28	408.82	39	98.06	381.29	367	7.4	353.27	340.8	6 335.57	338	.29		(84)
		nal temp															_
Temp	erature	during h	neating p	eriods ir	n the liv	ing	area 1	from Tal	ole 9	, Th′	1 (°C)					21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,n	า (s	ee Ta	ble 9a)	_			1		1		1	
	Jan	Feb	Mar	Apr	May	+	Jun	Jul	<del>                                     </del>	ug	Sep	Ос	+	+-	ec		<i>(</i> )
(86)m=	0.95	0.94	0.92	0.89	0.81	(	0.69	0.57	0.0	6	0.76	0.89	0.94	9.0	96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)	ı		1		1	
(87)m=	18.65	18.84	19.21	19.73	20.25	2	0.67	20.86	20.	84	20.53	19.9	1 19.21	18.	62		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Th	n2 (°C)					_	
(88)m=	20.4	20.4	20.4	20.41	20.41	2	0.42	20.42	20.	42	20.42	20.4	1 20.41	20	.4		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)								
(89)m=	0.95	0.94	0.92	0.87	0.79	(	0.66	0.51	0.5	54	0.73	0.87	0.93	0.9	95		(89)
Mean	interna	l temper	ature in	the rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	' in Tabl	e 9c)	-	-		-	
(90)m=	18.17	18.36	18.73	19.25	19.75	Ť	0.15	20.33	20.		20.03	19.4	3 18.74	18.	15		(90)
		l		l		-					f	LA = Li	ving area ÷	(4) =		0.48	(91)
Mean	interna	l temper	atura (fo	r the wh	ole dwe	llin	a) – fl	Δ <b>~</b> T1	<b></b> /1	_ fl	Δ) <b>~</b> T2						
(92)m=	18.41	18.6	18.96	19.48	19.99	$\overline{}$	9) – 11 20.4	20.59	20.	$\neg$	20.28	19.6	18.97	18.	38	1	(92)
L		nent to t		l				<u> </u>	L							]	
(93)m=	18.41	18.6	18.96	19.48	19.99	1	20.4	20.59	20.		20.28	19.6	1	18.	38	]	(93)
8. Spa	ace hea	ting requ	uirement											ı			
		mean int				ned	at ste	ep 11 of	Tabl	le 9b	, so tha	t Ti,m	=(76)m a	nd re-	cal	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oc	t Nov	D	ес	]	
Utilisa	tion fac	tor for g	ains, hm	1:													
(94)m=	0.93	0.92	0.9	0.85	0.78	(	0.66	0.53	0.5	56	0.73	0.86	0.91	0.9	94		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (8	4)m											1	
(95)m=	327.36	341.91	347.12	342.1	318.32	20	61.55	200.69	204	1.7	256.59	291.6	3 306.82	317	.64		(95)

Monthly average external temperature from Table 8			
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]			
(97)m= 843.55 816.81 741.31 621.24 485.29 335.02 230.11 239.71 358.52 530.31 698.2	9 838.89		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	<u> </u>		
(98)m= 384.05 319.13 293.27 200.98 124.23 0 0 0 0 177.57 281.8		0400.04	7(00)
Total per year (kWh/year) = Sun	(98) <sub>15,912</sub> =	2168.91	(98)
Space heating requirement in kWh/m²/year		43.66	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)			
Space heating: Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$		1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		1	(204)
Efficiency of main space heating system 1		100	(206)
Efficiency of secondary/supplementary heating system, %	·	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	/ Dec	kWh/ye	 ear
Space heating requirement (calculated above)			
384.05         319.13         293.27         200.98         124.23         0         0         0         0         177.57         281.8	387.81		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	1		(211)
384.05 319.13 293.27 200.98 124.23 0 0 0 0 177.57 281.8			7(0.4)
Total (kWh/year) =Sum(211) <sub>15,10</sub>	12	2168.91	(211)
Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)]\} \times 100 \div (208)$			
(215)m =	0		
Total (kWh/year) =Sum(215) <sub>15,10</sub>	12=	0	(215)
Water heating	•		_
Water heating from separate community system:  Annual water heating requirement		1816.98	(64)
Fraction of heat from community CHP			(303a)
·		1	(305)
Factor for charging method for community water heating  Distribution loss factor (Table 13c) for community heating system		1 .05	╡```
Distribution loss factor (Table 12c) for community heating system  Water heat from CLID. (2022) v (2025) v (2027)		1.05	(306)
Water heat from CHP (64) x (303a) x (305) x (30	<i>'</i>	1907.83	(310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)		19.08	(313)
Annual totals  Space heating fuel used, main system 1	ar 	2168.91	<u>r</u>
Electricity for pumps, fans and electric keep-hot		2100.01	
mechanical ventilation - balanced, extract or positive input from outside	215		(230a)
Total electricity for the above, kWh/year sum of (230a)(230g) =	215		(200a)
TOTAL ETECHTICATOR THE ADDIVE KVVII/VEAL SUIT OF (2504)(2504) =		045	(224)
Electricity for lighting		215  243.4	(231)

12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	1125.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating from community system			
	Energy kWh/yea	Emission factor kg CO2/kWh	Emissions kg CO2/year
CO2 from other sources of space and water hear Efficiency of heat source 1 (%)	ting (not CHP) here is CHP using two fuels repea	t (363) to (366) for the second fue	329 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (	367b) x 0.52	300.96 (367)
Electrical energy for heat distribution	[(313) x	0.52	9.9 (372)
Total CO2 associated with community systems	(363)(366) + (3	368)(372)	310.86 (373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	111.59 (267)
Electricity for lighting	(232) x	0.519 =	126.33 (268)
Total CO2, kg/year	su	m of (265)(271) =	1674.44 (272)
Dwelling CO2 Emission Rate	(2)	72) ÷ (4) =	33.7 (273)
EI rating (section 14)			76 (274)

		H	ser Details:						
A	A 1 - D': 1 :	U:					OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012	2	Stroma Softwa					019516 on: 1.0.4.25	
Software Hame.	Otroma r O/tr 2012		erty Address:			SHP	VOISIO	71. 1.0.4.20	
Address :		·	,	,					
1. Overall dwelling dime	ensions:								
Ground floor		Г	Area(m²)	(4.5)		ight(m)	] <sub>(0-)</sub>	Volume(m³	<u>-</u>
				(1a) x	3	.09	(2a) =	153.51	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	)+(1n) [	49.68	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	153.51	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
N. arken of all larges	heating he	eating		, ,			40 I		_
Number of chimneys	0 +		+ 0	] = [	0		40 =	0	(6a)
Number of open flues	0 +	0	+ 0	] = [	0		20 =	0	(6b)
Number of intermittent fa				L	2	X '	10 =	20	(7a)
Number of passive vents	<b>3</b>			L	0	<b>X</b>	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a	a)+(6b)+(7a)+(	(7b)+(7c) =	Г	20		÷ (5) =	0.13	(8)
	peen carried out or is intended			ontinue fr			- (0) =	0.13	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp			•	ruction			0	(11)
deducting areas of openii		onaing to the	greater wan are	a (aner					
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1 (s	sealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught str	ripped						0	(14)
Window infiltration			0.25 - [0.2			( . = \		0	(15)
Infiltration rate	50		(8) + (10)					0	(16)
Air permeability value, If based on air permeabil	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
	es if a pressurisation test has				is heina u	sed		0.38	(18)
Number of sides sheltere			a acgree an per		.o 2011.g u			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.38	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun .	Jul Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3	3.8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0	.95 0.92	1	1.08	1.12	1.18		
					<u> </u>		I	J	

Adjusted infiltration rate (allowing for s	helter and wind s	speed) = (21a) x	(22a)m				
0.48 0.48 0.47 0.42	0.41 0.36	0.36 0.35	0.38 0.41	0.43	0.45		
Calculate effective air change rate for If mechanical ventilation:	the applicable ca	ise				•	(23a)
If exhaust air heat pump using Appendix N, (	23h) = (23a) <b>x</b> Fmy (6	equation (N5)) othe	nwise (23h) = (23a)			0	
If balanced with heat recovery: efficiency in 9						0	(23b)
a) If balanced mechanical ventilation	-			(23h) <b>v</b> [1	   _ (23c)	0 ÷ 1001	(23c)
(24a)m= 0 0 0 0	0 0		0 0	0	0	- 100]	(24a)
b) If balanced mechanical ventilation	without heat red	covery (MV) (24h	$\frac{1}{1} = \frac{1}{(22b)m} + \frac{1}{(22b)m}$	(23b)			, ,
(24b)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24b)
c) If whole house extract ventilation	or positive input	ventilation from (	outside	1	<u> </u>		
if (22b)m < 0.5 x (23b), then (24	•			b)			
(24c)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24c)
d) If natural ventilation or whole hou if (22b)m = 1, then (24d)m = (22							
(24d)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(24d)
Effective air change rate - enter (24a	a) or (24b) or (24	c) or (24d) in box	x (25)	•			
(25)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(25)
3. Heat losses and heat loss parameter	ter:						
ELEMENT Gross Openii		rea U-val	ue AXL	J	k-value	)	ΑΧk
area (m²) r	n <sup>2</sup> A ,r	m² W/m²	2K (W	/K)	kJ/m²-ł	<	kJ/K
Doors Type 1	2.13	x 1	= 2.13				(26)
Doors Type 1 Doors Type 2	0.7	x 1 x 1	= 2.13				(26) (26)
• •		x 1					. ,
Doors Type 2	0.7	x 1	= 0.7				(26)
Doors Type 2 Doors Type 3	0.7	x 1 x 1	= 0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 0.96 0.7	x 1 x 1 x 1 x 1	= 0.7 = 0.96 = 0.7 = 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $-0.04] = 1.41$ $-0.04] = 0.24$				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 0.96 0.7 0.7 1.06	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7 0.96 0.7 0.7 1.06 0.18	x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7 0.96 0.7 0.7 1.06 0.18 1.93	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7 0.96 0.7 1.06 0.18 1.93 1.4	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ = 0.7 = 0.96 = 0.7 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 1.05				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)	
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0 Walls Type 4 2.81 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 0.51				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5         2.6	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.44 = 1.06 = 1.05 = 0.51 = 1.06				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 17.56 1.91 0.18 3.16 Roof (30)49.68 0 49.68 0.13 6.46 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium 250 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)6.15 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)38.36 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =31.28 31.05 30.83 29.76 29.56 28.64 28.64 28.46 28.99 29.56 29.97 30.39 (38)(39)m = (37) + (38)m Heat transfer coefficient, W/K (39)m =69.65 69.41 69.19 68.12 67.92 67 67 66.82 67.35 67.92 68.33 68.75 (39)Average =  $Sum(39)_{1...12}/12=$ 68.12 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.35 1.37 1.35 1.35 (40)m =1.4 1.39 1.37 1.36 1.37 1.38 1.38 (40)Average =  $Sum(40)_{1...12}/12=$ 1.37 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):		1.39		(48)
Temperature factor from Table 2b		0.54		(49)
Energy lost from water storage, kWh/year	$(48) \times (49) =$	0.75		(50)
b) If manufacturer's declared cylinder loss factor is not known	1:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0		(51)
If community heating see section 4.3  Volume factor from Table 2a		0		(52)
Temperature factor from Table 2b		0		(52)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0		(54)
Enter (50) or (54) in (55)	(11)11(01)11(02)11(00)	0.75		(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$			, ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where	H11) is from Append	l ix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33		(57)
Primary circuit loss (annual) from Table 3	•	0		(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div$	365 × (41)m		l	
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	ostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26		(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m			
(61)m= 0 0 0 0 0 0	0 0 0	0 0		(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m	
(62)m= 167.5 147.83 155.71 140.22 137.88 123.86 119.5	9 130.35 129.85 145.37	152.91 163.68		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar contribut	ion to water heating)	•	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)			
(63)m= 0 0 0 0 0 0	0 0 0	0 0		(63)
Output from water heater				
(64)m= 167.5 147.83 155.71 140.22 137.88 123.86 119.5	9 130.35 129.85 145.37	152.91 163.68		
	Output from water heate	r (annual) <sub>112</sub>	1714.75	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	]	
(65)m= 77.48 68.83 73.56 67.7 67.63 62.26 61.55	65.13 64.26 70.12	71.92 76.21		(65)
include (57)m in calculation of (65)m only if cylinder is in the	e dwelling or hot water is f	rom community h	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts				
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
(66)m= 84.03 84.03 84.03 84.03 84.03 84.03 84.03	84.03 84.03 84.03	84.03 84.03		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5			
(67)m= 13.89 12.33 10.03 7.59 5.68 4.79 5.18	6.73 9.03 11.47	13.39 14.27		(67)
Appliances gains (calculated in Appendix L, equation L13 or L	.13a), also see Table 5		1	
(68)m= 146.4 147.92 144.09 135.94 125.66 115.99 109.5	3 108.01 111.84 119.99	130.27 139.94		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5		ı	
(00) -   044   044   044   044   044   044   044				
(69)m= 31.4 31.4 31.4 31.4 31.4 31.4 31.4 31.4	31.4 31.4 31.4	31.4 31.4		(69)
Pumps and fans gains (Table 5a)  (70)m= 3 3 3 3 3 3 3 3 3 3	31.4 31.4 31.4	31.4 31.4		(69)

Losses	Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)	
Water heating gains (Table 5)														
(72)m=	104.13	102.42	98.87	94.03	90.9	86.48	82.72	87.53	89.24	94.25	99.9	102.43	(72)	
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
(73)m=	315.63	313.89	304.2	288.78	273.44	258.47	248.64	253.48	261.32	276.91	294.77	307.86	(73)	
6. Sol	6. Solar gains:													
Solar a	Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation													

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

	tion:	Access Facto Table 6d		Area m²	a and	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.93	x	10.63	x	0.63	x	0.7	] =	6.27	(74)
North	0.9x	0.77	X	1.4	x	10.63	x	0.63	x	0.7	] =	4.55	(74)
North	0.9x	0.77	X	1.4	x	10.63	x	0.63	x	0.7	=	4.55	(74)
North	0.9x	0.77	X	1.93	x	20.32	x	0.63	x	0.7	] =	11.99	(74)
North	0.9x	0.77	x	1.4	x	20.32	x	0.63	x	0.7	=	8.69	(74)
North	0.9x	0.77	x	1.4	x	20.32	x	0.63	x	0.7	=	8.69	(74)
North	0.9x	0.77	x	1.93	x	34.53	x	0.63	x	0.7	=	20.37	(74)
North	0.9x	0.77	x	1.4	x	34.53	x	0.63	x	0.7	] =	14.77	(74)
North	0.9x	0.77	X	1.4	x	34.53	X	0.63	X	0.7	=	14.77	(74)
North	0.9x	0.77	x	1.93	x	55.46	x	0.63	x	0.7	] =	32.71	(74)
North	0.9x	0.77	X	1.4	x	55.46	x	0.63	X	0.7	=	23.73	(74)
North	0.9x	0.77	X	1.4	x	55.46	X	0.63	X	0.7	=	23.73	(74)
North	0.9x	0.77	X	1.93	x	74.72	X	0.63	X	0.7	=	44.07	(74)
North	0.9x	0.77	X	1.4	x	74.72	X	0.63	X	0.7	=	31.97	(74)
North	0.9x	0.77	X	1.4	x	74.72	x	0.63	x	0.7	=	31.97	(74)
North	0.9x	0.77	X	1.93	x	79.99	X	0.63	X	0.7	=	47.18	(74)
North	0.9x	0.77	X	1.4	x	79.99	X	0.63	X	0.7	=	34.22	(74)
North	0.9x	0.77	X	1.4	x	79.99	x	0.63	x	0.7	=	34.22	(74)
North	0.9x	0.77	X	1.93	x	74.68	X	0.63	x	0.7	=	44.05	(74)
North	0.9x	0.77	x	1.4	x	74.68	X	0.63	x	0.7	=	31.95	(74)
North	0.9x	0.77	x	1.4	x	74.68	x	0.63	x	0.7	=	31.95	(74)
North	0.9x	0.77	X	1.93	x	59.25	x	0.63	X	0.7	=	34.95	(74)
North	0.9x	0.77	x	1.4	x	59.25	X	0.63	X	0.7	=	25.35	(74)
North	0.9x	0.77	x	1.4	X	59.25	X	0.63	X	0.7	=	25.35	(74)
North	0.9x	0.77	X	1.93	x	41.52	X	0.63	X	0.7	=	24.49	(74)
North	0.9x	0.77	X	1.4	x	41.52	x	0.63	X	0.7	=	17.76	(74)
North	0.9x	0.77	X	1.4	x	41.52	X	0.63	X	0.7	=	17.76	(74)
North	0.9x	0.77	X	1.93	x	24.19	x	0.63	X	0.7	] =	14.27	(74)
North	0.9x	0.77	X	1.4	x	24.19	X	0.63	x	0.7	=	10.35	(74)
North	0.9x	0.77	x	1.4	X	24.19	X	0.63	X	0.7	=	10.35	(74)

North	0.9x	0.77	1	1.00	l .,	40.40	1 ,	0.00	۱	0.7	1 _	774	(74)
North	-	0.77	] X ]	1.93	X I	13.12	X	0.63	X	0.7	] = ]	7.74	╡゛
North	0.9x	0.77	] X ]	1.4	l x	13.12	X	0.63	X	0.7	] = ]	5.61	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	]	1.4	l x	13.12	l x	0.63	X	0.7	] = 1 _	5.61	
North	<u> </u>	0.77	] X ]	1.93	l x l	8.86	X	0.63	X	0.7	] = ]	5.23	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	] X ] ,,	1.4	l x	8.86	X	0.63	X	0.7	] = ] _	3.79	$= \frac{1}{1} \frac{(74)}{(74)}$
East	0.9x	0.77	] X ] <sub>v</sub>	1.4	l x	8.86	X	0.63	X	0.7	] = ] <sub>=</sub>	3.79	$\frac{1}{2}$ (74) (76)
East	0.9x	0.77	]	0.95	X	19.64	l x	0.63	X	0.7	] 1	5.7	(76) (76)
East	0.9x C	0.77	]	0.95	x x	38.42	x x	0.63	X	0.7	=	11.15	(76) (76)
East	0.9x	0.77	] x ] x	0.95	^   x	63.27 92.28	] ^   ] <sub>x</sub>	0.63	x	0.7	]	26.79	] <sub>(76)</sub>
East	0.9x	0.77	」^ ] ×	0.95	^   x	113.09	] ^ ] <sub>x</sub>	0.63	X	0.7	] =	32.83	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	115.77	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	33.61	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	110.22	] ^ ] <sub>x</sub>	0.63	X	0.7	]	32	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	94.68	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	27.49	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	73.59	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	21.37	(76)
East	0.9x	0.77	」 ^ ] <sub>×</sub>	0.95	l ^ l x	45.59	] ^ ] <sub>x</sub>	0.63	X	0.7	]	13.24	(76)
East	0.9x	0.77	] ^ ] <sub>x</sub>	0.95	l ^	24.49	] ^ ] <sub>x</sub>	0.63	X	0.7	]	7.11	(76)
East	0.9x	0.77	」 ^ ] x	0.95	l ^ l x	16.15	] ^ ] <sub>x</sub>	0.63	X	0.7	]	4.69	(76)
South	0.9x	0.77	]	1.06	l ^	46.75	]	0.63	X	0.7	]	15.15	(78)
South	0.9x	0.77	]	0.18	l ^	46.75	]	0.63	X	0.7	]	2.57	(78)
South	0.9x	0.77	]	0.31	l x	46.75	)	0.63	x	0.7	] ] =	4.43	(78)
South	0.9x	0.77	] x	1.06	x	76.57	) x	0.63	x	0.7	] ] <sub>=</sub>	24.8	(78)
South	0.9x	0.77	] x	0.18	X	76.57	X	0.63	x	0.7	] ] <sub>=</sub>	4.21	(78)
South	0.9x	0.77	] ]	0.31	l X	76.57	] ]	0.63	X	0.7	] ]	7.25	(78)
South	0.9x	0.77	] ]	1.06	X	97.53	)   X	0.63	X	0.7	] ] =	31.6	(78)
South	0.9x	0.77	X	0.18	X	97.53	X	0.63	X	0.7	]   =	5.37	(78)
South	0.9x	0.77	X	0.31	X	97.53	X	0.63	x	0.7	j   =	9.24	(78)
South	0.9x	0.77	X	1.06	х	110.23	X	0.63	X	0.7	=	35.71	(78)
South	0.9x	0.77	X	0.18	x	110.23	X	0.63	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	0.31	x	110.23	x	0.63	x	0.7	j =	10.44	(78)
South	0.9x	0.77	j×	1.06	x	114.87	x	0.63	x	0.7	j =	37.21	(78)
South	0.9x	0.77	x	0.18	x	114.87	X	0.63	x	0.7	=	6.32	(78)
South	0.9x	0.77	x	0.31	x	114.87	x	0.63	x	0.7	] =	10.88	(78)
South	0.9x	0.77	X	1.06	x	110.55	x	0.63	x	0.7	j =	35.81	(78)
South	0.9x	0.77	x	0.18	x	110.55	x	0.63	x	0.7	] =	6.08	(78)
South	0.9x	0.77	x	0.31	x	110.55	x	0.63	x	0.7	] =	10.47	(78)
South	0.9x	0.77	x	1.06	x	108.01	x	0.63	x	0.7	] =	34.99	(78)
South	0.9x	0.77	×	0.18	x	108.01	x	0.63	x	0.7	] =	5.94	(78)
South	0.9x	0.77	x	0.31	x	108.01	x	0.63	x	0.7	] =	10.23	(78)
South	0.9x	0.77	X	1.06	x	104.89	x	0.63	x	0.7	<b>=</b>	33.98	(78)
South	0.9x	0.77	×	0.18	x	104.89	x	0.63	X	0.7	] =	5.77	(78)

South	0.9x	0.77	×	0.3	31	x	10	04.89	x	0.63		x	0.7	=	9.94	(78)
South	0.9x	0.77	X	1.0	)6	X	10	01.89	x	0.63		x	0.7	=	33.01	(78)
South	0.9x	0.77	X	0.1	18	x	10	01.89	x	0.63		x	0.7	=	5.6	(78)
South	0.9x	0.77	X	0.3	31	X	10	01.89	x	0.63		x	0.7	=	9.65	(78)
South	0.9x	0.77	X	1.0	)6	X	8	2.59	x	0.63		x	0.7	=	26.75	(78)
South	0.9x	0.77	X	0.1	18	х	8	2.59	x	0.63		x	0.7	=	4.54	(78)
South	0.9x	0.77	X	0.3	31	x	8	2.59	x	0.63		x	0.7	=	7.82	(78)
South	0.9x	0.77	X	1.0	06	х	5	5.42	x	0.63		x	0.7	=	17.95	(78)
South	0.9x	0.77	X	0.1	18	x	5	5.42	x	0.63		x	0.7	=	3.05	(78)
South	0.9x	0.77	X	0.3	31	X	5	5.42	x	0.63		x	0.7	=	5.25	(78)
South	0.9x	0.77	X	1.0	)6	X	4	10.4	x	0.63		x	0.7	=	13.09	(78)
South	0.9x	0.77	X	0.1	18	x	4	40.4	x	0.63		x	0.7	=	2.22	(78)
South	0.9x	0.77	X	0.3	31	x	4	40.4	x	0.63		x	0.7	=	3.83	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	= Sum(74)	)m(8	32)m			-	
(83)m=	43.22	76.8	114.49	159.19	195.25	2	01.6	191.11	162.8	32 129.	64 8	37.32	52.32	36.64		(83)
Total g				r (84)m =	<del>`</del>	Ť							1	·	1	
(84)m=	358.85	390.69	418.69	447.97	468.69	46	60.07	439.75	416.	3 390.	97 3	64.24	347.09	344.49		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	n)										
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	area 1	from Tal	ole 9,	Th1 (°C	)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	ı (se	ee Ta	ble 9a)					,		•	
	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	ig Se	р	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.97	0.91	C	).79	0.63	0.68	3 0.88	В (	0.97	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	in Ta	able 9c)					_	
(87)m=	19.54	19.68	19.93	20.29	20.63	2	0.88	20.97	20.9	5 20.7	'8 2	20.36	19.9	19.53		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	, Th2 (°0	C)					
(88)m=	19.76	19.77	19.77	19.79	19.79	1	19.8	19.8	19.8	1 19.8	B 1	9.79	19.78	19.78	]	(88)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina.	h2.	m (se	e Table	9a)						-	
(89)m=	0.99	0.99	0.98	0.95	0.87	T	0.69	0.48	0.53	3 0.8	1 (	0.96	0.99	1		(89)
Mean	interna	l temner	ature in	the rest	of dwell	ina	T2 (f	allow ste	ns 3	to 7 in T	ahle (	3c)		ı		
(90)m=	17.86	18.06	18.42	18.95	19.41	Ť	9.72	19.79	19.7		$\neg$	9.06	18.39	17.84	]	(90)
` ´ I			<u> </u>	<u> </u>	<u> </u>				<u> </u>		fLA	= Livir	ng area ÷ (₄	1 4) =	0.48	(91)
Maaa	:	1 40 000 0 0 0	otivo /fo	ماند مماند	مريدام مام	، ما:ال	~\ fI	ΛΤ4	. /4	£I ^\	TO					
(92)m=	18.67	18.84	19.15	r the wh	20	<del> </del>	g) = 11 0.28	20.36	20.3	<del></del>	1	9.69	19.12	18.66	1	(92)
			l	interna		1							10.12	10.00		(02)
(93)m=	18.67	18.84	19.15	19.6	20	1	0.28	20.36	20.3		<del>i i</del>	9.69	19.12	18.66	]	(93)
	ace h <u>ea</u>	ting requ	uirement													
					re obtaii	ned	at ste	ep 11 of	Table	9b, so	that T	ï,m=(	76)m an	d re-cal	culate	
the ut		1		using Ta	l .					-			1	1	1	
,	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	ig Se	p	Oct	Nov	Dec	]	
I			ains, hm	ı —	0.00	T -	. 70	0.55		1 000	<u>, I .</u>	0.00	0.00	0.00	1	(04)
(94)m=	0.99	0.99	0.98	0.95	0.88	Γ.	).73	0.55	0.6	0.83	3 (	0.96	0.99	0.99	J	(94)
usetu	ıl gains,	HILLIGAM)	vv = 194	4 IIII X (X	41111											
(95)m=	356.05	385.99	409.51	425.83	412.95	33	36.44	242.32	250.0	07 325.	92 3	48.55	342.38	342.24	1	(95)

Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)									
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]									
(97)m= 1000.99 967.82 875.5 728.75 563.95 380.5 251.88 264.02 409.44 617.23 821.39 993.99 (97)									
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m									
(98)m= 479.83 390.99 346.69 218.1 112.34 0 0 0 199.9 344.89 484.91									
Total per year (kWh/year) = Sum(98) <sub>15912</sub> = $2577.65$ (98) Space heating requirement in kWh/m²/year $51.89$ (99)									
9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:									
Fraction of space heat from secondary/supplementary system 0 (201									
Fraction of space heat from main system(s) $ (202) = 1 - (201) =                                   $									
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 $(204)$									
Efficiency of main space heating system 1									
Efficiency of secondary/supplementary heating system, %									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year									
Space heating requirement (calculated above)									
479.83 390.99 346.69 218.1 112.34 0 0 0 199.9 344.89 484.91									
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (212) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (213) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (214) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (215) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (216) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (217) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 $ $ ($									
Total (kWh/year) = Sum(211) <sub>15,1012</sub> 2756.84 (211									
Space heating fuel (secondary), kWh/month									
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0									
Total (kWh/year) =Sum(215) <sub>15,1012</sub> = 0 (215)									
Water heating									
Water heating from separate community system:  Annual water heating requirement  1714.75 (64)									
Annual totals kWh/year kWh/year									
Space heating fuel used, main system 1 2756.84									
Water heating fuel used 2030.49									
Electricity for pumps, fans and electric keep-hot									
central heating pump: 30 (230									
boiler with a fan-assisted flue									
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231									
Electricity for lighting									
12a. CO2 emissions – Individual heating systems including micro-CHP									
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year									
Space heating (main system 1) (211) x 0.216 = 595.48 (261									

Space heating (secondary)	(215) x	0.519	= [	0	(263)
Water heating	(219) x	0.216	= [	438.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1034.06	(265)
Water heating from community system					
	Energy kWh/year	Emission fa kg CO2/kW		Emissions kg CO2/year	
Electrical energy for heat distribution	[(313) x	0	=	0	(372)
Total CO2 associated with community systems	(363)(366) + (368	3)(372)	=	0	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	= [	127.27	(268)
Total CO2, kg/year	sum o	of (265)(271) =		1200.26	(272)

TER =

(273)

35.61

#### Property Details: Flat Type A - ASHP + PV

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 55.3 m<sup>2</sup> 3.09 m

Living area: 28.01 m<sup>2</sup> (fraction 0.507)

Front of dwelling faces: North East

Opening types:						
Name:	Source:	Type:	Glazing:		Argon:	Frame:
D8_01	Manufacturer	Solid				Metal
Vent_08_03	Manufacturer	Solid				
Vent_08_02	Manufacturer	Solid				
Vent_08_06	Manufacturer	Solid				
V_01	Manufacturer	Solid				Metal
Window_08_07	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_01	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_04	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Window_08_05	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Name:	Gap:	Frame Fac	ctor: g-value:	U-value:	Area:	No. of Openings
D8_01	mm	0	0	1	2.13	1
Vent_08_03	mm	0	0	1	0.96	1
Vent_08_02	mm	0	0	1	0.96	1
Vent_08_06	mm	0	0	1	0.7	1
V_01	mm	0	0	1	0.2	1
Window_08_07	6mm	0.7	0.4	1.2	0.86	1
Window_08_01	6mm	0.7	0.4	1.2	2.01	1
Window_08_04	6mm	0.7	0.4	1.2	2.01	1
Window_08_05	6mm	0.7	0.4	1.2	1.46	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1
Name:	Type-Name:	Location:	Orient:		Width:	Height:
D8_01	- •	8_01	North East		0	0
Vent_08_03		8_07	South West		0	0
Vent_08_02		8_07	South West		0	0
Vent_08_06		8_07	South West		0	0
V_01		8_01	North East		1.01	0.2

Window_08_07	8_05	North East	0.6	1.44
Window_08_01	8_07	South West	1.22	1.65
Window_08_04	8_07	South West	1.22	1.65
Window_08_05	8_07	South West	1.22	1.2
Fanlight	8 01	North East	1.01	0.315

Overshading: Average or unknown

Opaque Elemen	ts:						
Type: External Elemer	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
8_01	15.172	2.65	12.52	0.13	0	False	N/A
8_02	1.854	0	1.85	0.13	0	False	N/A
8_03	6.727	0	6.73	0.13	0	False	N/A
8_04	1.823	0	1.82	0.13	0	False	N/A
8_05	6.365	0.86	5.5	0.13	0	False	N/A
8_07	28.737	8.1	20.64	0.13	0	False	N/A
8_08	19.467	0	19.47	0.13	0.82	False	N/A
Ground	55.3			0.11			N/A
Internal Elemer	<u>nts</u>						

<u>Internal Elements</u> <u>Party Elements</u>

Therma	ساما ا	ہملمان	
		ura ra	Дς.

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

Ventilation.

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329 Piping>=1991, pre-insulated, medium temp, variable flow

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: 0.386

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Photovoltaic 2

Installed Peak power: 0.966

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Photovoltaic 3

Installed Peak power: 0.362

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		l Jeor F	Details:						
Access News	Adam Ritchie	– USEFL		_ \]	L a		OTDO	0010510	
Assessor Name: Software Name:							O019516 ion: 1.0.4.25		
John Maile.	Stroma FSAP 2012	Property				SHP <u>+ F</u>		71. 1.0. <del>4</del> .20	
Address :				Í					
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	(1a) v		ight(m)	7(20)	Volume(m³	_
	-> (41) > (4 -> - (4 -) > (4 -> - (4 -> (4 -> - (4 ->			(1a) x	3	3.09	(2a) =	170.88	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)					_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:	main seconda	irv	other		total			m³ per hou	r
North an of all increases	heating heating						40 =	-	_
Number of chimneys	0 + 0	_	0	] = [	0			0	(6a)
Number of open flues	0 + 0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0	X '	10 =	0	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				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	0		÷ (5) =	0	(8)
•	een carried out or is intended, proce			continue fr			. (0) –	0	
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of the contract			•	ruction			0	(11)
deducting areas of opening	-	to the great	ici wali arc	a (anoi					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
J	s and doors draught stripped		0.05 [0.0	(4.4) 4	1001			0	(14)
Window infiltration			0.25 - [0.2 x (14) ÷ 100] = (8) + (10) + (11) + (12) + (13) + (15) =					0	(15)
Infiltration rate	aEO evareaged in public met	oo nor h					oroo	0	(16)
	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20]$	•	•	•	elle oi e	envelope	area	2.5	(17)
•	es if a pressurisation test has been de				is beina u	sed		0.12	(18)
Number of sides sheltere		,	<b>5 7</b>	,	3			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (′	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =					0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
								I	

Adjusted infilt	ration rat	e (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se			!				¬
If mechanic			ondiv N. (C	12h) - (22a	) Em. (c	auation (	NEN otho	nuina (22h	) - (225)			0.5	(23a)
If exhaust air h									) = (23a)		[	0.5	(23b)
		-	-	_					26\m . /′	22b) [4	1 (220)	75.65	(23c)
a) If balanc (24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(24a)
b) If balanc	ed mech	anical v	entilation	without	heat rec	covery (I	MV) (24b	)m = (22	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I	house ex m < 0.5 >			•	•				5 v (22h	١			
(24c)m = 0	0.5 7	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0	0	0		(24c)
d) If natural				<u> </u>		<u> </u>		<u> </u>					(= .0)
	m = 1, th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective ai	r change	rate - e	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)	-				
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area		Openin		Net Ar A ,r		U-val		AXU	<b>~</b>	k-value		
				•	۱, ۲۸	112	W/m2	.r.	(W/Ł	()	kJ/m²-ł	\ KJ/	1.
Doors Type 1		,	.,	•	2.13		VV/m2	.K = [	2.13	\)	KJ/III²•r	X KJ/	(26)
Doors Type 1 Doors Type 2		,		•		x			•		KJ/III²·r	C KJ/	
• •				•	2.13	x x	1	= [	2.13		KJ/M²-r	( KJ/	(26)
Doors Type 2				•	2.13	x x	1	= [	2.13		KJ/M²-r	K KJ/	(26) (26)
Doors Type 2 Doors Type 3		,			2.13 0.96 0.96	x x	1 1	= [ = [ = = [	2.13 0.96 0.96		KJ/IIIr	, KJ/	<ul><li>(26)</li><li>(26)</li><li>(26)</li></ul>
Doors Type 2 Doors Type 3 Doors Type 4		, ,			2.13 0.96 0.96 0.7	x x x x x x	1 1 1	= [ = [ = [	2.13 0.96 0.96 0.7		KJ/M²-r	, KJ/	(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	e 1	, ,			2.13 0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1 1	= [ = [ = [ = 0.04] = [	2.13 0.96 0.96 0.7 0.2		KJ/M²-r	, KJ/	(26) (26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2	, ,		•	2.13 0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= [ = [ = [ = [ 0.04] = [ 0.04] = [	2.13 0.96 0.96 0.7 0.2 0.98		KJ/M²-r	, KJ/	(26) (26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ	e 1 e 2 e 3				2.13 0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 /[1/( 1.2 )+	= [ = [ = [ = [ 0.04] = [ 0.04] = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3		KJ/ITI r	, KJ/	(26) (26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+	= = = = = = = = = = = = = = = = = = =	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3		KJ/M²-r	, KJ/	(26) (26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4				2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	= = = = = = = = = = = = = = = = = = =	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3		KJ/M²-r	, KJ/	(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4		2.65		2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	= [ = [ = [ ] = [ ] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37		KJ/ITI r		(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	e 1 e 2 e 3 e 4 e 5	17			2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11	= [ = [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083		KJ/M²-r		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1	e 1 e 2 e 3 e 4 e 5	17 5	2.65		2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= [ = [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63		KJ/ITI r		(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2 e 3 e 4 e 5	17 5 3	2.65		2.13 0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24		KJ/ITI r		(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ	e 1 e 2 e 3 e 4 e 5	17 5 3 2	2.65 0		2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1/(1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87		KJ/ITI r		(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Wi	e 1 e 2 e 3 e 4 e 5	17 5 3 2 6	2.65 0 0		2.13 0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13	= [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24		KJ/ITI P		(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Typ Wi	e 1 e 2 e 3 e 4 e 5  15.1  1.8  6.7  1.8	5 3 2 6 74	2.65 0 0 0 0.86		2.13 0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	2.13 0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72		KJ/ITI P		(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

				· · · · · · · · · · · · · · · · · · ·	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
					lls and part	titions								
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat ca	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therma	al mass	parame	ter (TMF	c = Cm ÷	: TFA) ir	n kJ/m²K			Indicat	tive Value	: Low		100	(35)
•	•	sments wh ad of a dea			constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						20.32	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he								(33) +				47.64	(37)
Ventila	tion hea			d monthly	i						25)m x (5)	<u> </u>	1	
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
		( /)	II D) \A/	/ 21.C						_	Sum(39) <sub>1</sub>	12 /12=	62.22	(39)
г		meter (F		r	4.40			44		= (39)m ÷			1	
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14	1.13	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	average =	Sum(40) <sub>1</sub> .	12 / 12=	1.13	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(41)m=			31	30	31	30	-	Ť		31	30	-		(41)
	31			l		30	-	Ť		31	30	-	ear:	(41)
4. Wa	31 ter heat	28 ting ener	gy requi	l		30	-	Ť		31		31 kWh/ye	ear:	
4. Wa Assum if TF	ter heat ed occu A > 13.9	ze ting ener upancy, I 9, N = 1	rgy requi	irement:			31	31	30		1.	31	ear:	(41)
4. Wa Assum if TF if TF Annual	ter heat ed occu A > 13.9 A £ 13.9 averag	ing energipancy, I 9, N = 1 9, N = 1 e hot wa	rgy requi N + 1.76 x	irement:  [1 - exp	o(-0.0003	349 x (TF	31 FA -13.9 erage =	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/ye	ear:	
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annua	ing energy, I pancy, I p, N = 1 p, N = 1 e hot wall average	rgy requi N + 1.76 x ater usag hot water	irement:  [1 - exp ge in litre usage by	o(-0.0003 es per da 5% if the a	349 x (TF ay Vd,av welling is	31 FA -13.9 erage = designed to	31 )2)] + 0.0 (25 x N)	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	əar:	(42)
4. Wa Assume if TFA if TFA Annual Reduce	ter heat ed occu A > 13.9 A £ 13.9 averag the annual	ing energipancy, I pancy, I pancy, I pancy, I pancy, I pancy I	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the a	349 x (TF ay Vd,av lwelling is hot and co	31  FA -13.9 erage = designed id	31 (25 x N) (25 achieve	30 0013 x (7 + 36 a water us	ΓFA -13. se target o	9) 78	31 kWh/yu 85	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36	ΓFA -13.	1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assume if TF, if TF, Annual Reduce in not more	ter heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy in N = 1 p	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr  ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from T	31  FA -13.9 erage = designed to ld)  Jul Table 1c x	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us	ΓFA -13. se target o Oct	1. 9) 78	31 kWh/yu 85 0.05	ear:	(42)
4. Wa Assume if TF if TF Annual Reduce is not more	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy I panc	rgy requive the state of the st	irement:  [1 - exp  ge in litre usage by a r day (all w	es per da 5% if the d vater use, I	349 x (TF ay Vd,av twelling is thot and co	31  A -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (T + 36 a water us Sep	ΓFA -13. se target o  Oct  79.61	9) 78 Nov 82.73	85 .05 Dec		(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirements of the second reports of the second reports of the second requirements of the second requirem	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec	936.55	(42)
4. Wa  Assume if TF, annual Reduce in not more  Hot wate (44)m=	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy all average litres per pancy all average litres per pancy all average litres per pancy all average a	rgy requive the second requirements of the second reports of the second reports of the second requirements of the second requirem	irement:  [1 - exp  ge in litre usage by day (all w  Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	ΓFA -13.  se target o  Oct  79.61  Fotal = Su	9) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec		(42)
4. Wa  Assume if TF, if TF, Annual Reduce in not more  Hot wate (44)m= [  Energy contact   15   15   15   15   15   15   15   1	ed occu A > 13.9 A £ 13.9 averag the annua e that 125 Jan er usage in 85.85	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy hot water in litres per pancy hot water	rgy requive the second of the	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24	FA -13.9 erage = designed in the signed in t	31 (25 x N) to achieve Aug (43) 73.36	30  0013 x (7  + 36     a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1. 9) 78 Nov 82.73 m(44)12 = ables 1b, 1	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3		(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy co (45)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan er usage in 85.85 content of	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pan	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the of vater use, I  May  Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy c (45)m= [ If instanta (46)m= [	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17	o(-0.0003 es per da 5% if the ovater use, I  May Vd,m = far  73.36  onthly = 4.	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25	FFA -13.  See target of Oct  79.61  Fotal = Surith (see Tail 104.01)	1.9) 78 Nov 82.73 m(44)12 = ables 1b, 1 113.54	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42)
4. Wa  Assume if TF if T	ed occur A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage ir 85.85 content of 127.31 aneous w 19.1 storage	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiverse requirements of the second period period pe	irement:  [1 - exp ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = fai  73.36  onthly = 4.  96.12 o hot water  14.42	349 x (TF ay Vd,av Iwelling is that and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage),	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  76.86  enter 0 in  11.53	31 (25 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  0 to (61)  13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy co (45)m= [ If instanta (46)m= [ Water s Storage	ter heat ed occu A > 13.9 A £ 13.9 averag the annua e that 125  Jan 85.85 content of 127.31 aneous w 19.1 storage e volum	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required to the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated me  100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W	349 x (TF ay Vd,av fwelling is hot and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44	31  FA -13.9  erage = designed to lid)  Jul  Table 1c x  70.24  m x nm x E  76.86  enter 0 in  11.53  storage	31 (25 x N) (25 x N) (25 x N) (26 achieve  Aug (43) (73.36 (77.3600  88.2 (46) (13.23) within sa	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  0 to (61)  13.39	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31 kWh/ys 85 3.05 Dec 85.85 c, 1d) 123.3	936.55	(42) (43) (44) (45)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the content of t	ed occur A > 13.9 A £ 13.9 A £ 13.9 A verage the annual of that 125 Jan Ber usage in 85.85 Content of 127.31 Storage e volume munity herise if no	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I p	rgy requive the second of the	irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49  culated me 100.17  for use (no	o(-0.0003 es per da 5% if the of vater use, I  May Vd,m = fai  73.36  onthly = 4.  96.12 o hot water  14.42	349 x (TF ay Vd,av lwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS	and and and and and and and and and and	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa  Assume if TFA if TFA Annual Reduce is not more  Hot wate (44)m= [ Energy of (45)m= [ Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commotherw Water storage If commother III II II II II II II II II II II II I	ed occu A > 13.9 A £ 13.9 A £ 13.9 averag the annua that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely required by the state of th	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated mo  100.17  for use (no  15.03  and any so ank in dw er (this in	es per da 5% if the avater use, I  May  Vd,m = far  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (43) (73.36 (88.2 (46) (13.23 (47)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  - c, 1d)  123.3  - 18.49	936.55	(42) (43) (44) (45) (46) (47)
4. Wa  Assume if TF, if TF, annual Reduce is not more  Hot wate (44)m= [  Energy conditions of the common of the c	der heat ed occur A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in 85.85 content of 127.31 aneous w 19.1 storage e volum munity h vise if no storage anufact	ing energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I pa	rgy requiversely requirements of the sector	irement:  [1 - exp  ge in litre usage by and and (all we  Apr ach month  76.49  culated mo 100.17  for use (no 15.03  and any so ank in dw er (this in	of (-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fact  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W  velling, e	349 x (TF ay Vd,av fwelling is hot and co  Jun ctor from 7 70.24  190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31 (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (25 x N) (43) (73.36 (88.2 (46) (13.23 (47)	30  30  30  30  30  4 36 a water us  Sep  76.49  76.49  89.25  1 to (61)  13.39  ame vess	Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	1.9) 78 Nov 82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54 m(45) <sub>112</sub> = 17.03	31  kWh/y 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)

Energy lost from water storage, kWh/year	$(48) \times (49) =$	110	(50)
b) If manufacturer's declared cylinder loss factor is not known	:		1 (54)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3		0.02	(51)
Volume factor from Table 2a		1.03	(52)
Temperature factor from Table 2b		0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	(54)
Enter (50) or (54) in (55)		1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(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 contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where	(H11) is from Append	lix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.01	30.98 32.01	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div 3$	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m	-	
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each month	h (62)m = 0.85 × (45)m +	(46)m + (57)m +	ı (59)m + (61)m
(62)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	<del>, , , , , , , , , , , , , , , , , , , </del>	167.03 178.57	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan			l
(add additional lines if FGHRS and/or WWHRS applies, see A		ion to water neating)	
(63)m= 0 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater		<u> </u>	I
(64)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29	167.03 178.57	
	Output from water heate	r (annual) <sub>112</sub>	1878.81 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)ml + 0.8 x [(46)m	+ (57)m + (59)m	1
(65)m= 86.55 76.97 82.43 76.1 76.18 70.37 69.78	73.55 72.47 78.81	80.55 85.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the		ļ. ļ.	l neating
5. Internal gains (see Table 5 and 5a):	arraming of flot mater is t		.out.ing
,			
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 110.77 110.77 110.77 110.77 110.77 110.77 110.77	<del>                                     </del>	110.77 110.77	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	<del>-</del>	1	, ,
(67)m= 39.79 35.34 28.74 21.76 16.26 13.73 14.84	19.28 25.88 32.87	38.36 40.89	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	<u> </u>		·
(68)m= 240.24 242.73 236.45 223.07 206.19 190.33 179.73	<del>, , , , , , , , , , , , , , , , , , , </del>	213.77 229.64	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	1 1	210.77   220.04	
(69)m= 47.92 47.92 47.92 47.92 47.92 47.92 47.92 47.92	47.92 47.92 47.92	47.92 47.92	(69)
	11.02 11.02 11.32	11.02 71.02	I (55)
Pumps and fans gains (Table 5a) (70)m=	0 0 0	0 0	(70)
			I (10)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -73.85   -73.85			
(71)m=   -73.85   -73.85   -73.85   -73.85   -73.85   -73.85   -73.85	-73.85 -73.85 -73.85	-73.85 -73.85	(71)

Water heati	ng gains (T	able 5)												
(72)m= 116.3	<del></del>	110.79	105.7	102.39	97.74	93.79	98.	85 100	0.65	105.92	111.87	114.54	]	(72)
Total intern	nal gains =	<u> </u>			(6	<b></b> 66)m + (67)n	า + (68	3)m + (69)			<del></del>	m	J	
(73)m= 481.	<del>_</del>	460.82	435.38	409.7	386.6	1 373.19	380	.22 394	4.9	420.52	448.85	469.91	1	(73)
6. Solar ga	ins:													
Solar gains a		using sola	r flux from	Table 6a	and ass	ociated equa	ations	to convert	to the	applica	able orientat	ion.		
Orientation:			Area			lux		g_			FF		Gains	
	Table 6d		m²		T	able 6a		Table	6b	-	Table 6c		(W)	
Northeast 0.9	0.77	X	3.0	36	x	11.28	x	0.4	ļ	_ x [	0.7	=	1.88	(75)
Northeast 0.9	0.77	X	0.3	32	x	11.28	X	0.4	ļ	x_[	0.7	=	0.7	(75)
Northeast 0.9	0.77	X	3.0	36	x	22.97	X	0.4	ļ	x_[	0.7	=	3.83	(75)
Northeast 0.9	0.77	X	0.3	32	x	22.97	X	0.4	ļ	x	0.7	=	1.43	(75)
Northeast 0.9	0.77	Х	3.0	36	x	41.38	X	0.4	ļ	x_[	0.7	=	6.91	(75)
Northeast 0.9	0.77	Х	0.3	32	x	41.38	X	0.4	ļ	] x [	0.7	=	2.57	(75)
Northeast 0.9	0.77	X	3.0	36	x	67.96	X	0.4	ļ	x	0.7	=	11.34	(75)
Northeast 0.9	0.77	X	0.3	32	x	67.96	X	0.4		x_[	0.7	=	4.22	(75)
Northeast 0.9	0.77	X	3.0	36	x	91.35	X	0.4		x_[	0.7	=	15.24	(75)
Northeast 0.9	0.77	X	0.3	32	x	91.35	X	0.4	ļ	x	0.7	=	5.67	(75)
Northeast 0.9	0.77	Х	3.0	36	x	97.38	X	0.4	ļ	x_[	0.7	=	16.25	(75)
Northeast 0.9	0.77	X	0.3	32	x	97.38	X	0.4	ļ	x_[	0.7	=	6.05	(75)
Northeast 0.9	0.77	X	3.0	36	X	91.1	X	0.4	ļ	x_[	0.7	=	15.2	(75)
Northeast 0.9	0.77	Х	0.3	32	x	91.1	X	0.4	ļ	_ x [	0.7	=	5.66	(75)
Northeast 0.9	0.77	X	3.0	36	x	72.63	X	0.4	ļ	x_[	0.7	=	12.12	(75)
Northeast 0.9	0.77	X	0.3	32	x	72.63	X	0.4	ļ	x	0.7	=	4.51	(75)
Northeast 0.9	0.77	Х	3.0	36	x	50.42	X	0.4	ļ	_ x [	0.7	=	8.41	(75)
Northeast 0.9	0.77	X	0.3	32	x	50.42	X	0.4	ļ	_ x [	0.7	=	3.13	(75)
Northeast 0.9	0.77	X	3.0	36	x	28.07	X	0.4	ļ	x	0.7	=	4.68	(75)
Northeast 0.9	0.77	X	0.3	32	x	28.07	X	0.4	ļ	<b>x</b>	0.7	=	1.74	(75)
Northeast 0.9	0.77	X	3.0	36	x	14.2	X	0.4	ļ	_ x [	0.7	=	2.37	(75)
Northeast 0.9	0.77	X	0.3	32	x	14.2	X	0.4	ļ	x [	0.7	=	0.88	(75)
Northeast 0.9	0.77	X	3.0	36	x	9.21	X	0.4	ļ	x_[	0.7	=	1.54	(75)
Northeast 0.9	0.77	X	0.3	32	x	9.21	x	0.4	ļ	x_[	0.7	=	0.57	(75)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	36.79	]	0.4	ļ	x_[	0.7	=	14.35	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	36.79	]	0.4	ļ	] x [	0.7	=	14.35	(79)
Southwest <sub>0.9</sub>	0.77	X	1.4	ŀ6	x	36.79	]	0.4	1	x_[	0.7	=	10.42	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	62.67	]	0.4	ļ	x_[	0.7	=	24.44	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	62.67	]	0.4	ļ	x_[	0.7	=	24.44	(79)
Southwest <sub>0.9</sub>	0.77	х	1.4	l6	x	62.67	]	0.4		x	0.7	=	17.76	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	85.75	]	0.4	1	x	0.7	=	33.45	(79)
Southwest <sub>0.9</sub>	0.77	X	2.0	)1	x	85.75	]	0.4	1	<b>x</b> [	0.7	=	33.45	(79)

Southwest <sub>0.9x</sub>								1			1 г		_	Г		7(70)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		5.75	] 1	0.4		]	0.7	=	= [ 	24.29	(79)
	0.77	×	2.0		X		06.25	 	0.4		]	0.7	=	= [ 	41.44	(79)
Southwesto.9x	0.77	X	2.0		X		06.25	] 1	0.4		] X	0.7	=	= [ 	41.44	(79)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		06.25	] i	0.4		]	0.7		= [   	30.1	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	19.01		0.4		]	0.7		= [ 	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	19.01		0.4		]	0.7		= [	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	19.01		0.4		] × [	0.7		= [	33.72	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	18.15		0.4		] x [	0.7	-	= [	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	18.15		0.4		X	0.7		= [	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	18.15		0.4		×	0.7		= [	33.47	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	13.91		0.4		x	0.7	:	= [	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91		0.4		x	0.7		= [	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	13.91		0.4		x	0.7	:	= [	32.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39		0.4		] x [	0.7	:	= [	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39		0.4		] x [	0.7	:	= [	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	04.39		0.4		] x [	0.7		= [	29.57	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85		0.4		] x [	0.7		= [	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	g	2.85		0.4		] x [	0.7		= [	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	g	2.85		0.4		] x [	0.7	:	= [	26.3	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	6	9.27		0.4		x [	0.7	:	= [	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	6	9.27		0.4		x [	0.7	:	= [	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	x	6	9.27		0.4		x	0.7		= [	19.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07		0.4		×	0.7		= [	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07		0.4		×	0.7		= [	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	4	4.07		0.4		x	0.7		<u> </u>	12.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	3	1.49		0.4		×	0.7		<b>-</b> [	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	3	1.49	İ	0.4		×	0.7		= [	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	3	1.49	j	0.4		×	0.7		<u> </u>	8.92	(79)
•																_
Solar gains in	watts, cal	lculated	for each	n month	1			(83)m	= Sum(74	l)m(	(82)m					
(83)m= 41.71	71.9	100.66	128.54	147.46	14	47.93	141.98	127	.63 110.	.28	80.08	50.11	35.59	9		(83)
Total gains –	internal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts									
(84)m= 522.91	549.35	561.48	563.92	557.16	5	34.57	515.18	507	.85 505.	.18	500.6	498.96	505.5	1		(84)
7. Mean inte	rnal tempe	erature (	(heating	seasor	า)											
Temperature	during he	eating p	eriods in	the livi	ing	area	from Tal	ole 9,	Th1 (°C	;)				ſ	21	(85)
Utilisation fa	ctor for ga	ins for l	iving are	a, h1,m	า (ร	ee Ta	ble 9a)									_
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Se	ер	Oct	Nov	De	С		
(86)m= 0.91	0.9	0.87	0.82	0.74	(	0.61	0.47	0.9	5 0.6	6	0.81	0.89	0.92			(86)
Mean interna	al tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)	•		-				
(87)m= 19.12	19.3	19.62	20.05	20.46	_	0.78	20.92	20.			20.22	19.61	19.08	3		(87)
Temperature	during be	eating o	erinde in	rest of	. 4/v	elling	from To	hle (	Th2 (%	C)		-1				
(88)m= 20.43	20.43	20.43	20.44	20.44	_	0.45	20.45	20.	`		20.44	20.44	20.43	3		(88)
250												1	L			. /

Utilisa	ition fac	tor for a	ains for	rest of d	welling, l	n2 m (se	e Table	9a)						
(89)m=	0.91	0.89	0.86	0.81	0.72	0.57	0.42	0.45	0.63	0.79	0.88	0.91		(89)
Mean	internal	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	L 7 in Tabl	e 9c)				
(90)m=	18.65	18.83	19.15	19.58	19.97	20.27	20.39	20.38	20.2	19.74	19.15	18.62		(90)
			l	l			l		f	L LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	internal	l temner	ature (fo	or the wh	ole dwel	ling) – f	Ι Δ <b>ν</b> Τ1	+ (1 – fl	Δ) <b>v</b> T2					
(92)m=	18.89	19.07	19.38	19.82	20.22	20.53	20.66	20.65	20.46	19.98	19.39	18.86		(92)
L	adiustn		L he mear	ı ı interna	tempera	ature fro	ı m Table	4e. whe	ere appro	L opriate				
(93)m=	18.89	19.07	19.38	19.82	20.22	20.53	20.66	20.65	20.46	19.98	19.39	18.86		(93)
8. Spa	ace hea	ting requ	uirement											
				mperatui using Ta		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ւ Utilisa			ains, hm	<u> </u>	···ωy	0011		7.09	Сор		1101	200		
(94)m=	0.89	0.87	0.84	0.79	0.71	0.58	0.44	0.47	0.63	0.78	0.86	0.89		(94)
Usefu	I gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	464.36	478.28	472.44	445.22	393.8	308.43	228.74	236.33	317.81	389.7	428.12	452.36		(95)
Month	nly avera	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 I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]		-	· 	
(97)m=	926.12	896.95	813.58	679.84	528.85	362.98	248.38	259.21	391.32	582.55	767.07	920.24		(97)
Space					nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	<del> </del>	1)m		l	
(98)m=	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		_
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1883.71	(98)
Space	e heating	g require	ement in	kWh/m²	/year								34.06	(99)
9a. Ene	ergy red	Juiremer	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatir	_										,		_
					y/supple	mentary	•						0	(201)
Fraction	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								100	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	heating	g require	ement (c	alculate	d above)									
	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		
(211)m	= {[(98]	)m x (20	(4)] } x 1	00 ÷ (20	06)									(211)
	343.55	281.34	253.8	168.92	100.48	0	0	0	0	143.48	244.04	348.1		
_								Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	F	1883.71	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month							!		_
= {[(98)	m x (20	1)]}x1	00 ÷ (20	8)						-	-		1	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)

Water heating				
Water heating from separate community separate comm	system:		1878.81	(64)
Fraction of heat from community CHP			1	(303a)
Factor for charging method for communi	ty water heating		1	(305)
Distribution loss factor (Table 12c) for co	ommunity heating system		1.1	(306)
Water heat from CHP	(	(64) x (303a) x (305) x (306) =	2066.69	(310a)
Electricity used for heat distribution	0.01 ×	[(307a)(307e) + (310a)(310e)] =	20.67	(313)
Annual totals Space heating fuel used, main system 1		kWh/year	<b>kWh/year</b> 1883.71	]
Electricity for pumps, fans and electric kee	ep-hot			_
mechanical ventilation - balanced, extrac	ct or positive input from outside	218.89	1	(230a)
Total electricity for the above, kWh/year	sum o	f (230a)(230g) =	218.89	(231)
Electricity for lighting			281.06	(232)
Electricity generated by PVs			-1391.63	(233)
10a. Fuel costs - individual heating syste	ems:			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19 x 0.01 =	248.46	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0	(242)
Water heating from CHP	(310a) x	4.24 × 0.01 =	87.63	(342a)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	28.87	(249)
(if off-peak tariff, list each of (230a) to (23 Energy for lighting	0g) separately as applicable and (232)	d apply fuel price according to $13.19$ x $0.01$ =	Table 12a 37.07	(250)
Additional standing charges (Table 12)			60	(251)
	one of (233) to (235) x)	13.19 x 0.01 =	-183.56	(252)
Appendix Q items: repeat lines (253) and <b>Total energy cost</b>	(254) as needed (245)(247) + (250)(254) =		278.48	(255)
11a. SAP rating - individual heating system				
Energy cost deflator (Table 12)			0.42	(256)
. ,	(255) x (256)] ÷ [(4) + 45.0] =		1.17	](257)
SAP rating (Section 12)			83.73	(258)
12a. CO2 emissions – Individual heating	systems including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.519 =	977.65	(261)

Space heating (secondary)	(215) x		0.519 =	0	(263)
Water heating from community system					_
		Energy kWh/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water hea Efficiency of heat source 1 (%)	ting (not CHP) there is CHP using two	fuels repeat (363) to	(366) for the second for	uel 329	(367a)
CO2 associated with heat source 1	[(307b)+(310b	)] x 100 ÷ (367b) x	0.52	326.02	(367)
Electrical energy for heat distribution	[(313)	x	0.52	= 10.73	(372)
Total CO2 associated with community systems	(363).	(366) + (368)(37	2)	= 336.75	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519 =	113.61	(267)
Electricity for lighting	(232) x		0.519 =	145.87	(268)
Energy saving/generation technologies Item 1			0.519 =	-722.25	(269)
Total CO2, kg/year		sum of (265	i)(271) =	851.62	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	=	15.4	(273)
EI rating (section 14)				89	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Pri</b> i fact	<b>mary</b> tor	<b>P. Energy</b> kWh/year	
Space heating (main system 1)	• •		•	•	(261)
Space heating (main system 1) Space heating (secondary)	kWh/year		tor	kWh/year	(261) (263)
	kWh/year		3.07 =	kWh/year	⊒` <b>-</b>
Space heating (secondary)	kWh/year (211) x (215) x		3.07 =	kWh/year	⊒` <b>-</b>
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heating space and wa	kWh/year (211) x (215) x	fact	3.07 =	kWh/year  5783  0  Emissions kWh/year	⊒` <b>-</b>
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heating space and wa	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two	fact	3.07 =	kWh/year  5783  0  Emissions kWh/year	(263)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two	fact Energy kWh/year  fuels repeat (363) to	3.07 = 3.07 = Primary factor (366) for the second for	kWh/year  5783  0  Emissions kWh/year	(263)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  Energy associated with heat source 1	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two [(307b)+(310b)]	fact Energy kWh/year  fuels repeat (363) to	3.07	kWh/year  5783  0  Emissions kWh/year  sel 329 = 1928.49	(263) (263) (367a) (367)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  Energy associated with heat source 1  Electrical energy for heat distribution	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two [(307b)+(310b)]	fact Energy kWh/year  fuels repeat (363) to     x 100 ÷ (367b) x    x	3.07	kWh/year  5783  0  Emissions kWh/year  1928.49  = 60.35	(263) (263) (367a) (367) (372)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  Energy associated with heat source 1  Electrical energy for heat distribution  Total Energy associated with community systems	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two [(307b)+(310b) [(313) (363).	fact Energy kWh/year  fuels repeat (363) to     x 100 ÷ (367b) x    x	rior	kWh/year  5783  0  Emissions kWh/year  Jel 329  = 1928.49  = 60.35  = 336.75	(263) (263) (367a) (367) (372) (373)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  Energy associated with heat source 1  Electrical energy for heat distribution  Total Energy associated with community systems Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two [(307b)+(310b [(313) (363).	fact Energy kWh/year  fuels repeat (363) to     x 100 ÷ (367b) x    x	rior 3.07 = 3.07 =  Primary factor  (366) for the second for the s	kWh/year  5783  0  Emissions kWh/year  sel 329  = 1928.49  = 60.35  = 336.75  672	(367a) (367a) (367) (372) (373) (267)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  Energy associated with heat source 1  Electrical energy for heat distribution  Total Energy associated with community systems Electricity for pumps, fans and electric keep-hot Electricity for lighting  Energy saving/generation technologies	kWh/year (211) x (215) x  ting (not CHP) there is CHP using two [(307b)+(310b [(313) (363).	fact Energy kWh/year  fuels repeat (363) to     x 100 ÷ (367b) x    x	rior   3.07	kWh/year  5783  0  Emissions kWh/year  1928.49  = 60.35  = 336.75  672  862.85	(367a) (367a) (367) (372) (373) (267) (268)

		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property i	Address	: Flat Ty	ре А - А	SHP + F	Pγ		
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	_
	\			(1a) x	3	3.09	(2a) =	170.88	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)					_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	170.88	(5)
2. Ventilation rate:	main seconda	w . r	other		40401			m³ nor hou	
	main seconda heating heating	y 	otner		total		ı	m³ per hou	r 
Number of chimneys	0 + 0	+	0	_ = _	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+ [	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	X	10 =	0	(7a)
Number of passive vents	1			Ī	0	X	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	X -	40 =	0	(7c)
				_			Air ch	anges per ho	ur
,	ys, flues and fans = $(6a)+(6b)+$			[	0		÷ (5) =	0	(8)
Number of storeys in t	neen carried out or is intended, proce the dwelling (ns)	ed to (17), (	otherwise (	continue tr	om (9) to	(16)		0	(9)
Additional infiltration	no awaiiing (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 for	r masoni	y constr	ruction	-		0	(11)
	resent, use the value corresponding	to the great	er wall are	a (after			'		_
deducting areas of openii	ngs);	).1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(**************************************	,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelope	area	2.5	(17)
	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Number of sides sheltere	es if a pressurisation test has been do ad	one or a deg	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	eu .		(20) = 1 -	[0.075 x (1	19)] =			0 1	-(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m <i>÷ 1</i>								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
()	1	1 5.00	L	· ·	1	1		l	

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effect		_	rate for t	he appli	cable ca	se	•	•	•	•			(00-)
If exhaust air he			andiv N (2	3h) - (23s	a) × Fmv (e	aguation (	N5N othe	rwisa (23h	) <i>- (</i> 23a)			0.5	(23a)
If balanced with									) = (25a)			0.5	(23b)
a) If balanced		-	-	_					2h)m + (	23h) 🗸 [1	 1 <i>– (23c</i> )	75.65 ± 1001	(23c)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(24a)
b) If balanced	d mecha	nical ve	ntilation	without	heat rec	coverv (ľ	л ИV) (24b	)m = (22	2b)m + (2	1 23b)		l	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	ouse extr	ract ven	tilation o	or positiv	re input v	ventilatio	on from o	outside				ı	
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	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change r	ate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)				•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losses	s and hea	at loss p	paramete	er:									
ELEMENT	Gross area (		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Boole Type T					2.13	X	1	= [	2.13				(26)
Doors Type 2					2.13 0.96	=	1	= [	2.13 0.96				(26) (26)
						x		=					, ,
Doors Type 2					0.96	x	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x x	1 1	= [ = [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2				0.96 0.96 0.7 0.2	x x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.2 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3			7 [	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4	7	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5	_	2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	2 3 4 5				0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ 0.11 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 1.67 0.37 6.083 1.63 0.24				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ /(1/(1.2)+ (0.11 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.11 0.13 0.13 0.13 0.13	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 0.98 2.3 2.3 1.67 0.37 6.083 1.63 0.24 0.87 0.24 0.72				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29)

			ows, use e sides of in				ated using	TOTTIGIA 1	I( I/O Vala	( <del>C)+</del> 0.04] a	io givoii iii	paragrapri		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				27.32	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therma	al mass	parame	eter (TMF	P = Cm -	: TFA) in	n kJ/m²K			Indica	tive Value	: Low		100	(35)
			ere the de tailed calci		constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	<						20.32	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			47.64	(37)
Ventila	tion hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.85	15.68	15.5	14.62	14.44	13.56	13.56	13.39	13.91	14.44	14.8	15.15		(38)
Heat tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	63.49	63.32	63.14	62.26	62.08	61.2	61.2	61.03	61.56	62.08	62.44	62.79		
•											Sum(39) <sub>1</sub> .	12 /12=	62.22	(39)
Heat lo		meter (F	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.1	1.11	1.12	1.13	1.14		<b>—</b>
Numbo	r of day	ıs in moı	nth (Tab	lo 1a\					/	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.13	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30 30	31	30	31		(41)
(41)111=	- 51		] 31		31		] 31	31	30	31	30	31		(+1)
4. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum if TF	ed occu A > 13.9	upancy, l 9, N = 1			(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x (T	ΓFA -13.		kWh/ye	ear:	(42)
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 78		ear:	(42)
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usaç	[1 - exp ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 78	85	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 78	85	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 78 Nov	.05	ear:	, ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 78	.05	ear:	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed in designed i	(25 x N) o achieve Aug (43) 73.36	+ 36 a water us  Sep  76.49	Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44)112 =	.05 Dec 85.85	936.55	, ,
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed in designed i	(25 x N) o achieve Aug (43) 73.36	+ 36 a water us  Sep  76.49	Oct  79.61  Total = Su	9) 78 Nov 82.73 m(44)112 =	.05 Dec 85.85		(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in 85.85	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cal	[1 - exp ge in litre usage by day (all w Apr ach month 76.49	es per da 5% if the day vater use, I May Vd,m = factorized 73.36	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24	erage = designed in designed i	(25 x N) to achieve  Aug (43)  73.36	+ 36 a water us  Sep  76.49 a kWh/mon 89.25	Oct  79.61  Total = Su  104.01	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1	.05  Dec  85.85  c, 1d)  123.3		(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per I Feb n litres per 82.73	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cal	[1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me	es per da 5% if the de tater use, l'  May  Vd,m = fact  73.36  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 70.24	erage = designed to designed t	(25 x N) o achieve Aug (43) 73.36 0Tm / 3600 88.2	+ 36 a water us  Sep  76.49 kWh/mon 89.25	Oct  79.61  Total = Su  104.01	82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54	.05  Dec  85.85  c, 1d)  123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan 85.85 content of 127.31 aneous w	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73  thot water 111.35  vater heatin	N + 1.76 x ater usag hot water person per Mar r day for ea 79.61  used - cale	[1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me	es per da 5% if the de tater use, l'  May  Vd,m = fact  73.36  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 70.24	erage = designed to designed t	(25 x N) o achieve Aug (43) 73.36 0Tm / 3600 88.2	+ 36 a water us  Sep  76.49 kWh/mon 89.25	Oct  79.61  Total = Su  104.01	82.73 m(44) <sub>112</sub> = ables 1b, 1 113.54	.05  Dec  85.85  c, 1d)  123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in 85.85 content of 127.31 aneous w	upancy, I 9, N = 1 9, N = 1 le hot wa al average litres per l Feb n litres per 82.73  thot water 111.35  vater heatif 16.7  loss:	N + 1.76 x ater usag hot water person per Mar r day for ear 79.61 used - calc 114.9 ng at point 17.24	[1 - exp ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17	es per da 5% if the divater use, I May Vd,m = factor 13.36	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 0 to (61) 13.39	Oct  79.61  Total = Su  104.01  Total = Su  15.6	9)  78  Nov  82.73  m(44) 112 = ables 1b, 1  113.54  m(45) 112 = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce a not more  Hot water  (44)m=  Energy of (45)m=  If instant  (46)m= Water s Storage	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l Feb n litres per 82.73 f hot water 111.35 vater heatil 16.7 loss:	N + 1.76 x ater usage hot water person per Mar day for ear 79.61  used - calc 114.9  ng at point 17.24	ge in litre usage by day (all w Apr ach month 76.49  culated mo 100.17  for use (no	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  07m / 3600 88.2  boxes (46) 13.23  within sa	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 0 to (61) 13.39	Oct  79.61  Total = Su  104.01  Total = Su  15.6	9)  78  Nov  82.73  m(44) 112 = ables 1b, 1  113.54  m(45) 112 = 17.03	85.85 = c, 1d) 123.3	936.55	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s  Storage If comm	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 le hot wa al average litres per l 82.73  Thot water 111.35  vater heatin 16.7  loss: le (litres)	N + 1.76 x ater usag hot water person per Mar r day for ear 79.61 used - calc 114.9 ng at point 17.24	ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17  of use (no	es per da 5% if the divater use, $P$ May $Vd,m = fac$ $73.36$ $96.12$ $96.12$ older or Welling, e	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF if TF Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m= Water s  Storage If commotherw	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l 82.73  f hot water 111.35  vater heatin 16.7  loss: he (litres) heating a b stored	N + 1.76 x ater usage hot water person per Mar r day for ear 79.61  used - calc 114.9  ng at point 17.24  including and no talc and no talc at 1.76 x	ge in litre usage by day (all w Apr ach month 76.49  culated me 100.17  of use (no	es per da 5% if the divater use, $P$ May $Vd,m = fac$ $73.36$ $96.12$ $96.12$ older or Welling, e	ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce anot more  Hot wate  (44)m=  Energy of  (45)m=  If instant  (46)m=  Water s  Storage  If commother w  Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 85.85 content of 127.31 aneous w 19.1 storage e volume nunity has storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average litres per l 82.73  f hot water 111.35  vater heatil 16.7  loss: line (litres) lineating all o stored loss:	N + 1.76 x ater usage hot water person per Mar r day for ear 79.61  used - calc 114.9  ng at point 17.24  including and no talc and no talc at 1.76 x	ge in litre usage by day (all w Apr ach month 76.49  culated mo 100.17  for use (no 15.03  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	ay Vd,av Iwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS nter 110	erage = designed to do do do do do do do do do do do do do	(25 x N) o achieve  Aug (43) 73.36  0Tm / 3600 88.2  boxes (46) 13.23  within sa (47)	+ 36 a water us  Sep  76.49 b kWh/mon 89.25 to (61) 13.39 ame vess	Oct  79.61  Total = Su  104.01  Total = Su  15.6  sel	9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	85 .05 Dec 85.85 c, 1d) 123.3	936.55	(43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) = 110	(50)
b) If manufacturer's declared cylinder loss factor is not known		<b>4</b> - 13
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3	0.02	(51)
Volume factor from Table 2a	1.03	(52)
Temperature factor from Table 2b	0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) = 1.03	(54)
Enter (50) or (54) in (55)	1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	
(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 contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.01 30.98 32.01	(57)
		(58)
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 3		(30)
(modified by factor from Table H5 if there is solar water hea	• •	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26 22.51 23.26	(59)
		, ,
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	<del>``</del>	(04)
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0	(61)
Total heat required for water heating calculated for each mont		, ,
(62)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29 167.03 178.57	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant	ity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)	
(63)m= 0 0 0 0 0 0	0 0 0 0 0	(63)
Output from water heater		
(64)m= 182.59 161.28 170.18 153.67 151.4 136.44 132.14	143.48 142.75 159.29 167.03 178.57	
	Output from water heater (annual) <sub>112</sub>	378.81 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)	m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 86.55 76.97 82.43 76.1 76.18 70.37 69.78	73.55 72.47 78.81 80.55 85.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):		
Metabolic gains (Table 5), Watts		
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
(66)m= 92.31 92.31 92.31 92.31 92.31 92.31 92.31	92.31 92.31 92.31 92.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	
Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	also see Table 5 7.71 10.35 13.15 15.34 16.36	(67)
	7.71 10.35 13.15 15.34 16.36	(67)
(67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5	(67) (68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86	
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86	
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15)         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86 a), also see Table 5	(68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15	7.71 10.35 13.15 15.34 16.36 13a), also see Table 5 118.75 122.95 131.92 143.23 153.86 a), also see Table 5	(68)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15 or L15 or L15         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23       32.23         Pumps and fans gains (Table 5a)         (70)m=       0       0       0       0       0       0	7.71 10.35 13.15 15.34 16.36  13a), also see Table 5  118.75 122.95 131.92 143.23 153.86  a), also see Table 5  32.23 32.23 32.23 32.23 32.23	(68) (69)
(67)m=       15.91       14.14       11.5       8.7       6.51       5.49       5.93         Appliances gains (calculated in Appendix L, equation L13 or L         (68)m=       160.96       162.63       158.42       149.46       138.15       127.52       120.42         Cooking gains (calculated in Appendix L, equation L15 or L15 or L15 or L15         (69)m=       32.23       32.23       32.23       32.23       32.23       32.23         Pumps and fans gains (Table 5a)	7.71	(68) (69)

Water h	heatin	g gains (T	able 5)								_		ī	
(72)m=	116.34	114.53	110.79	105.7	102.39	97.7	4 93.79	98.	85 100.65	105.9	2 111.87	114.54		(72)
Total in	nterna	al gains =					(66)m + (67)	m + (68	3)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m=	343.9	341.99	331.4	314.55	297.74	281.	44 270.83	276	.01 284.65	301.6	8 321.13	335.45		(73)
6. Sola														
Ū			ŭ					ations	to convert to th	ne applic		ion.		
Orienta	ation:	Access F Table 6d	actor	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northea	ıst <sub>0.9x</sub>	0.77	x	0.8	36	х	11.28	X	0.4	x	0.7		1.88	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.3	32	х	11.28	×	0.4	×	0.7		0.7	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	х	22.97	X	0.4	x	0.7	=	3.83	(75)
Northea	st 0.9x	0.77	x	0.3	32	х	22.97	X	0.4	x	0.7	<u> </u>	1.43	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.0	36	х	41.38	×	0.4	х	0.7	=	6.91	(75)
Northea	st 0.9x	0.77	x	0.3	32	x $\Box$	41.38	x	0.4	×	0.7		2.57	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.8	36	х	67.96	X	0.4	x	0.7	_	11.34	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	67.96	X	0.4	x	0.7	=	4.22	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	х	91.35	X	0.4	x	0.7	=	15.24	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	91.35	X	0.4	X	0.7	=	5.67	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	x	97.38	X	0.4	x	0.7	=	16.25	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	х	97.38	X	0.4	x	0.7	=	6.05	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	x	91.1	X	0.4	х	0.7	=	15.2	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	91.1	X	0.4	x	0.7	=	5.66	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	72.63	X	0.4	x	0.7	=	12.12	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	72.63	X	0.4	X	0.7	=	4.51	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	50.42	X	0.4	x	0.7	=	8.41	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	50.42	X	0.4	x	0.7		3.13	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	28.07	X	0.4	X	0.7	=	4.68	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	28.07	X	0.4	X	0.7		1.74	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	3.0	36	x	14.2	X	0.4	X	0.7	=	2.37	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	14.2	X	0.4	X	0.7	=	0.88	(75)
Northea	ıst <u>0.9</u> x	0.77	X	3.0	36	X	9.21	X	0.4	X	0.7		1.54	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.3	32	x	9.21	X	0.4	X	0.7	=	0.57	(75)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	36.79		0.4	X	0.7	=	14.35	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	36.79		0.4	X	0.7	=	14.35	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	1.4	16	x	36.79		0.4	x	0.7	=	10.42	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	62.67		0.4	x	0.7	=	24.44	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	х	62.67		0.4	x	0.7	=	24.44	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	1.4	16	x	62.67		0.4	x	0.7	=	17.76	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	2.0	)1	x	85.75		0.4	x	0.7	=	33.45	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	2.0	)1	x	85.75		0.4	x	0.7	=	33.45	(79)

Southwest <sub>0.9x</sub>		<b>—</b>			1			1			ı ا				2.22	7(70)
Southwest <sub>0.9x</sub>	0.77	×	1.4		X		35.75	] 1		0.4	_ ×	0.7		=	24.29	(79)
<u>L</u>	0.77	×	2.0		X		06.25	] 1		0.4	X	0.7		=	41.44	(79)
Southwesto.s	0.77	×	2.0		X		06.25	]		0.4	_ × ¦	0.7		=	41.44	(79)
Southwesto.gx	0.77	×	1.4		X		06.25	]		0.4	X	0.7	_	=	30.1	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	1	19.01	]		0.4	_ ×	0.7		=	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	1	19.01	]		0.4	x	0.7	_	=	46.42	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	19.01	]		0.4	X	0.7		=	33.72	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	18.15	_		0.4	X	0.7		=	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	18.15	_		0.4	X	0.7		=	46.08	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	18.15	]		0.4	X	0.7		=	33.47	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91	<u> </u>		0.4	X	0.7		=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	1	13.91	]		0.4	X	0.7		=	44.43	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	X	1	13.91			0.4	x	0.7		=	32.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39			0.4	X	0.7		=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	1	04.39	]		0.4	X	0.7		=	40.71	(79)
Southwest <sub>0.9x</sub>	0.77	Х	1.4	6	X	1	04.39			0.4	x	0.7		=	29.57	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	9	2.85			0.4	х	0.7		=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	9	2.85	]		0.4	x	0.7		=	36.21	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	6	x	9	2.85	]		0.4	x	0.7		=	26.3	(79)
Southwest <sub>0.9x</sub>	0.77	Х	2.0	1	X	6	9.27			0.4	x	0.7		=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	х	2.0	1	X	6	9.27	]		0.4	x	0.7		=	27.02	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	6	9.27	]		0.4	x	0.7		=	19.62	(79)
Southwest <sub>0.9x</sub>	0.77	X	2.0	1	X	4	4.07	ĺ		0.4	x	0.7		=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	4	4.07	ĺ		0.4	x	0.7		=	17.19	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	4	4.07	ĺ		0.4	x	0.7		=	12.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	x	3	31.49	ĺ		0.4	x	0.7	司	=	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	1	X	3	1.49	ĺ		0.4	x	0.7		=	12.28	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	6	X	3	1.49	i		0.4	T x	0.7	一	=	8.92	(79)
L																
Solar gains in	watts, cal	culated	for each	n month	1			(83)m	n = Sur	m(74)m .	(82)m				_	
(83)m= 41.71	71.9	100.66	128.54	147.46	14	47.93	141.98	127	.63	110.28	80.08	50.11	35.5	59		(83)
Total gains – i	nternal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts			-		-			_	
(84)m= 385.61	413.89	432.05	443.09	445.2	42	29.38	412.81	403	.64	394.93	381.76	371.25	371.	.04		(84)
7. Mean inter	nal tempe	erature (	(heating	seasor	า)											
Temperature	during he	eating p	eriods in	the liv	ing	area	from Tal	ole 9	, Th1	(°C)					21	(85)
Utilisation fac	tor for ga	ins for li	iving are	a, h1,n	า (ร	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	De	ec		
(86)m= 0.95	0.94	0.92	0.88	0.81	(	0.69	0.56	0.5	59	0.75	0.88	0.94	0.9	6		(86)
Mean interna	l tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ns 3 to 7	7 in T	able	9c)		•			-	
(87)m= 18.76	18.96	19.32	19.82	20.3	_	0.69	20.88	20.	- 1	20.58	19.99	19.31	18.7	73	]	(87)
Temperature	during be	ating n	eriode in	rest of	: 4/v	مااام	from To	عامه	 G Th	I 2 (°C\		_!			1	
(88)m= 20.43	20.43	20.43	20.44	20.44	_	0.45	20.45	20.	- 1	20.44	20.44	20.44	20.4	43	1	(88)
25			****				L							_	J	` ,

	factor for g	ains for	rest of d	welling, h	n2,m (se	e Table	9a)						
(89)m= 0.95	5 0.94	0.91	0.87	0.79	0.66	0.51	0.54	0.72	0.87	0.93	0.95		(89)
Mean inter	nal temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m= 18.3		18.86	19.35	19.82	20.2	20.36	20.35	20.1	19.53	18.85	18.27		(90)
	•							f	LA = Livin	g area ÷ (4	l) =	0.51	(91)
Mean inter	nal temper	ature (fo	r the wh	ole dwel	llina) = fl	IA×T1	+ (1 – fl	A) x T2			'		_
(92)m= 18.5	<del></del> -	19.09	19.59	20.06	20.45	20.62	20.6	20.34	19.76	19.08	18.5		(92)
Apply adju	stment to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 18.5	3 18.73	19.09	19.59	20.06	20.45	20.62	20.6	20.34	19.76	19.08	18.5		(93)
8. Space h	eating req	uirement											
Set Ti to th					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisati						<del> </del>	_	_			_		
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	<del> </del>	· ·	1	0.70	0.00	0.50	0.55	0.70	0.05	0.04	0.04		(04)
(94)m= 0.94		0.9	0.85	0.78	0.66	0.53	0.55	0.72	0.85	0.91	0.94		(94)
Useful gair (95)m= 360.9		387.29	377.77	346.87	282.86	216.84	222.35	283.22	324.83	339.35	348.87		(95)
Monthly av						210.04	222.33	200.22	324.03	339.33	340.07		(00)
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss r						oxdot							, ,
(97)m= 903.7		795.23	665.53	519.14	358	246.18	256.61	384.39	568.84	748.09	898.1		(97)
Space hea	ting require	ement fo	r each m	ı nonth, k\	Wh/mon	th = $0.02$	4 x [(97	)m – (95	)m] x (4′	1)m			
(98)m= 404.	<del>- ř · · ·</del>	303.51	207.19	128.17	0	0	0	0	181.54	294.29	408.63		
	•						Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2260.05	(98)
Space hea	ting require	ement in	kWh/m²	/year								40.87	(99)
9a. Energy	requiremen	nts – Indi	ividual h	eating sy	/stems i	ام ما المام ما							_
Space hea		nto mai	viadaiiii	Jannig o		'ATOILUIOILAIOL	micro-C	HP)					
•					,	nciuaing	micro-C	HP)					
Fraction of	space hea	at from s	econdary	//supple			micro-C	HP)				0	(201
Fraction of Fraction of	•		-			system	micro-C (202) = 1 -	, in the second				0	╡ ゚
	space hea	at from m	nain syst	em(s)		system	(202) = 1 -	, in the second	(203)] =				(202)
Fraction of	space heati	at from m	nain syst main sys	em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202)
Fraction of Fraction of Efficiency	space heat total heati of main spa	at from ming from take	nain systomain systomain systom	em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1 1 100	(202)
Fraction of Fraction of Efficiency of	space heat total heati of main spa	at from mag from lace heat	main systemain systemain systementary	em(s) stem 1 em 1 y heating	mentary	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -		Nov	Doo	1 1 100 0	(202) (204) (206) (208)
Fraction of Fraction of Efficiency of Efficiency	space heating total heating from the space of secondary to the space o	at from m ng from ace heat ry/supple Mar	nain systemain systemain systementary	em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 -	- (201) =	(203)] =	Nov	Dec	1 1 100	(202) (204) (206) (208)
Fraction of Fraction of Efficiency of Efficiency of Jan Space hea	space heat total heati of main space of seconda n Feb tting require	at from m ng from ace heat ry/supple Mar ement (c	main systemain systemain systementary Apr	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct			1 1 100 0	(202) (204) (206) (208)
Fraction of Fraction of Efficiency of Efficiency of Jan Space hea	space heating from the space of secondary required the space of secondary required the space of secondary required the space of secondary required the space of secondary required the space of space of secondary required the space of spac	at from mager from mager heat ry/supplement (compared to 303.51	main systemain systemain systementary Apr calculated	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -		Nov 294.29	Dec 408.63	1 1 100 0	(202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jai Space head 404.	total heati of main spa of seconda n Feb ting require 11 332.6 98)m x (20	at from many from mace heat ry/supplement (company) and a supplement (compa	main systemain systemain systematary  Apr  calculated 207.19  00 ÷ (20	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0	(201) (202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jan Space hea	total heati of main spa of seconda n Feb ting require 11 332.6 98)m x (20	at from mager from mager heat ry/supplement (compared to 303.51	main systemain systemain systementary Apr calculated	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	r system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar
Fraction of Fraction of Fraction of Efficiency of  Efficiency of  Jan Space head  404.*  (211)m = {[(	total heating from the secondary of secondary from the secondary from	mat from many from mace heat ry/supplement (compared and sold and	main systemain systemain systementary Apr alculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0	(202) (204) (206) (208) ar
Fraction of Fraction of Fraction of Efficiency of Efficiency of Jan Space head 404.*  (211)m = {[(	space heat total heating frequire ting require 11 332.6 98)m x (20 11 332.6 string fuel (s	mat from many from mace heat ry/supplement (company 303.51 square) ] } x 1 square and a square from many f	main systemain systemain systemantary Apr calculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar
Fraction of Fraction of Efficiency of Efficiency of Jan Space head 404.  (211)m = {[(	space heat total heating frequire ting require 11 332.6 98)m x (20 11 332.6 string fuel (s	mat from many from mace heat ry/supplement (company 303.51 square) ] } x 1 square and a square from many f	main systemain systemain systemantary Apr calculated 207.19 00 ÷ (20 207.19	em(s) stem 1 em 1 y heating May d above) 128.17	mentary g system Jun 0	y system  n, %  Jul  0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (	Oct 181.54	294.29	408.63	1 1 100 0 kWh/ye	(202) (204) (206) (208) ar

Motor booting					
Water heating Water heating from separate community system:					
Annual water heating requirement				1878.81	(64)
Fraction of heat from community CHP				1	(303a)
Factor for charging method for community water	heating			1	(305)
Distribution loss factor (Table 12c) for community	heating system			1.1	(306)
Water heat from CHP		(64) x (303a) x (305) x	(306) =	2066.69	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (31	0a)(310e)] =	20.67	(313)
Annual totals Space heating fuel used, main system 1		kWh	/year	kWh/year 2260.05	
Electricity for pumps, fans and electric keep-hot					_
mechanical ventilation - balanced, extract or posi-	itive input from ou	tside	218.89	]	(230a)
Total electricity for the above, kWh/year		sum of (230a)(230g) =		218.89	(231)
Electricity for lighting				281.06	(232)
Electricity generated by PVs				-1391.63	(233)
12a. CO2 emissions – Individual heating systems	s including micro-	CHP			
	<b>Energy</b> kWh/year	<b>Emission</b> kg CO2/k		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.519	=	1172.96	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating from community system					
		0,	sion factor		
		kWh/year kg C	O2/kWh	kg CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		fuels repeat (363) to (366) for	r the second fue	329	(367a)
CO2 associated with heat source 1	[(307b)+(310	b)] x 100 ÷ (367b) x	0.52	326.02	(367)
Electrical energy for heat distribution	[(313	s) x	0.52	10.73	(372)
Total CO2 associated with community systems	(363	)(366) + (368)(372)	=	336.75	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	113.61	(267)
Electricity for lighting	(232) x	0.519	=	145.87	(268)
Energy saving/generation technologies Item 1		0.519	=	-722.25	(269)
Total CO2, kg/year		sum of (265)(271)	=	1046.93	(272)
Dwelling CO2 Emission Rate		(272) - (4)		18.93	
		$(272) \div (4) =$		10.93	
El rating (section 14)		(272) ÷ (4) =		86	(274)

			Hserl	Details:						
Assessor Name:	Adam Ritchi	io	03011		a Num	hor.		STD()	019516	
Software Name:	Stroma FSA	_			a Num are Vei				on: 1.0.4.25	
			Property	Address			SHP + F			
Address :										
1. Overall dwelling dime	ensions:									
0 10			Are	ea(m²)	1		ight(m)	1	Volume(m³)	_
Ground floor				55.3	(1a) x	3	.09	(2a) =	170.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1	d)+(1e)+(	1n)	55.3	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3d	l)+(3e)+	.(3n) =	170.88	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ſ
Number of chimneys	0	+ 0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	_ + [	0	- -	0	x	20 =	0	(6b)
Number of intermittent fa	ns	J [				2	x -	10 =	20	(7a)
Number of passive vents	<b>,</b>				F	0	x	10 =	0	
Number of flueless gas fi					L	0	x 4	40 =	0	(7c)
rtamber er naerese gae n					L	0			0	
								Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and far	ns = (6a) + (6b)	·(7a)+(7b)+	·(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b	een carried out or is	s intended, proc	eed to (17),	otherwise of	continue fr	rom (9) to (	(16)			<b>-</b> -
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration	05 famataal and		0 05 (-				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0  if both types of wall are p.					•	uction			0	(11)
deducting areas of opening	•	, ,	10 ti 10 gi 00		a (a					_
If suspended wooden t	,	,	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•								0	(13)
Percentage of windows	s and doors dra	ught stripped		0.25 - [0.2	) v (1.4\ · 1	1001 -			0	(14)
Window infiltration Infiltration rate				•	. ,	100] = 12) + (13) -	+ (15) =		0	(15)
Air permeability value,	a50 expressed	l in cubic met	res ner h					area	5	(16)
If based on air permeabil			•	•	•	0110 01 0	птоюро	uiou	0.37	(18)
Air permeability value applie	-					is being u	sed		0.0.	
Number of sides sheltered	ed								0	(19)
Shelter factor					[0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	_			(21) = (18	) x (20) =				0.37	(21)
Infiltration rate modified f	<del> </del>	<del>.</del>	1	T .			NI.		1	
Jan Feb	Mar   Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 20	0.7		1 4 2	A F	4.7	1	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
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 infiltrat	tion rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
Calculate effect		•	rate for t	he appli	cable ca	se	!						
If mechanical If exhaust air hea			andiv N. (2	2h) _ (22c	) v Emy (c	auation (	VEVV othor	wico (22h	) - (222)		[	0	(23a)
If balanced with I									) = (23a)			0	
		-	-	_					26\m , /'	22h) [4	1 (220)	. 1001	(23c)
a) If balanced	o mechar	o lical ve	nulation	with nea	at recove		7R) (24a	$\frac{1)m = (22)}{0}$	20)m + (2 0	23b) <b>x</b> [	0	÷ 100j	(24a)
b) If balanced							ļ		<b>!</b>		U		(214)
(24b)m= 0	0 0	0	0	0 Without	0	overy (r	0	0	0	0	0		(24b)
c) If whole ho													(= .0)
if (22b)m				-	-				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	entilation	or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	!				
if (22b)m	= 1, ther	n (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air c	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				ı	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losses	and hea	t loss p	paramete	er:									
ELEMENT	Gross area (r		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-ł		A X k kJ/K
Doors Type 1													
Doors Type I					2.13	X	1	= [	2.13				(26)
Doors Type 1 Doors Type 2					2.13 0.96	x x	1	= [	2.13 0.96				(26) (26)
						=		=					` ,
Doors Type 2					0.96	×	1	= [	0.96				(26)
Doors Type 2 Doors Type 3					0.96	x x	1	= [	0.96				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	1				0.96 0.96 0.7	x x x	1 1	= [ = [ = [	0.96 0.96 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5					0.96 0.96 0.7 0.2	x x x x x x x x x x x x x x x x x x x	1 1 1	= [ = [ = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 2	2				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x 1 x x 1	1 1 1 1 /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type 2 Windows Type 3	2 3				0.96 0.96 0.7 0.2 0.86 2.01	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type 6 Windows Type 6	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 1.46	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 3 4				0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type 1	2 3 4 5		2.65		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (28)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type	2 3 4 5 15.17 1.85		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 1.94 0.42 7.189 2.25 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 8	2 3 4 5 15.17 1.85 6.73		0		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 7 Windows Type 8 Windows Type 8 Windows Type 9	2 3 4 5 15.17 1.85 6.73 1.82		0 0		0.96 0.96 0.7 0.2 0.86 2.01 2.01 1.46 0.32 55.3 12.52 1.85 6.73	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type Windo	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99 3.71				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 7 Windows Type 8 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Windows Type 9 Walls Type 9 Walls Type 9 Walls Type 9	2 3 4 5 15.17 1.85 6.73 1.82 6.36 28.74		0 0 0.86		0.96 0.96 0.7 0.2 0.86 2.01 1.46 0.32 55.3 12.52 1.85 6.73 1.82 5.5	x x x x x x x x x x x x x x x x x x x	1 1 1 1/(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.18 0.18	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.96 0.96 0.7 0.2 1.14 2.66 2.66 1.94 0.42 7.189 2.25 0.33 1.21 0.33 0.99				(26) (26) (26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (29)

* for win	dows and	root windi	ows, asc c				ateu using	i Torritala 17	I ( 170 valu	C)+0.0+j C	is given in	paragrapi	7 3.2	
		as on both	sides of in	nternal wal	ls and pan	แนงกร								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				33.3	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6083	(34)
Therm	al mass	parame	ter (TMF	= Cm +	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	•				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
		ad of a de					,							<b>–</b>
	ŭ	`	,		using Ap	•	<b>\</b>						6.77	(36)
	abric he		are not kn	iown (36) =	= 0.05 x (3	1)			(33) +	(36) =			40.08	(37)
		at loss ca	alculated	d monthly	V						(25)m x (5)		40.00	(•••)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(38)m=	34.37	34.13	33.89	32.79	32.58	31.62	31.62	31.44	31.99	32.58	33	33.44		(38)
∐oot tr	anefor o	coefficier	1 o+ \///k/	l	l .		l	<u> </u>	(30)m	= (37) + (37)	38)m		J	
(39)m=	74.45	74.21	73.97	72.87	72.66	71.7	71.7	71.52	72.07	72.66	73.08	73.52	1	
(00)111=	74.40	'2	70.07	72.07	72.00	/ 1.7	' '.'	71.02			Sum(39) <sub>1</sub> .	<u> </u>	72.87	(39)
Heat Ic	oss para	meter (H	HLP), W	/m²K						$= (39)m \div$			. 2.0.	` ′
(40)m=	1.35	1.34	1.34	1.32	1.31	1.3	1.3	1.29	1.3	1.31	1.32	1.33		
					•		•	•	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.32	(40)
Numbe		/s in moi	<u> </u>	<del>-                                    </del>		ı					1	<u> </u>	1	
	Jan	Feb	Mar	Apr	l May	Jun	Jul	Aug	Sep	Oct	I Nov	I Daa		
		-	-	<del></del>	May		-	Ť			Nov	Dec	ł	
	31	28	31	30	31	30	31	31	30	31	30	31 kWh/ye	ear:	(41)
(41)m= 4. Wa	31	28	31	30	31		-	Ť			-	31	ear:	(41)
4. Wa	31 ater heat	28 ting ener	31 rgy requi	30	31	30	31	31	30	31	30	31	ear:	
4. Wa	ater heat ned occu (A > 13.9	ting energy, Iupancy,	31 rgy requi	30	31	30	31	Ť	30	31	30	31 kWh/ye	ear:	
4. Wa Assum if TF if TF	31 ned occu (A > 13.9 (A £ 13.9	28 ting energy, I upancy, I 9, N = 1	31 rgy requi N + 1.76 x	30 irement:	31	30 349 x (TF	31 -A -13.9	31	30 0013 x (7	31	30	31 kWh/ye	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average	ngy requivalents of the second	irement:  [1 - exp ge in litre usage by	31 o(-0.0003 es per da 5% if the d	30 349 x (TF ay Vd,av lwelling is	31 FA -13.9 erage = designed to	31	30 0013 x (7 + 36	31 ГFA -13.	30 1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce	ater heat ned occu A > 13.9 A £ 13.9 I averag the annual that 125	ting energy, I pancy, I pancy, I pancy, I pancy, I pancy pan	31  N + 1.76 x  ater usage hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31 o(-0.0003 es per da 5% if the o	30 349 x (TF ay Vd,av lwelling is not and co	31  FA -13.9 erage = designed to	31 (25 x N) (25 achieve	30 0013 x (7 + 36 a water us	31 ΓFA -13. se target o	30 1. 9) 78	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua that 125	ting energy, I pancy, I pancy, I pancy, I pe hot was al average litres per l	31  N + 1.76 x ater usag hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31  o(-0.0003  es per da 5% if the of vater use, I	30 349 x (TF ay Vd,av lwelling is that and co	31  FA -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (7 + 36	31 ГFA -13.	30 1. 9)	31 kWh/yo 85	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125 Jan er usage in	ting energy, I pancy, I pancy, I pe hot was al average litres per I pe hot litres per li	31  N + 1.76 x ater usag hot water person per Mar r day for ea	irement:  [1 - exp ge in litre usage by r day (all w  Apr ach month	31  o(-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fa	30 349 x (TF ay Vd,av Iwelling is that and co Jun ctor from T	31  FA -13.9 erage = designed to ld)  Jul Table 1c x	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us	31  FFA -13.  See target of	30 1. 9) 78	31 kWh/yo 85 .05	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more	ater heat ned occu A > 13.9 A £ 13.9 I averag the annua that 125	ting energy, I pancy, I pancy, I pe hot was al average litres per per per per per per per per per per	31  N + 1.76 x ater usag hot water person per	irement:  [1 - exp ge in litre usage by r day (all w	31  o(-0.0003  es per da 5% if the of vater use, I	30 349 x (TF ay Vd,av lwelling is that and co	31  FA -13.9 erage = designed to ld)  Jul	31 (25 x N) to achieve	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61	30 1.9) 78 Nov	31 kWh/yo 85 .05 Dec		(42)
4. Wa Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ater heat ned occu (A > 13.9 (A £ 13.9 I averag the annual e that 125 Jan er usage in	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usage hot water person per Mar r day for ear 79.61	30 irement: [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  o(-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fa  73.36	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43)	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61  Fotal = Su	30 1.99) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec	ear:	(42)
4. Wa Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ater heat ned occu (A > 13.9 (A £ 13.9 I averag the annual e that 125 Jan er usage in	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usage hot water person per Mar r day for ear 79.61	30 irement: [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  o(-0.0003  es per da 5% if the of vater use, I  May  Vd,m = fa  73.36	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24	FA -13.9 erage = designed to ld)  Jul Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep	31  FFA -13.  See target of Oct  79.61  Fotal = Su	30 1.99) 78 Nov 82.73 m(44) <sub>112</sub> =	85 .05 Dec		(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m=	ater heat ned occur (A > 13.9 (A £ 13.9 I average the annual e that 125  Jan er usage in 85.85	ting energy, I pancy, I p, N = 1 p, N = 1 pe hot wa al average litres per p Feb n litres per 82.73	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	30 irement:  [1 - exp ge in litre usage by r day (all w Apr ach month 76.49	31  (-0.0003 es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.	30 349 x (TF ay Vd,av (welling is not and co Jun ctor from 7 70.24	Table 1c x  70.24	31 (25 x N) to achieve Aug (43) 73.36	30  0013 x (7  + 36     a water us  Sep  76.49  0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Su  th (see Ta  104.01	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3		(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy (45)m=	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125  Jan 85.85  content of	ting energy, lapancy,	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me	31  o(-0.0003  es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36	30 0013 x (7 + 36 a water us Sep 76.49 0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Su  th (see Ta  104.01	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3	936.55	(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy (45)m= If instant (46)m=	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua that 125  Jan 85.85  content of 127.31  taneous w 19.1	ting energy, lapancy,	31  N + 1.76 x ater usag hot water person per Mar 79.61  used - cal	irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me 100.17	31  o(-0.0003  es per da 5% if the d vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94	31  FA -13.9  erage = designed to ld)  Jul  Table 1c x  70.24  m x nm x E  76.86	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2	30 0013 x (7 + 36 a water us Sep 76.49 0 kWh/mon 89.25	31  FFA -13.  See target of Oct  79.61  Fotal = Su  th (see Ta  104.01	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54	31  kWh/yo 85 .05  Dec  85.85  c, 1d) 123.3	936.55	(42)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy (45)m= If instant (46)m= Water	ater heat ned occur (A > 13.9 (A £ 1	ing energy, I pancy, I pancy, I pancy, I pancy, I pe hot was all average litres per per per per per per per per per per	31  N + 1.76 x ater usage hot water person per day for ear 114.9  ng at point 17.24	30  irement:  [1 - exp ge in litre usage by a day (all w Apr ach month 76.49  culated me 100.17  of use (no	31  31  (-0.0003  es per da 5% if the covater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44	31  FA -13.9  erage = designed is lid)  Jul  Table 1c x  70.24  76.86  enter 0 in  11.53	31 (25 x N) to achieve Aug (43) 73.36 07m / 3600 88.2 boxes (46) 13.23	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  1 to (61)  13.39	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	30  1. 9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m= Water Storag	ater heat  alter h	ting energy, lapancy,	31  rgy requivalent requirements of the second reports of the second reports of the second requirement	30  irement:  [1 - exp ge in litre usage by a r day (all w Apr ach month 76.49  culated mo 100.17  for use (no	31 31 31 31 31 31 31 31 31 31 31 31 31 3	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 x storage), 12.44 /WHRS	31  FA -13.9  erage = designed to lid)  Jul  Table 1c x  70.24  m x nm x E  76.86  enter 0 in  11.53  storage	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  1 to (61)  13.39	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6	30  1. 9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31 kWh/yo 85 .05 Dec 85.85 = c, 1d) 123.3	936.55	(42) (43) (44) (45) (46)
4. Wa Assum if TF if TF Annua Reduce not more (44)m= Energy ( (45)m= Water Storag If comr	ater heat ned occur A > 13.9 A £ 13.9 I averag the annua e that 125 Jan ar usage ii  85.85  content of 127.31  taneous w 19.1 storage e volum munity h	ting energy, I pancy, I pancy, I pancy, I possible for water litres per partition in the second second partition in the second	31  rgy requiver 179,61  114.9  includinating at point and no tales.	30  irement:  [1 - exp ge in litre usage by a day (all we have ach month 76.49  culated month 100.17  for use (not have any so any so any so any so any so any so any so any so any in dwelling any so any in dwelling any so any	31  31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44 /WHRS nter 110	an x nm x E  76.86  enter 0 in  11.53  storage  litres in	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m=  Water Storag If comr Otherw	31  ater heat ned occur in A > 13.9 if A £ 13.9 If average the annual in the that 125  Jan ar usage in ataneous w 19.1 storage e volum munity he vise if no	ting energy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy, I pancy I	31  rgy requiver 179,61  114.9  includinating and no tales.	30  irement:  [1 - exp ge in litre usage by a day (all we have ach month 76.49  culated month 100.17  for use (not have any so any so any so any so any so any so any so any so any in dwelling any so any in dwelling any so any	31  31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94 r storage), 12.44 /WHRS nter 110	an x nm x E  76.86  enter 0 in  11.53  storage  litres in	31 (25 x N) (26 x N) (27 x N) (27 x N) (28 x N) (28 x N) (29 x N) (29 x N) (20 x N)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m= Water Storag If comr Otherw Water	ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater heat  ater annual  ater annual  ater that 125  Jan  ater usage in  ater usage	ting energy, I pancy, I pancy, I pancy, I possible for water sper part of the second s	31  rgy requivalent requirements of the second reports of the second reports of the second requirement	irement:  [1 - exp  ge in litre usage by a r day (all w  Apr ach month  76.49  culated mo  100.17  for use (no  15.03  and any so ank in dw er (this in	31  31  (-0.0003 es per da 5% if the de vater use, I  May  Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.9)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  c, 1d)  123.3	936.55	(42) (43) (44) (45) (46) (47)
4. Wa Assum if TF if TF Annua Reduce not more  Hot wate (44)m=  Energy (45)m=  If instant (46)m=  Water Storag If comr Otherw Water a) If m	ater heat ned occur in A > 13.9 I average the annual the that 125  Jan 85.85  content of 127.31  taneous w 19.1 storage to volum munity h vise if no storage nanufact	ting energy, I pancy, I pancy, I pancy, I possible for water sper part of the second s	31  rgy requiver 1.76 x ater usage hot water overson per mar reay for ear reay for ear 114.9  rg at point 17.24  including and no tale hot water and no tale cale and lectared I	30  irement:  [1 - exp  ge in litre usage by r day (all w  Apr ach month  76.49  culated me 100.17  for use (no 15.03  ang any so ank in dw er (this in	31  (-0.0003 es per da 5% if the da vater use, I  May Vd,m = fa  73.36  onthly = 4.  96.12  o hot water  14.42  olar or W velling, e	30 349 x (TF ay Vd,av lwelling is not and co Jun ctor from 7 70.24 190 x Vd,r 82.94  r storage), 12.44  /WHRS nter 110 nstantar	and and and and and and and and and and	31  (25 x N) to achieve  Aug (43)  73.36  77.36  88.2  boxes (46,  13.23  within sa (47)	30  0013 x (7  + 36 a water us  Sep  76.49  0 kWh/mon  89.25  13.39  ame vess	31  FFA -13.  See target of Oct  79.61  Fotal = Su  104.01  Fotal = Su  15.6  Sel	30  1.99)  78  Nov  82.73  m(44) <sub>112</sub> = ables 1b, 1  113.54  m(45) <sub>112</sub> = 17.03	31  kWh/ye 85  .05  Dec  85.85  -c, 1d)  123.3  -18.49	936.55	(41) (42) (43) (44) (45) (46) (47) (48) (49)

Energy lost from water storage, kWh/year	$(48) \times (49) =$	0.75	(50)
<ul> <li>b) If manufacturer's declared cylinder loss factor is not known</li> <li>Hot water storage loss factor from Table 2 (kWh/litre/day)</li> </ul>	:		(54)
If community heating see section 4.3		0	(51)
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.75	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33	(56)
If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50) - (H11)] \div$	(50), else $(57)$ m = $(56)$ m where $($	H11) is from Append	ix H
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div (59)$ m	365 × (41)m		•
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	stat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m		
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each month	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 173.91 153.44 161.5 145.27 142.72 128.04 123.44	<del></del>	158.63 169.89	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contribut	ion to water heating)	l
(add additional lines if FGHRS and/or WWHRS applies, see A		-	
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			•
(64)m= 173.91 153.44 161.5 145.27 142.72 128.04 123.46	3 134.79 134.34 150.61	158.63 169.89	
	Output from water heate	r (annual) <sub>112</sub>	1776.58 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	]
(65)m= 79.61 70.69 75.48 69.38 69.24 63.65 62.83	66.6 65.75 71.86	73.83 78.27	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is fr	om community h	eating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts			
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 92.31 92.31 92.31 92.31 92.31 92.31 92.31	92.31 92.31 92.31	92.31 92.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	l l	
(67)m= 15.91 14.14 11.5 8.7 6.51 5.49 5.93	7.71 10.35 13.15	15.34 16.36	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	13a), also see Table 5	l l	
(68)m= 160.96 162.63 158.42 149.46 138.15 127.52 120.43	<del>-                                    </del>	143.23 153.86	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5	l l	
(69)m= 32.23 32.23 32.23 32.23 32.23 32.23 32.23	32.23 32.23 32.23	32.23 32.23	(69)
Pumps and fans gains (Table 5a)	<u> </u>	<u> </u>	ı
(70)m= 3 3 3 3 3 3 3 3	3 3 3	3 3	(70)
	3 3 3	3 3	(70)
(70)m= 3 3 3 3 3 3 3 3 Losses e.g. evaporation (negative values) (Table 5) (71)m= -73.85 -73.85 -73.85 -73.85 -73.85 -73.85		3 3	(70)

Water	heating	gains (T	able 5)														
(72)m=	107	105.2	101.45	96.36	93.06	8	88.41	84.45	89.	52 91.32	96	.59	102.54	105.2	7		(72)
Total i	nterna	l gains =				•	(66)	)m + (67)m	+ (68	3)m + (69)m -	+ (70)m	n + (	71)m + (72)	m	_		
(73)m=	337.57	335.65	325.06	308.22	291.41	2	75.11	264.49	269	.67 278.32	2 295	5.34	314.8	329.11	7		(73)
6. Sol	ar gain	s:															
Solar g	ains are	calculated (	using sola	r flux from	Table 6a	and	assoc	iated equa	tions	to convert to	the app	plica	ıble orientat	ion.			
Orienta		Access F	actor	Area			Flu			g_ -		_	FF		C	Sains	
		Table 6d		m²			I al	ble 6a		Table 6l	b 		Table 6c			(W)	
Northea	ist <sub>0.9x</sub>	0.77	X	3.0	36	X	1	1.28	X	0.63		x [	0.7	=		2.97	(75)
Northea	ist <sub>0.9x</sub>	0.77	X	0.3	32	X	1	1.28	X	0.63		x	0.7	=		1.1	(75)
Northea	ast 0.9x	0.77	X	3.0	36	X	2	22.97	X	0.63		x [	0.7	=		6.04	(75)
Northea	ast 0.9x	0.77	X	0.3	32	X	2	22.97	X	0.63		x [	0.7	=		2.25	(75)
Northea	ast 0.9x	0.77	X	3.0	36	X	4	11.38	x	0.63		x [	0.7	=		10.88	(75)
Northea	nst <sub>0.9x</sub>	0.77	X	0.3	32	X	4	11.38	x	0.63		<b>x</b> [	0.7	=		4.05	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.0	36	X	6	67.96	x	0.63		x [	0.7	=		17.86	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.3	32	X	6	67.96	X	0.63		x [	0.7	=		6.65	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	3.0	36	X	9	91.35	x	0.63		x [	0.7	=		24.01	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.3	32	X	9	1.35	x	0.63		x [	0.7	=		8.93	(75)
Northea	ast 0.9x	0.77	X	0.0	36	X	9	97.38	x	0.63		x [	0.7	=		25.6	(75)
Northea	ast <sub>0.9x</sub>	0.77	X	0.3	32	X	9	7.38	x	0.63		x [	0.7	=		9.52	(75)
Northea	st 0.9x	0.77	Х	0.8	36	X		91.1	x	0.63		x [	0.7	=		23.94	(75)
Northea	ast 0.9x	0.77	X	0.3	32	X		91.1	x	0.63		x [	0.7	=		8.91	(75)
Northea	st 0.9x	0.77	X	0.0	36	X	7	72.63	x	0.63		x [	0.7			19.09	(75)
Northea	st 0.9x	0.77	Х	0.3	32	X	7	72.63	x	0.63		x [	0.7	=		7.1	(75)
Northea	st 0.9x	0.77	X	0.0	36	X	5	50.42	x	0.63		x [	0.7	=		13.25	(75)
Northea	st 0.9x	0.77	X	0.3	32	X	5	50.42	x	0.63		x [	0.7			4.93	(75)
Northea	ıst <sub>0.9x</sub>	0.77	X	0.0	36	X	2	28.07	x	0.63		x [	0.7			7.38	(75)
Northea	st 0.9x	0.77	х	0.3	32	X	2	28.07	x	0.63		x [	0.7	=		2.74	(75)
Northea	st 0.9x	0.77	X	0.0	36	X		14.2	x	0.63		x [	0.7			3.73	(75)
Northea	st 0.9x	0.77	Х	0.3	32	X		14.2	x	0.63		x [	0.7	=		1.39	(75)
Northea	st 0.9x	0.77	X	0.0	36	X		9.21	x	0.63		x [	0.7			2.42	(75)
Northea	ıst <sub>0.9x</sub>	0.77	x	0.3	32	X	,	9.21	x	0.63		x [	0.7	_ =		0.9	(75)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	3	36.79		0.63		x [	0.7	_ =		22.6	(79)
Southw	est <sub>0.9x</sub>	0.77	X	2.0	)1	X	3	36.79		0.63		x [	0.7	_ =		22.6	(79)
Southw	est <sub>0.9x</sub>	0.77	X	1.4	16	X	3	36.79		0.63		x [	0.7	<del>-</del>		16.42	(79)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	6	62.67		0.63		x [	0.7	=		38.5	(79)
Southw	est <sub>0.9x</sub>	0.77	x	2.0	)1	X	6	62.67		0.63		x [	0.7	=		38.5	(79)
Southw	est <sub>0.9x</sub>	0.77	х	1.4	16	X	6	62.67		0.63		x [	0.7			27.96	(79)
Southw	est <sub>0.9x</sub>	0.77	х	2.0	)1	X	8	35.75		0.63		x [	0.7	=		52.68	(79)
Southw	est <sub>0.9x</sub>	0.77	х	2.0	)1	X	8	35.75		0.63		x [	0.7	=		52.68	(79)

Southwesto, 94 0.77	Southweste o					, –	05	7					25.77	(70)
Southwests 9, 0.77 × 2.01 × 106.25 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 1.46 × 119.01 0.63 × 0.7 = 73.11 (79)  Southwests 9, 0.77 × 2.01 × 119.01 0.63 × 0.7 = 73.11 (79)  Southwests 9, 0.77 × 2.01 × 119.01 0.63 × 0.7 = 53.1 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 53.1 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 72.58 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 72.58 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 65.27 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 118.15 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 113.91 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 69.97 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 104.39 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.43 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 2.01 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.63 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46 × 0.22 × 0.23 × 0.23 × 0.7 = 64.13 (79)  Southwests 9, 0.77 × 1.46	<u>L</u>		=		<del></del>	<b>-</b>		<u> </u>		=		<del> </del>		== ` '
Southwests, 9x	<u>L</u>		=			<b>-</b>		<u> </u>		=		=		== ` '
Southwesto, as	<u>L</u>		=			*  _		<u> </u>		×		=		====
Southwesto, sx	<u>L</u>	0.77	X	1.46	5	×		_	0.63	×	0.7	=	47.41	== ` '
Southwesto, sx	<u>L</u>	0.77	X	2.01		x	119.01	_	0.63	X	0.7	=	73.11	== ` '
Southwesto, 9k	<u> </u>	0.77	X	2.01		×	119.01	_	0.63	X	0.7	=	73.11	(79)
Southwesto, 9x	<u>L</u>	0.77	X	1.46	3	×	119.01	_	0.63	X	0.7	=	53.1	(79)
Southwesto 9x	<u>L</u>	0.77	X	2.01		x	118.15	_	0.63	X	0.7	=	72.58	(79)
Southwesto, 9x	<u>L</u>	0.77	X	2.01		x	118.15	<u> </u>	0.63	X	0.7	=	72.58	(79)
Southwesto, 9x	<u>L</u>	0.77	X	1.46	3	x	118.15	<u> </u>	0.63	X	0.7	=	52.72	(79)
Southwesto.9x	<u>L</u>	0.77	X	2.01		x	113.91		0.63	X	0.7	=	69.97	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	113.91	]	0.63	X	0.7	=	69.97	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.46	6	x	113.91	]	0.63	X	0.7	=	50.83	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	104.39	]	0.63	X	0.7	=	64.13	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	104.39	]	0.63	X	0.7	=	64.13	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	1.46	3	x	104.39	]	0.63	X	0.7	=	46.58	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	92.85	]	0.63	х	0.7	=	57.04	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	X	2.01		x	92.85	]	0.63	х	0.7	=	57.04	(79)
Southwesto, 9x	Southwest <sub>0.9x</sub>	0.77	x	1.46	6	x	92.85	Ī	0.63	x	0.7	=	41.43	(79)
Southwest0,9x 0.77 x 1.46 x 69.27 0.63 x 0.7 = 30.91 (79) Southwest0,9x 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 2.01 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 1.46 x 44.07 0.63 x 0.7 = 27.07 (79) Southwest0,9x 0.77 x 1.46 x 44.07 0.63 x 0.7 = 19.66 (79) Southwest0,9x 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.66 (79) Southwest0,9x 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34 (79) Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79) Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest0,9x 0.77 x 1.46 x 1.40 x	Southwest <sub>0.9x</sub>	0.77	x	2.01	1	x	69.27	Ī	0.63	x	0.7		42.55	(79)
Southwest0.9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	69.27	Ī	0.63	x	0.7	=	42.55	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	x	1.46	3	x	69.27	Ī	0.63	x	0.7		30.91	(79)
Southwesto,9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	44.07	ĺ	0.63	x	0.7		27.07	(79)
Southwesto.9x	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	44.07	Ī	0.63	x	0.7	_	27.07	(79)
Southwest <sub>0.9x</sub> 0.77 x 2.01 x 31.49 0.63 x 0.7 = 19.34 (79)  Southwest <sub>0.9x</sub> 0.77 x 1.46 x 31.49 0.63 x 0.7 = 14.05 (79)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	1.46	5	x	44.07	Ī	0.63	x	0.7		19.66	(79)
Solar gains in watts, calculated for each month  (83)m = Sum(74)m(82)m  (83)m = 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m = 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  [86)m = 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	2.01		x	31.49	ĺ	0.63	x	0.7		19.34	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	x	2.01		x $\square$	31.49	i	0.63	x	0.7	=	19.34	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Southwest <sub>0.9x</sub>	0.77	X	1.46	3	x	31.49	i	0.63	x	0.7		14.05	(79)
(83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	L							_						
(83)m= 65.69 113.25 158.54 202.45 232.26 232.99 223.62 201.02 173.69 126.13 78.93 56.06  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17  (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Solar gains in	watts, cal	culated	for each	month			(83)m	n = Sum(74)m	ı(82)m	l.			
(84)m= 403.25 448.9 483.6 510.67 523.66 508.1 488.12 470.69 452.01 421.47 393.72 385.17 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	1					1	9 223.62	201	.02 173.69	126.1	3 78.93	56.06	]	(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Total gains – ii	nternal an	nd solar	(84)m =	(73)m	+ (83)	m , watts		•		•		_	
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(84)m= 403.25	448.9	483.6	510.67	523.66	508.	1 488.12	470	.69 452.01	421.4	7 393.72	385.17		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.96 0.91 0.78 0.61 0.65 0.86 0.97 0.99 1 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	7. Mean inter	nal tempe	erature (	heating	season	)								
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec							a from Ta	ble 9	, Th1 (°C)				21	(85)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Utilisation fac	tor for gai	ins for li	ving area	a, h1,m	see	Table 9a)		, ,					
(86)m=       1       0.99       0.98       0.96       0.91       0.78       0.61       0.65       0.86       0.97       0.99       1       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m=       19.62       19.77       20.02       20.36       20.67       20.89       20.97       20.96       20.82       20.43       19.97       19.6       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)						r	<del></del>	A	ug Sep	Oc	t Nov	Dec	]	
(87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(86)m= 1	0.99	0.98	0.96	0.91	0.78	0.61	0.6	55 0.86	0.97	0.99	1	1	(86)
(87)m= 19.62 19.77 20.02 20.36 20.67 20.89 20.97 20.96 20.82 20.43 19.97 19.6 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Mean interna	l temnera	ture in l	iving are	a T1 (fo	ollow s	stens 3 to	7 in T	able 9c)	_			_	
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		· · ·			•		_i	1		20.43	3 19.97	19.6	1	(87)
	` '	<u> </u>	!							1			1	
(00)	· ·						<del></del>	_		10.94	3 10.92	10.92	1	(88)
	(00)111= 19.0	19.01	10.61	15.03	13.03	19.0	1 13.04	1 19.	19.04	1 19.0	19.02	19.02	J	(00)

Substantian factor for gains for rest of develling, 12, m (see) Table 9a)   (89)   (89)   (80)   (	1 14:11:4:	6		-: <b>f</b>			-0 (	- T-51-	0-1						
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   (90)ms   18   18.22   18.58   19.07   19.5   19.77   19.83   19.83   19.80   19.10   19.10   18.52   17.98   (90)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)   (17.4 - Living area + (4) = 0.51   (91)							`	i		0.78	0.95	0.99	1		(89)
(90)m= 18 18 2.2 18.58 19.07 19.5 19.77 19.83 19.83 19.86 19.18 18.52 17.98 (90)  **RLA = LaVing area + (4) = 0.51 (91)  **RLA = LaVing	` ′							-				0.99	'		(00)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2							<u> </u>		·		<del>'</del>	10.50	17.00		(90)
Mean intermal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (92)m   18.82   18   19.31   19.72   20.09   20.34   20.41   20.4   20.28   19.81   19.25   18.8   (92)   Apply adjustment to the mean intermal temperature from Table 4e, where appropriate   (93)m   18.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (83)   38.5pace heating requirement   Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a   Value   Valu	(90)111=	10	10.22	10.36	19.07	19.5	19.77	19.63	19.63					0.54	<b>¬</b> `´
(92)m										'	LA - LIVIII	g arca + (-	-	0.51	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (83)ms   8.82   19   19.31   19.72   20.09   20.34   20.41   20.4   20.26   19.81   19.25   18.8   (93)    8. Space heating requirement to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec    Useful gains, hm:  (94)ms 0.98   0.99   0.98   0.95   0.88   0.72   0.54   0.58   0.81   0.95   0.99   0.99   0.99   (94)    Useful gains, hm:  (95)ms 40.06   44.2.91   471.51   482.82   458.31   368.31   264.38   274.11   367.31   400.57   388.04   382.66   (95)    Monthly average external temperature from Table 8    (96)ms 4.3   4.9   6.5   8.9   11.7   14.8   16.6   16.4   14.1   10.6   7.1   4.2   (98)    Heat loss rate for mean internal temperature, Lm . W = ((39)m x ([93)m x ([9				<u> </u>			ling) = f	LA × T1	+ (1 – fL						
Same   18.82   19	` ′											19.25	18.8		(92)
Set   1 to the mean internal temperature obtained at step   11 of Table   9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table   9a	· · · · · ·														(00)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m 0.99 0.99 0.98 0.95 0.88 0.72 0.54 0.58 0.81 0.96 0.99 0.99 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 40.00.6 442.91 471.51 482.82 458.31 368.31 264.38 274.11 367.31 400.57 388.04 382.66 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, lm, W = (39)m x (93)m x (96)m x (97)m x (98)m x (9	` '					20.09	20.34	20.41	20.4	20.26	19.81	19.25	18.8		(93)
The bilisation factor for gains using Table 9a   Sep   Sep   Oct   Nov   Dec											. —				
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:  (94)m= 0.99 0.99 0.98 0.98 0.95 0.88 0.72 0.54 0.58 0.81 0.95 0.99 0.99 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 400.06 442.91 471.51 482.82 458.31 368.31 264.38 274.11 367.31 400.57 388.04 382.66 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)    (97)m= 1080.82 1046.57 947.57 788.66 609.63 411.49 273.2 288.41 444.14 669.22 888.21 1073.2 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m  (98)m= 506.48 405.66 354.19 22.0 112.58 0 0 0 0 0 199.87 360.12 513.77  Total per year (kWh/year) = Sum(98)sz = 2672.88 (98)  Space heating requirements - Individual heating systems including micro-CHP)  Space heating requirements - Individual heating systems including micro-CHP)  Space heating from main system 1 (202) = 1 - (201) = 1 (202)  Fraction of space heat from space heating system 1 (202) = 1 - (201) = 1 (202)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 1 (204) = (202) x [1 - (203)] = 1 (204)  Efficiency of secondary/supplementary heating system 3 (202) = 1 - (201) = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1 - (203)] = 2 (202) x [1							Jun	.lul	Aun	Sen	Oct	Nov	Dec		
(94)   (94)   (95)   (99)   (99)   (99)   (94)   (94)   (94)   (94)   (95)   (94)   (95)   (94)	L Utilisatio					iviay	Odii	Oui	7 tag	ОСР	001	1407	DCO		
Useful gains, hmGm , W = (94)m x (84)m (95)m = 400.06	_	ī				0.88	0.72	0.54	0.58	0.81	0.95	0.99	0.99		(94)
(95)m		gains,	hmGm .	W = (94	1)m x (8	 4)m									
(96)me				· ·	<u> </u>		368.31	264.38	274.11	367.31	400.57	388.04	382.66		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)   (97)m=	Monthly	/ avera	age exte	rnal tem	perature	from Ta	able 8								
(97)me   1080.82   1046.57   947.57   788.66   609.63   411.49   273.2   286.41   444.14   669.22   888.21   1073.2   (97)					·			16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m = 506.48	Heat los	ss rate	for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
Space heating requirement in kWh/m²/year   Sum(98)ssv   2672.88   (98)	(97)m= 10	080.82	1046.57	947.57	788.66	609.63	411.49	273.2	286.41	444.14	669.22	888.21	1073.2		(97)
Space heating requirement in kWh/m²/year   Sum(98)s   2672.88   (98)	Space h	heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
Space heating requirement in kWh/m²/year   48.33   (99)	(98)m= 5	506.48	405.66	354.19	220.2	112.58	0	0	0	0	199.87	360.12	513.77		
Space heating:   Fraction of space heat from secondary/supplementary system   Qu20   1 - (201)   =   1   (202)									Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2672.88	(98)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.5 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         506.48 405.66 354.19 220.2 112.58 0 0 0 0 0 199.87 360.12 513.77         60.12 513.77           (211)m = {[(98)m x (204)] } x 100 ÷ (206)         Total (kWh/year) = Sum(211), a.s.oi. = 2858.69 (211)           Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)           2(15)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space h	heatin	g require	ement in	kWh/m²	/year							ĺ	48.33	(99)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.5 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         506.48 (405.66) (354.19) (202) (112.58) 0 0 0 0 0 199.87 (360.12) (513.77)           (211) m = {[(98)m x (204)] } x 100 ÷ (206)         (211)           Space heating fuel (secondary), kWh/month           = [(98)m x (201)] } x 100 ÷ (208)           (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9a. Ener	av rea	uiremer	nts – Indi	vidual h	eating sv	/stems i	ncludina	micro-C	CHP)					
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211)_1s1012 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		· .								<b>,</b>					
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) (204) (204) (205) (206) (208) (	•		•	t from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.5012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of tot	al heati	na from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =		i	1	(204)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  506.48 405.66 354.19 220.2 112.58 0 0 0 0 199.87 360.12 513.77  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_	-										= '
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year		•					n evetom	0/-							╡```
Space heating requirement (calculated above)  506.48															
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								Jul	Aug	Sep	Oct	Nov	Dec	kwn/ye	ear
$ (211) \text{m} = \{ [(98) \text{m x } (204)] \ \} \times 100 \div (206) \\ \hline 541.69 \ 433.86 \ 378.81 \ 235.51 \ 120.41 \ 0 \ 0 \ 0 \ 0 \ 213.77 \ 385.16 \ 549.48 \\ \hline \hline                                $		<del>- i</del>	•	· `				0	0	0	100.97	260.12	512 77		
541.69 433.86 378.81 235.51 120.41 0 0 0 0 213.77 385.16 549.48  Total (kWh/year) = Sum(211) <sub>15,1012</sub> 2858.69 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0							U	U	U	U	199.07	300.12	513.77		
	· · · · —	í			· ` ·										(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	_ 5	541.69	433.86	378.81	235.51	120.41	0	0							<b>¬</b> ,
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $	_								lota	ı (KVVN/yea	ar) =5um(2	(11) <sub>15,1012</sub>	=	2858.69	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	•	•	•		• , .	month									
						_	_	_	0	_	_	_			
	(Z15)M=	U	U	U	U	U	U	U							(245)
Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0 (215)									Tota	(ICVVIII/ y GC	, →Cum(2	-· · · / <sub>15,1012</sub>		U	(213)

#### Water heating Water heating from separate community system: Annual water heating requirement (64)1776.58 kWh/year **Annual totals** kWh/year Space heating fuel used, main system 1 2858.69 Water heating fuel used 2103.94 Electricity for pumps, fans and electric keep-hot central heating pump: (230c)30 boiler with a fan-assisted flue (230e)45 sum of (230a)...(230g) = Total electricity for the above, kWh/year 75 (231)Electricity for lighting 281.06 (232)12a. CO2 emissions - Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year Space heating (main system 1) (211) x 617.48 (261)0.216 (215) x Space heating (secondary) 0.519 0 (263)(219) x Water heating (264)0.216 454.45 (261) + (262) + (263) + (264) =Space and water heating 1071.93 (265)Water heating from community system **Emission factor Emissions Energy** kWh/year kg CO2/kWh kg CO2/year Electrical energy for heat distribution [(313) x (372)0 0 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)0 Electricity for pumps, fans and electric keep-hot (231) x (267)0.519 38.93 (232) x Electricity for lighting 145.87 (268)0.519 sum of (265)...(271) = Total CO2, kg/year 1256.72 (272)

TER =

(273)

33.39

#### **SAP Input**

#### Property Details: Flat Type B - ASHP + PV

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0  $35 \text{ m}^2$  3.09 m

Living area: 22 m<sup>2</sup> (fraction 0.594)

Front of dwelling faces: North East

- ( )	$n \cap n$	Ina -	†\ /	naci
U	DELL		ιv	pes:

Window\_05\_08

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_5_01	Manufacturer	Solid			Metal
Vent_05_03	Manufacturer	Solid			
Vent_05_01	Manufacturer	Solid			
Vent_D5_08	Manufacturer	Solid			
Window_05_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_05_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_05_08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D_5_01	mm	0	0	1	2.13	1
Vent_05_03	mm	0	0	1	0.94	1
Vent_05_01	mm	0	0	1	0.75	1
Vent_D5_08	mm	0	0	1	0.68	1
Window_05_02	6mm	0.7	0.4	1.2	2	1
Window_05_01	6mm	0.7	0.4	1.2	1.04	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

0.7

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_5_01		5_01	North East	0	0
Vent_05_03		5_05	South West	0.57	1.65
Vent_05_01		5_01	North East	0.623	1.2
Vent_D5_08		5_05	South West	0.57	1.2
Window_05_02		5_05	South West	1.21	1.65
Window_05_01		5_01	North East	1.2	0.863
Fanlight		5_01	North East	1.01	0.315
Window_05_08		5_05	South West	1.21	1.2

0.4

1.2

1.45

1

6mm

# **SAP Input**

Overshading:	Average or unknown

Opaque Elements:							
Type: Gr External Elements	oss area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
5_01	15.481	4.24	11.24	0.13	0	False	N/A
5_02	2.039	0	2.04	0.13	0	False	N/A
5_03	2.874	0	2.87	0.13	0	False	N/A
5_05	18.386	5.07	13.32	0.13	0	False	N/A
R_01	35	0	35	0.1	0		N/A
Internal Elements							
Party Elements							
Thermal bridges:							
Thermal bridges:		No info	rmation on therm	al bridging (y=0.	15) (y =0.15)		
Ventilation:							
Pressure test:		Yes (As	designed)				
Ventilation:			ed with heat recov	very			
		Numbe	r of wet rooms: K	itchen + 1			
		Ductwo	rk: Insulation, rig	jid			
		Approve	ed Installation Sc	heme: False			
Number of chimneys	:	0					
Number of open flue	s:	0					
Number of fans:		0					
Number of passive s		0					
Number of sides she	Itered:	0					
Pressure test:		2.5					
Main heating system:							
Main heating system	:	Electric Standar	underfloor heatir	ng			
			ectricity				
			urce: SAP Tables				
			ble: 425				
				diately below floo	r coverina		
				s in insulated tim	•		
			heating pump : 2				
			•	: Design flow ten	nperature >45°C		
		Room-s			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
		Boiler ir	nterlock: Yes				
Main heating Control:							
Main heating Control	l:	-	nmer and room tl code: 2704	hermostat			
Secondary heating sys	stem:	CONTROL	COUC. 2704				
Secondary heating sy		None					
Water heating:							
Water heating:		952 Fro	m DHW-only con	nmunity scheme			
			•	•	ınity scheme - hea	t pump	
				•	ion 1, efficiency 32		
				ated, medium ter	•		
			water cylinder				
		Solar pa	anel: False				
Others:							
Electricity tariff:		Standar	d Tariff				
In Smoke Control Are	ea:	Yes					

#### **SAP Input**

Conservatory: No conservatory

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

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.645

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Photovoltaic 2

Installed Peak power: 0.258

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Photovoltaic 3

Installed Peak power: 0.242 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		l Jeor F	Details:						
Access News	A down Ditable	– USELL		_ NI	L		OTDO	0010510	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Hame.		Property				SHP + F		71. 1.0.4.20	
Address :				,	•				
1. Overall dwelling dime	ensions:								
Ground floor		Are	a(m²)	las		ight(m)	7(0-)	Volume(m³	_
	-> (41) - (4 -> - (4 1) - (4 -> - (4			(1a) x	3	3.09	(2a) =	108.15	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(	in)	35	(4)					_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	108.15	(5)
2. Ventilation rate:	main seconda	arv	other		total			m³ per hou	r
North an of all increases	heating heating						40 =	-	_
Number of chimneys	0 + 0	_  +	0	] = [	0			0	(6a)
Number of open flues	0 + 0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				0	X	40 =	0	(7c)
							Air ch	nanges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	(7a)+(7b)+(	(7c) =	Г	0		÷ (5) =	0	(8)
•	een carried out or is intended, proce			continue fi			. (0) –	0	
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of the contract			•	ruction			0	(11)
deducting areas of opening		to the great	ici wan arc	a (anci					
If suspended wooden f	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
J	s and doors draught stripped		0.05 [0.0	(4.4) 4	1001			0	(14)
Window infiltration			0.25 - [0.2		_	. (15) -		0	(15)
Infiltration rate	aEO expressed in subject that	oo nor h	(8) + (10)				oroo	0	(16)
· · · · · · · · · · · · · · · · · · ·	q50, expressed in cubic metitive value, then $(18) = [(17) \div 20]$	•	•	•	ietre or e	envelope	area	2.5	(17)
•	es if a pressurisation test has been d				is beina u	sed		0.12	(18)
Number of sides sheltere			<b>9 ,</b>	,	3			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed							_	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
			1	·				I	

Adjusted infilti	ration rate	(allowi	ng for sh	nelter an	id wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	se	!	!	!		!		
If mechanic			anadin N. (O	)OF) (OO.	-) <b></b>		\  <b> </b>		\ (00-\			0.5	(23a
If exhaust air h		0 11	, ,	, (	, (		,, .	`	) = (23a)			0.5	(23b
If balanced wit		-	-	_					<b>.</b>		4 (00.)	75.65	(230
a) If balance	ed mechai			with he	at recov	<del>,                                    </del>	HR) (24a   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24			0.26		0.27	J	(240
b) If balance						<del>, , ,</del>	<del></del>	<del>í `</del>	<del>r ´     `</del>		Ι ,	1	(24k
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(241
c) If whole h	nouse extr m < 0.5 × 1								5 v (23h	۸			
(24c)m = 0	0.5 2	0	0	0	0	0	0 = (221	0	0	0	0	1	(240
d) If natural	L			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				J	
,	m = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	) or (24h	o) or (24	c) or (24	d) in bo	x (25)	!		•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	as and had	et loop r	oromot	ori								4	
ELEMENT	Gross area (	3	Openin m	ıgs	Net Ar A ,r		U-val		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	X	1		2.13				(26)
Doors Type 2					0.94	x	1	<b>=</b> i	0.94	=			(26)
Doors Type 3					0.75	x		_ :		=			(26)
Doors Type 4							1	=	0.75				
Windows Type					0.68	X	1	= [ = [	0.75	$\exists$			(26)
	e 1							= [	0.68				` '
• •					2	x1	1/[1/( 1.2 )+	= [	0.68 2.29				(27)
Windows Type	e 2				1.04	x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27) (27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4	_	4 24	$\neg$	2 1.04 0.32 1.45	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4	극	4.24		2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0 0 5.07		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.24 2.04	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements,	m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	as given in	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	s given in	paragrapl		(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both season between the season both season between season between season between season between season sea	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m² ws, use e ides of in S (A x	0 5.07 0 effective winternal walk	indow U-va	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (29) (29) (29)

can he u	usad insta	ad of a de	tailed calc	ulation										
					using Ap	pendix I	<						11.07	(36)
	J	`	,		= 0.05 x (3	•	•						11.07	(00)
	abric hea	0 0		, ,	,	,			(33) +	(36) =			28.41	(37)
Ventila	tion hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38)
Heat tr	ansfer c	oefficier	nt, W/K		-	-	-		(39)m	= (37) + (	38)m		-	
(39)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		
Heat Ic	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	: Sum(39) <sub>1</sub> - (4)	12 /12=	37.63	(39)
(40)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		
Numbe	er of day	s in mor	nth (Tab	le 1a)		-	-		,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.08	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			_		-	-	-		-	-			_	
4. Wa	ter heat	ing ener	rgy requi	rement:								kWh/y	ear:	
if TF		0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		.28	]	(42)
Annua Reduce	the annua	e hot wa Il average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target c		1.62	]	(43)
not more	. 1				<u> </u>			Ι	0	0-4	Nan		1	
Hot wate	Jan er usage ir	Feb i litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	]	
(44)m=	71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08	1	
(1.7,11											ım(44) <sub>112</sub> :	ļ	775.4	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600						
(45)m=	105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08	]	
										Total = Su	ım(45) <sub>112</sub> :	=	1016.67	(45)
ı				,		· · ·		boxes (46	,		_	•	٦	
(46)m= Water	15.81 storage	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31	]	(46)
	_		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0	1	(47)
•		,			/elling, e		_						1	, ,
	•	-			_			mbi boil	ers) ente	er '0' in (	(47)			
	storage												-	
,					or is kno	wn (kWł	n/day):					0	<u> </u>	(48)
•			m Table									0	<u> </u>	(49)
			storage	-	ear loss fact	or is not	known:	(48) x (49)	) =		1	10	]	(50)
Hot wa	ter stora	age loss		om Tabl	le 2 (kW						0	.02	]	(51)
	e factor	-		JII 7.U							1	.03	1	(52)
			m Table	2b							-	).6	1	(53)
													_	

Energy lost from water storage, kWh/year	(47) y (54) y (52) y (52) -			(54)
Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	= 1.0		(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	1.0		(33)
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32	2.01 30.98	32.01	(56)
If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50)$ – $(H11)]$ ÷				()
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32	2.01 30.98	32.01	(57)
Primary circuit loss (annual) from Table 3	! !		)	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div$	365 × (41)m			
(modified by factor from Table H5 if there is solar water hea	` '	ermostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23	3.26 22.51	23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (4	1)m			
(61)m= 0 0 0 0 0 0	0 0	0 0	0	(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)$	)m + (46)m +	 (57)m + (59)m +	(61)m
(62)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	1 128.3 127.39 14	11.39 147.5	157.36	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar cor	ntribution to wate	r heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)			
(63)m= 0 0 0 0 0 0	0 0	0 0	0	(63)
Output from water heater				
(64)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	1 128.3 127.39 14	11.39 147.5	157.36	
	Output from water	heater (annual) <sub>1.</sub>	12 1667.	51 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)	m + (61)m] + 0.8 x [(4	46)m + (57)m	+ (59)m ]	
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38	68.5 67.36 72	2.86 74.05	78.16	(65)
include (57)m in calculation of (65)m only if cylinder is in the	e dwelling or hot water	r is from com	munity heating	
5. Internal gains (see Table 5 and 5a):				
Martal alla asias (Tall E) Marta				
ivietabolic gains (Table 5), Watts				
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep (	Oct Nov	Dec	
	<del>                                     </del>	Oct Nov 6.84 76.84	Dec 76.84	(66)
Jan Feb Mar Apr May Jun Jul	76.84 76.84 76			(66)
Jan   Feb   Mar   Apr   May   Jun   Jul	76.84 76.84 76 also see Table 5			(66) (67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5	6.84     76.84       1.65     25.27	76.84	` ,
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84         76.84         76.84         76.84         76.84         76.84         76.84           Lighting gains (calculated in Appendix L, equation L9 or L9a),         (67)m=         26.21         23.28         18.94         14.34         10.72         9.05         9.78	76.84 76.84 76 also see Table 5 12.71 17.05 21 .13a), also see Table	6.84     76.84       1.65     25.27	76.84	` ,
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  120.23 124.5 13	6.84 76.84 1.65 25.27 5	76.84	(67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5	6.84 76.84 1.65 25.27 5	76.84	(67)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5	6.84 76.84 1.65 25.27 5 33.57 145.02	76.84 26.94 155.79	(67) (68)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table 3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84 1.65 25.27 5 33.57 145.02	76.84 26.94 155.79	(67) (68)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table 3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96	76.84 26.94 155.79	(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96	76.84 26.94 155.79	(67) (68) (69)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0	76.84 26.94 155.79 43.96	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5 43.96 43.96 43 0 0 0	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0	76.84 26.94 155.79 43.96	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76 also see Table 5 12.71 17.05 21 13a), also see Table 3 120.23 124.5 13 a), also see Table 5 43.96 43.96 43 0 0 0	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43  0 0  3 -51.23 -51.23 -5  92.07 93.56 97  m + (68)m + (69)m + (70)m	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70)
Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         76.84	76.84 76.84 76  also see Table 5  12.71 17.05 21  13a), also see Table  3 120.23 124.5 13  a), also see Table 5  43.96 43.96 43  0 0  3 -51.23 -51.23 -5  92.07 93.56 97  m + (68)m + (69)m + (70)m	6.84 76.84  1.65 25.27  5  33.57 145.02  3.96 43.96  0 0  51.23 -51.23  7.92 102.85  m + (71)m + (72)	76.84  26.94  155.79  43.96  0  -51.23	(67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	1.04	x	11.28	x	0.4	x	0.7	=	2.28	(75)
Northeast 0.9x	0.77	X	0.32	x	11.28	x	0.4	х	0.7	] =	0.7	(75)
Northeast 0.9x	0.77	X	1.04	x	22.97	x	0.4	x	0.7	] =	4.63	(75)
Northeast 0.9x	0.77	X	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast 0.9x	0.77	X	1.04	x	41.38	x	0.4	x	0.7	] =	8.35	(75)
Northeast 0.9x	0.77	X	0.32	x	41.38	x	0.4	х	0.7	] =	2.57	(75)
Northeast 0.9x	0.77	X	1.04	x	67.96	x	0.4	х	0.7	] =	13.71	(75)
Northeast 0.9x	0.77	X	0.32	x	67.96	x	0.4	x	0.7	] =	4.22	(75)
Northeast 0.9x	0.77	X	1.04	x	91.35	x	0.4	x	0.7	] =	18.43	(75)
Northeast 0.9x	0.77	X	0.32	x	91.35	x	0.4	x	0.7	] =	5.67	(75)
Northeast 0.9x	0.77	X	1.04	x	97.38	x	0.4	x	0.7	] =	19.65	(75)
Northeast 0.9x	0.77	X	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast 0.9x	0.77	X	1.04	x	91.1	x	0.4	х	0.7	] =	18.38	(75)
Northeast 0.9x	0.77	X	0.32	x	91.1	x	0.4	х	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast 0.9x	0.77	X	0.32	x	72.63	x	0.4	х	0.7	] =	4.51	(75)
Northeast 0.9x	0.77	X	1.04	x	50.42	x	0.4	x	0.7	] =	10.17	(75)
Northeast 0.9x	0.77	X	0.32	x	50.42	x	0.4	x	0.7	] =	3.13	(75)
Northeast 0.9x	0.77	X	1.04	x	28.07	x	0.4	x	0.7	] =	5.66	(75)
Northeast 0.9x	0.77	X	0.32	x	28.07	x	0.4	x	0.7	] =	1.74	(75)
Northeast 0.9x	0.77	X	1.04	x	14.2	x	0.4	x	0.7	j =	2.86	(75)
Northeast 0.9x	0.77	X	0.32	x	14.2	x	0.4	x	0.7	j =	0.88	(75)
Northeast 0.9x	0.77	X	1.04	x	9.21	x	0.4	x	0.7	] =	1.86	(75)
Northeast 0.9x	0.77	X	0.32	x	9.21	x	0.4	x	0.7	] =	0.57	(75)
Southwest <sub>0.9x</sub>	0.77	X	2	x	36.79		0.4	x	0.7	] =	14.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	36.79		0.4	x	0.7	] =	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	62.67		0.4	x	0.7	] =	24.32	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	62.67		0.4	x	0.7	] =	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	х	85.75		0.4	x	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	85.75		0.4	x	0.7	<b>=</b>	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	106.25	ĺ	0.4	x	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	106.25		0.4	x	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	119.01		0.4	x	0.7	<b>=</b>	46.19	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	119.01	ĺ	0.4	x	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	118.15		0.4	x	0.7	] =	45.85	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.45	x	118.15		0.4	x	0.7	j =	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	113.91		0.4	x	0.7	j =	44.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.45	x	113.91		0.4	x	0.7	] =	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	x	104.39	j	0.4	x	0.7	] =	40.51	(79)
				-		-				-		

					_										
Southwest <sub>0.9x</sub>	0.77	×	1.4	15	x	10	04.39			0.4	X	0.7	=	29.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	2	2	x	9	2.85			0.4	x	0.7	=	36.03	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	9	2.85			0.4	x	0.7	=	26.12	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	2	x	6	9.27	]		0.4	x [	0.7	=	26.88	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	6	9.27	] [		0.4	x [	0.7	=	19.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	2	2	x	4	4.07	]		0.4	x [	0.7	=	17.1	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	4	4.07	]		0.4	x [	0.7	=	12.4	(79)
Southwest <sub>0.9x</sub>	0.77	х	2	2	x	3	1.49			0.4	x [	0.7	=	12.22	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	x	3	1.49			0.4	x	0.7	=	8.86	(79)
				_	_										
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m= 27.61	48.02	68.33	89.06	103.78	10	4.79	100.3	89.0	05	75.46	53.78	33.25	23.51		(83)
Total gains –	internal a	and solar	· (84)m =	= (73)m	+ (8	33)m	, watts					-		_	
(84)m= 392.92	410.6	419.2	422.05	418.96	40	3.69	389.45	383.	.64	380.16	376.5	375.97	380.88		(84)
7. Mean inte	rnal temp	perature	(heating	season	)										
Temperature			,		<i>'</i>	area f	from Tab	ole 9,	, Th	1 (°C)				21	(85)
Utilisation fa	•	٠.			_					, ,					
Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(86)m= 0.88	0.86	0.82	0.76	0.66	0	.52	0.39	0.4	<del>-</del>	0.58	0.74	0.84	0.88		(86)
Mean interna	al temper	ature in	livina ar	oa T1 /f/	سال	w sto	ns 3 to 7	I 7 in T	able	. 0c)		1	<u>I</u>	_	
(87)m= 19.45	19.62	19.91	20.29	20.62		0.86	20.95	20.9		20.81	20.42	19.9	19.42	1	(87)
` '		ı		<u> </u>				<u> </u>				1 .0.0			(- /
Temperature	<del></del>	· · ·		1	_	$\overline{}$			$\overline{}$	<u> </u>	00.40	1 00 40	00.40	7	(00)
(88)m= 20.45	20.45	20.45	20.46	20.46		0.47	20.47	20.4	47	20.47	20.46	20.46	20.46		(88)
Utilisation fa	<del></del>				_	<u> </u>		9a)				,		7	
(89)m= 0.87	0.85	0.81	0.74	0.64	0	.49	0.35	0.3	37	0.55	0.73	0.83	0.88		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing <sup>·</sup>	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)				
(90)m= 19	19.16	19.45	19.82	20.14	20	0.37	20.44	20.4	44	20.31	19.95	19.45	18.97		(90)
										f	LA = Livi	ng area ÷ (	4) =	0.63	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	llinc	a) = fl	_A × T1	+ (1 -	– fL	A) x T2					
(92)m= 19.28	19.45	19.74	20.12	20.44	ī	0.68	20.76	20.		20.62	20.25	19.73	19.26	7	(92)
Apply adjust	ment to t	he mear	interna	l temper	ı atur	re fro	m Table	4e, v	whe	re appro	priate	Į		_	
(93)m= 19.28	19.45	19.74	20.12	20.44	_	0.68	20.76	20.		20.62	20.25	19.73	19.26	]	(93)
8. Space he	ating requ	uirement													
Set Ti to the	mean int	ternal ter	nperatu	re obtair	ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
the utilisation	n factor fo	or gains	using Ta	able 9a								,		7	
Jan	Feb	Mar	Apr	May	L	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fa	<del></del>			_	_							1	ı	٦	(0.1)
(94)m= 0.85	0.83	0.79	0.73	0.64		0.5	0.38	0.4	4	0.56	0.72	0.81	0.86		(94)
Useful gains	1	· `	<u> </u>	·	1 00	0.40	440.5	154	ا ۵۵	044.0	070.4	1 004.05	000.40	7	(05)
(95)m= 333.77		332.77	308.76	267.09	<u> </u>	2.43	146.5	151.	.83	211.2	270.1	304.95	326.49		(95)
Monthly ave	rage exte	1	i –	ı	_		16.6	16.	<u>, I</u>	111	10.6	7.4	4.0	1	(96)
` '		6.5	8.9	11.7	<u> </u>	4.6	16.6			14.1	10.6	7.1	4.2	J	(30)
Heat loss ra (97)m= 575.94	1	an intern	422.4	328.31	1	, VV =	=[(39)m ] 153.97	X [(93	<del>_</del> т	- (96)M 242.73	J 362.28	477.18	572.03	1	(97)
(37)111= 373.94	337.01	303.02	722.4	320.31		. <del>-1</del> .01	133.81	100.	.03	۷٦۷.۱۵	JUZ.20	7//.10	312.03	J	(07)

Space heating require	ement fo	r each n	nonth, k\	Vh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m= 180.17 145.96	128.75	81.82	45.55	0	0	0	0	68.58	124.01	182.69		
			-		-	Tota	l per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	957.53	(98)
Space heating require	ment in	kWh/m²	<sup>2</sup> /year								27.36	(99)
9a. Energy requiremen	ts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space heating:	t from o	oondor	u/ou polo	montory	ovetem					Г	0	(201)
Fraction of space hea Fraction of space hea				mentary	•	(202) = 1 -	- (201) =			Ĺ	0	(202)
Fraction of total heating		•	. ,			(204) = (204)	, ,	(203)] =		L T	1	(204)
Efficiency of main spa	_	•				( - / (	- , [	( /1		<u> </u>	100	(206)
Efficiency of secondar		•		g system	າ, %					L [	0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space heating require		•				19					,	
180.17 145.96	128.75	81.82	45.55	0	0	0	0	68.58	124.01	182.69		
$(211)$ m = {[(98)m x (20-	4)] } x 1	<u> </u>	)6)									(211)
180.17 145.96	128.75	81.82	45.55	0	0	0	0	68.58	124.01	182.69		7(044)
Space heating fuel (se	ocondor	/\ k\\/b/	month			TOIA	i (KVVII/yea	ar) =Surri(	211) <sub>15,1012</sub>	<i>-</i>	957.53	(211)
$= \{[(98) \text{m x } (201)] \} \text{ x } 10$	•	•	monun									
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		
	-		-		-	Tota	l (kWh/yea	ar) =Sum(	215) <sub>15,1012</sub>	<u></u>	0	(215)
Water heating												
Water heating from sep Annual water heating			ty systen	n:						Γ	1667.51	(64)
Fraction of heat from	commun	ity CHP								ļ	1	(303a)
Factor for charging me	ethod fo	r commi	unity wat	er heati	ng					Ī	1	(305)
Distribution loss factor	r (Table	12c) for	commu	nity heat	ing syst	em				_ 	1.1	(306)
Water heat from CHP	•	·		·			(64) x (30	03a) x (30	5) x (306) :	_	1834.27	(310a)
Electricity used for he	at distrib	ution				0.01	× [(307a).	(307e) +	- (310a)(	[310e)] =	18.34	(313)
Annual totals								k	Wh/year		kWh/yeaı	 '
Space heating fuel use	d, main	system	1						•		957.53	
Electricity for pumps, fa	ans and	electric	keep-ho	t								
mechanical ventilation	ı - balan	ced, ext	ract or p	ositive ii	nput fror	n outside	e			138.54		(230a)
Total electricity for the	above, k	:Wh/yea	r			sum	of (230a).	(230g) =	:		138.54	(231)
Electricity for lighting										Ī	185.19	(232)
Electricity generated by	/ PVs									Ī	-937.91	(233)
10a. Fuel costs - indiv	ridual he	ating sy	stems:							_		

Fuel

kWh/year

Fuel Price

(Table 12)

**Fuel Cost** 

£/year

Space heating - main system 1	(211) x	13.19 x 0.01 = 126.3	(240)
Space heating - main system 2	(213) x	0 x 0.01 = 0	(241)
Space heating - secondary	(215) x	13.19 × 0.01 = 0	(242)
Water heating from CHP	(310a) x	4.24 × 0.01 = 77.77	(342a)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 = 18.27	(249)
(if off-peak tariff, list each of (230a) to (2 Energy for lighting	30g) separately as applicable and a	apply fuel price according to Table 12a $13.19 \times 0.01 = 24.43$	(250)
Additional standing charges (Table 12)		60	(251)
	one of (233) to (235) x)	13.19 × 0.01 = -123.71	(252)
Appendix Q items: repeat lines (253) and	d (254) as needed	120.11	(
Total energy cost	(245)(247) + (250)(254) =	183.06	(255)
11a. SAP rating - individual heating sys	stems		
Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.96	(257)
SAP rating (Section 12)		86.59	(258)
12a. CO2 emissions – Individual heatin	g systems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor Emission kg CO2/kWh kg CO2/	_
Space heating (main system 1)	(211) x		(261)
Space healing (main system 1)	(211) X	0.519 = 496.96	(261)
Space heating (secondary)	(215) x	0.519 = 496.96	(263)
		0.519	
Space heating (secondary)		0.519 = 0 Emission factor Emissions	(263)
Space heating (secondary)	(215) x Energy kWh/ye	0.519 = 0 Emission factor Emissions	(263)
Space heating (secondary) Water heating from community system	(215) x  Energy kWh/ye water heating (not CHP)	0.519 = 0 Emission factor Emissions	(263)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and water heating from the space and water heating from the space and	(215) x  Energy kWh/ye water heating (not CHP)	Emission factor Emissions kg CO2/kWh kg CO2/year act (363) to (366) for the second fuel	(263)  ar  (367a)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and v  Efficiency of heat source 1 (%)	(215) x  Energy kWh/ye water heating (not CHP)  If there is CHP using two fuels repe	Emission factor Emissions kg CO2/kWh kg CO2/year act (363) to (366) for the second fuel	(263) ar
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and v  Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/ye water heating (not CHP)  If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷  [(313) x	0.519 = 0  Emission factor Emissions kg CO2/kWh kg CO2/yes eat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  0.52 = 9.52	(263)  ar  (367a) (367) (372)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and vertice of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  ystems (363)(366) +	0.519 = 0  Emission factor Emissions kg CO2/kWh kg CO2/yes eat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  0.52 = 9.52	(263)  ar  (367a) (367) (372)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and vertice of the source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  ystems (363)(366) +	0.519	(263)  (367a) (367) (372) (373)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and verificiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system  Electricity for pumps, fans and electric keep	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels repersent the seep-hot (231) x  Energy kWh/ye (307b) + (310b)] x 100 ÷ (307b) + (310b)] x 100 ÷ (313) x  Energy kWh/ye (307b) + (310b)] x 100 ÷ (307b) + (310b)] x 100 ÷ (313) x	Emission factor Emissions kg CO2/kWh kg CO2/yes eat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  0.52 = 9.52  (368)(372) = 298.86	(263)  (367a) (367) (372) (372) (373) (267)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and verificiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system  Electricity for pumps, fans and electric ker  Electricity for lighting  Energy saving/generation technologies	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  yestems (363)(366) + eep-hot (231) x (232) x	Emission factor Emissions kg CO2/kWh kg CO2/year kg CO2/kWh kg CO2/year cat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  - 0.52 = 9.52  (368)(372) = 298.86  - 0.519 = 71.9  - 0.519 = 96.11	(263)  (367a) (367) (372) (373) (267) (268)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and verificiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system  Electricity for pumps, fans and electric ker  Electricity for lighting  Energy saving/generation technologies  Item 1	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  yestems (363)(366) + eep-hot (231) x (232) x	Emission factor Emissions kg CO2/kWh kg CO2/year kg CO2/kWh kg CO2/year cat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  - 0.52 = 9.52  (368)(372) = 298.86  - 0.519 = 71.9  - 0.519 = 96.11	(263)  (263)  (367a) (367) (372) (373) (267) (268)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and verificiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system  Electricity for pumps, fans and electric ker  Electricity for lighting  Energy saving/generation technologies  Item 1  Total CO2, kg/year	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  yestems (363)(366) + eep-hot (231) x (232) x	Emission factor Emissions kg CO2/year kg CO2/kWh kg CO2/year eat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  - 0.52 = 9.52  (368)(372) = 298.86  - 0.519 = 71.9  - 0.519 = 96.11  - 486.78  - 5um of (265)(271) = 477.07	(263)  (263)  (367a) (367) (372) (373) (267) (268) (269) (272)
Space heating (secondary)  Water heating from community system  CO2 from other sources of space and verificiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community system  Electricity for pumps, fans and electric ker  Electricity for lighting  Energy saving/generation technologies Item 1  Total CO2, kg/year  CO2 emissions per m²	Energy kWh/ye water heating (not CHP) If there is CHP using two fuels reper [(307b)+(310b)] x 100 ÷ [(313) x  yestems (363)(366) + eep-hot (231) x (232) x	Emission factor Emissions kg CO2/year kg CO2/kWh kg CO2/year eat (363) to (366) for the second fuel 329  - (367b) x 0.52 = 289.36  - 0.52 = 9.52  (368)(372) = 298.86  - 0.519 = 71.9  - 0.519 = 96.11  - 486.78  - 5um of (265)(271) = 477.07  - 272) ÷ (4) = 13.63	(263)  (263)  (367a) (367) (372) (373) (267) (268) (269) (272) (273)

	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	3.07 =	2939.6 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Water heating from community system			
	Energy kWh/ye	Primary ar factor	Emissions kWh/year
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)		at (363) to (366) for the second f	uel 329 (367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷	(367b) x 3.07	= 1711.61 (367)
Electrical energy for heat distribution	[(313) x	2.92	= 53.56 (372)
Total Energy associated with community systems	(363)(366) +	(368)(372)	= 298.88 (373)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	425.32 (267)
Electricity for lighting	(232) x	0 =	568.52 (268)
Energy saving/generation technologies Item 1		3.07	-2879.39 (269)
'Total Primary Energy	SI	um of (265)(271) =	2819.22 (272)
Primary energy kWh/m²/year	(2	272) ÷ (4) =	80.55 (273)

User Details:											
Assessor Name:	Adam Ritchie						STRO	019516			
Software Name:	Stroma FSAP 2012						on: 1.0.4.25				
Property Address: Flat Type B - ASHP + PV											
Address :											
1. Overall dwelling dime	ensions:	_									
Ground floor			a(m²)	(1a) v		ight(m)	(2a) =	Volume(m³	_		
	\			(1a) x	3	.09	(2a) =	108.15	(3a)		
·	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	35	(4)			,		_		
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	108.15	(5)		
2. Ventilation rate:	main seconda	w	other		40401			m³ nor hou	-		
	heating heating	, 	other		total		,	m³ per hou	_		
Number of chimneys	0 + 0	_ +	0	_ = _	0	X	40 =	0	(6a)		
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)		
Number of intermittent fa	ns				0	X	10 =	0	(7a)		
Number of passive vents	1			Ī	0	x	10 =	0	(7b)		
Number of flueless gas fi	res			Ī	0	<b>X</b>	40 =	0	(7c)		
				_							
				_			Air ch	anges per ho	ur 		
·	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)		
Number of storeys in the	een carried out or is intended, proce he dwelling (ns)	ea to (17), c	otnerwise (	continue tr	om (9) to	(16)		0	(9)		
Additional infiltration	ino arronning (ino)					[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction							0	(11)			
if both types of wall are present, use the value corresponding to the greater wall area (after											
deducting areas of opening If suspended wooden f	ngs);	).1 (seale	d), else	enter 0				0	(12)		
If no draught lobby, enter 0.05, else enter 0							0	(13)			
Percentage of windows and doors draught stripped							0	(14)			
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$							0	(15)			
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$							0	(16)			
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area							2.5	(17)			
•	ity value, then $(18) = [(17) \div 20] +$							0.12	(18)		
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has been do	ne or a deg	gree air pe	rmeability	is being u	sed			(19)		
Shelter factor	eu .		(20) = 1 -	[0.075 x (1	19)] =			0	(20)		
Infiltration rate incorporat	ting shelter factor		(21) = (18)	) x (20) =				0.12	(21)		
Infiltration rate modified f	or monthly wind speed										
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind sp	eed 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											
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18				
	1	1	L		L	L		I			

Adjusted infilti	ration rate	(allowi	ng for sh	nelter an	id wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	se	!	!	!		!		
If mechanic			anadin N. (O	)OF) (OO.	-) <b></b>		\  <b> </b>		\ (00-\			0.5	(23a
If exhaust air h		0 11	, ,	, (	, (		,, ,	`	) = (23a)			0.5	(23b
If balanced wit		-	-	_					<b>.</b>		4 (00.)	75.65	(230
a) If balance	ed mechai			with he	at recov	<del>,                                    </del>	HR) (24a   <sub>0.24</sub>	a)m = (22) 0.25	<del> </del>	23b) × [* 0.26	1 – (23c) 0.27	) ÷ 100] 1	(24a
(24a)m= 0.28	<u> </u>	0.27	0.26			0.24			0.26		0.27	J	(240
b) If balance						<del>, , ,</del>	<del></del>	<del>í `</del>	<del>r ´     `</del>		Ι ,	1	(24k
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(241
c) If whole h	nouse extr m < 0.5 × 1								5 v (23h	۸			
(24c)m = 0	0.5 2	0	0	0	0	0	0 = (221	0	0	0	0	1	(240
d) If natural	L			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				J	
,	m = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	r change r	ate - er	nter (24a	) or (24h	o) or (24	c) or (24	d) in bo	x (25)	!		•	•	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
3. Heat losse	as and had	et loop r	oromot	ori								4	
ELEMENT	Gross area (	3	Openin m	ıgs	Net Ar A ,r		U-val		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.13	X	1		2.13				(26)
Doors Type 2					0.94	x	1	<b>=</b> i	0.94	=			(26)
Doors Type 3					0.75	x		_ :		=			(26)
Doors Type 4							1	=	0.75				
Windows Type					0.68	X	1	= [ = [	0.75	$\exists$			(26)
	e 1							= [	0.68				` '
• •					2	x1	1/[1/( 1.2 )+	= [	0.68 2.29				(27)
Windows Type	e 2				1.04	x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	0.68 2.29 1.19				(27) (27)
Windows Type	e 2 e 3				1.04 0.32	x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} $	0.68 2.29 1.19 0.37				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4	_	4 24	$\neg$	2 1.04 0.32 1.45	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	0.68 2.29 1.19 0.37 1.66				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4	극	4.24		2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [	0.68 2.29 1.19 0.37 1.66 1.46				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	e 2 e 3 e 4 15.48		0		2 1.04 0.32 1.45 11.24	x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1 x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	e 2 e 3 e 4  15.48  2.04  2.87		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0 0 5.07		2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73				(27) (27) (27) (27) (29) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	e 2 e 3 e 4  15.48  2.04  2.87  18.39		0		2 1.04 0.32 1.45 11.24 2.04 2.87	x1 x1 x1 x1 x x1 x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements,	m <sup>2</sup>	0 0 5.07		2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5				(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e	0 0 5.07 0	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	as given in	paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	s given in	paragrapl		(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the are Fabric heat lo	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof windowes on both season between season both season between season between season between season between season between season between season sea	m² ws, use e ides of in	0 0 5.07 0 effective winternal wall	indow U-ve	2 1.04 0.32 1.45 11.24 2.04 2.87 13.32 35 73.78	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5			17.34	(27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of 6 * for windows and ** include the are	e 2 e 3 e 4  15.48  2.04  2.87  18.39  35 elements, d roof window eas on both s ess, W/K = r Cm = S(A	m² ws, use e ides of in S (A x	0 5.07 0 effective winternal walk	indow U-va	2 1.04 0.32 1.45 11.2 <sup>2</sup> 2.04 2.87 13.32 35 73.78 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1 /[1/( 1.2 )+ /[1		0.68 2.29 1.19 0.37 1.66 1.46 0.27 0.37 1.73 3.5	2) + (32a).			(27) (27) (29) (29) (29)

n be u														
	Ū	`	,		using Ap	•	K						11.07	(36
	of therma abric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			20.44	(37
		at loss ca	alculated	l monthly	V						25)m x (5)		28.41	(3/
Jiilia	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m=	10.03	9.92	9.81	9.25	9.14	8.58	8.58	8.47	8.81	9.14	9.36	9.59		(38
•	ansfer c	coefficier	nt M/K		<u> </u>	<u> </u>	!	ļ	(39)m	= (37) + (37)	38)m		l	
9)m=	38.44	38.33	38.22	37.66	37.55	36.99	36.99	36.88	37.21	37.55	37.77	37.99		
,					<u> </u>	<u> </u>	!	ļ	,	L Average =	Sum(39) <sub>1</sub> .	12 /12=	37.63	(3
eat lo	ss para	meter (F	ILP), W	m²K					(40)m	= (39)m ÷	(4)			
0)m=	1.1	1.1	1.09	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		_
ımhe	er of day	s in mor	nth (Tah	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.08	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
,						<u> </u>	<u> </u>	<u> </u>			<u> </u>		l	
L Wa	ter heat	ting ener	av regui	rement:								kWh/ye	ear:	
. ,,	nor noat	ing ono.	gyroqui	TOTTOTIC.								ikvvii, yv	Jan.	
		ipancy, I		[4 0)(0		) 40 v /TI	-A 420	\2\1 · 0 (	0042 v /	FFA 40		28		(4
:f T [	A . 10 (				(-() ()()(),	149 X ( ) F	-A - I.S 9	17 II + II I	JULO X L	IFA - IS.				
	A > 13.9 A £ 13.9		+ 1.76 X	[ι σχρ	( 0.0000	, 10 x (11	71 1010	<i>)</i> _/] . o.(	(		.9)			
if TF nnual	A £ 13.9 Laverag	9, N = 1 e hot wa	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		64	.62		(4
if TF nnual educe	A £ 13.9 l averag the annua	9, N = 1 e hot wa al average	ater usaç hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed		+ 36		64	.62		(4
if TF nnual duce	A £ 13.9 l averag the annua e that 125	9, N = 1 e hot wa al average litres per p	ater usaç hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is thot and co	erage = designed ld)	(25 x N) to achieve	+ 36 a water us	se target o	64 f	Г	]	(4
if TF nnual educe t more	A £ 13.9 l averag the annua e that 125 Jan	9, N = 1 le hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed ld) Jul	(25 x N) to achieve	+ 36		64	.62	]	(4
if TF nnual duce t more	A £ 13.9 I averag the annua that 125  Jan  r usage ir	P, N = 1 e hot want average litres per per per per per per per per per per	nter usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the a vater use, I May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from	erage = designed ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	se target o	Nov	Dec	]	(4
if TF nnual duce t more	A £ 13.9 l averag the annua e that 125 Jan	9, N = 1 le hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed ld) Jul	(25 x N) to achieve	+ 36 a water us Sep	Oct	Nov 68.49	Dec 71.08	775.4	
if TF nnual educe t more of wate	A £ 13.9 I averag the annua e that 125  Jan er usage ir	P, N = 1 The hot was all average litres per proper litres per proper litres per litres per 68.49	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 63.32	es per da 5% if the d vater use, I May Vd,m = fa 60.74	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed Id)  Jul Table 1c x 58.16	(25 x N) to achieve Aug (43)	+ 36 a water us Sep 63.32	Oct  65.91  Total = Su	Nov  68.49  m(44) <sub>112</sub> =	71.08	775.4	
if TF nnual educe t more t wate l)m=	A £ 13.9 I averag the annua e that 125  Jan er usage ir	P, N = 1 The hot was all average litres per proper litres per proper litres per litres per 68.49	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 63.32	es per da 5% if the d vater use, I May Vd,m = fa 60.74	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed Id)  Jul Table 1c x 58.16	(25 x N) to achieve Aug (43) 60.74	+ 36 a water us Sep 63.32	Oct  65.91  Total = Su	Nov  68.49  m(44) <sub>112</sub> =	71.08	775.4	
if TF innual educe t more of wate  1)m= aergy 0  5)m=	A £ 13.9 A £ 13.9 A experience that 125  Jan The rusage in 71.08  content of 105.41	P, N = 1 The hot was all average litres per per per litres per per ferman filters per fer	Mar 65.91  used - cale	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av Iwelling is that and co Jun ctor from 7 58.16 190 x Vd,r	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74  73.02	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49 m(44) <sub>112</sub> = ables 1b, 1	71.08 = c, 1d) 102.08	775.4	(4
if TF innual educe t more of wate  1)m= aergy 0  5)m=	A £ 13.9 A £ 13.9 A experience that 125  Jan The rusage in 71.08  content of 105.41	P, N = 1 The hot was all average litres per per per litres per per ferman filters per fer	Mar 65.91  used - cale	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av Iwelling is that and co Jun ctor from 7 58.16 190 x Vd,r	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94	71.08 = c, 1d) 102.08		(4
if TF innual duce t more t wate  ergy c ergy c innstant	A £ 13.9 A verage the annual enthat 125  Jan T1.08  content of 105.41  taneous w	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per per per per per per per per per	Mar 65.91  used - cale	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $60.74$ $onthly = 4$ .	ay Vd,av liwelling is that and co  Jun ctor from 7  58.16  190 x Vd,r  68.67	erage = designed ald)  Jul Table 1c x  58.16  m x nm x E  63.64	(25 x N) to achieve  Aug (43)  60.74  73.02	+ 36 a water us  Sep  63.32  6 kWh/mon  73.89	Oct  65.91  Total = Su  with (see Ta  86.12	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94	71.08 = c, 1d) 102.08		(4
if TF if TF innual iduce t more t wate int wate is in metant is in metant ater ater	A £ 13.9 A £ 13.9 A verage the annual enthat 125 A Jan A Table 1.08 A	P, N = 1 He hot was all average litres per per litres per per litres per per litres per per litres per per litres per per litres per per litres per per litres per li	Mar day for each of the state o	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no	es per da 5% if the d rater use, I  May  Vd,m = fa  60.74  79.58  c) hot water  11.94	ay Vd,av lwelling is hot and co  Jun  ctor from 5  58.16  190 x Vd,r  68.67  r storage),	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  1 to (61)  11.08	Oct  65.91  Total = Su  86.12  Total = Su  12.92	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		(4
if TF if TF innual induce it more it water into the	A £ 13.9 I average the annual enthat 125  Jan 71.08  content of 105.41  storage enthat 125  taneous w 15.81  storage enthat 125	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per per per per per per per per per	Mar Mar 65.91  used - calc 95.13  ng at point 14.27	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no	es per da 5% if the of vater use, I  May Vd,m = fact 60.74  onthly = 4.  79.58  o hot water 11.94  olar or W	ay Vd,av lwelling is hot and co  Jun ctor from 7 58.16  190 x Vd,r 68.67  r storage), 10.3	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  1 to (61)  11.08	Oct  65.91  Total = Su  86.12  Total = Su  12.92	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	71.08 = c, 1d) 102.08		(4)
if TF innual duce t more t wate t wate t)m= mstant ater orage	A £ 13.9 I average the annual enthat 125 I Jan Transperies Transpe	P, N = 1 He hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - call 95.13  ng at point 14.27  includin	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av welling is that and co Jun ctor from 58.16  190 x Vd,r 68.67  10.3  WHRS	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage ) litres in	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		
if TF nnual duce t more t wate t wate ergy t isi)m= nstant ater orag	A £ 13.9 I average the annual enthat 125 I Jan Transperies Transpe	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - call 95.13  ng at point 14.27  includin	ge in litre usage by day (all w  Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av welling is that and co Jun ctor from 58.16  190 x Vd,r 68.67  10.3  WHRS	erage = designed ld)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage ) litres in	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> =	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF if TF innual induce it more it water it water instant orage committeers ater ater ater ater ater ater ater ater	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  content of 105.41  storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage enthat 15.81 storage	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per litres per per litres per per litres per l	Mar Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includin nd no tal hot water	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no 12.44  ag any so nk in dw er (this in	es per da 5% if the of rater use, I  May  Vd,m = fa  60.74  79.58  o hot water  11.94  colar or W  velling, e	ay Vd,av lwelling is hot and co  Jun ctor from 58.16  190 x Vd,r 68.67  10.3  /WHRS nter 110 nstantar	erage = designed Id)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4 (4
if TF nnual duce t more  ergy c  ergy c  nstant orag  commisherw ater ) If m	A £ 13.9 I average the annual enthat 125 I Jan Total 1.08 I average in 1.08 I averag	P, N = 1 The hot was all average litres per per per litres per per litres per per litres per per litres per per litres per per litres per per litres per l	Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includin and no talc hot water	Apr Apr Ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The hot water 11.94  Color or Water Welling, encludes i	ay Vd,av lwelling is hot and co  Jun ctor from 58.16  190 x Vd,r 68.67  10.3  /WHRS nter 110 nstantar	erage = designed Id)  Jul Table 1c x  58.16  m x nm x E  63.64  enter 0 in  9.55  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  0 kWh/mor  73.89  11.08  ame vess	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF innual iduce it more int water instant instant interval inte	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  content of 105.41  storage enunity herise if no storage enunitaction and the content of the cont	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar 65.91  used - calc 95.13  ng at point 14.27  includin and no talc hot water	Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the of $5\%$ is a constant.	ay Vd,av liwelling is that and co  Jun ctor from 5 58.16  190 x Vd,r 68.67  10.3  IWHRS enter 110 nstantar wn (kWh	erage = designed ild)  Jul Table 1c x  58.16  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47)	+ 36 a water us  Sep  63.32  6 kWh/more  73.89  11.08  ame vess  ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF nnual educe t more t more nstant orag commitherw fater ) If m empe	A £ 13.9 I average the annual enthat 125  Jan 71.08  71.08  71.08  105.41  Istorage enthat vise if no storage enthat annufaction of the content of the conte	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar Mar Mar Mar Mar Mar Mar Mar Mar	ge in litre usage by day (all w  Apr ach month 63.32  culated me 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The properties of the water 11.94  Collar or Water Collar o	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) pmbi boil	+ 36 a water us  Sep  63.32  6 kWh/more  73.89  11.08  ame vess  ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31 0 0 0 10		(4 (4 (4 (4 (4
if TF innual educe t more t water instant orag committer therwise ater j If m empe nergy if m orag therwise the	A £ 13.9 I average the annual enthat 125 I Jan I T 1.08 I	P, N = 1 He hot was all average litres per l	Mar day for each of water usage hot water person per Mar day for each for each for each factor from the water day for each factor from the water day for each factor from the water day for each factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day for each factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day factor from the water day fact	ge in litre usage by day (all w Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da $5\%$ if the of $5\%$ is a constant.	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) pmbi boil	+ 36 a water us  Sep  63.32  73.89  11.08  ame vess  ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1	Dec 71.08 = c, 1d) 102.08 = 15.31		(4)
if TF innual if TF	A £ 13.9 I average the annual enthat 125 I Jan I T1.08	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar day for each of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared of factor free sections of the storage eclared eclared of the storage eclared ec	ge in litre usage by day (all w Apr ach month 63.32  culated mo 82.94  of use (no 12.44  ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da 5% if the of water use, I  May Vd,m = fact 60.74  79.58  The properties of the water 11.94  Collar or Water Collar o	ay Vd,av liwelling is that and color from 5 58.16  190 x Vd,r 68.67  10.3  /WHRS enter 110 nstantar wn (kWh	erage = designed old)  Jul Table 1c x  58.16  m x nm x L  63.64  enter 0 in  9.55  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  60.74  73.02  boxes (46)  10.95  within sa (47) ombi boil	+ 36 a water us  Sep  63.32  73.89  11.08  ame vess  ers) ente	Oct  65.91  Total = Su  86.12  Total = Su  12.92  Sel	Nov  68.49  m(44) <sub>112</sub> = ables 1b, 1  94  m(45) <sub>112</sub> = 14.1  47)	Dec 71.08 = c, 1d) 102.08 = 15.31 0 0 0 10		(4) (4) (4) (4) (5) (5) (5) (5) (5) (5)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	3 (54)
Enter (50) or (54) in (55)		1.03	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.0	1 30.98	32.01 (56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m when	re (H11) is from	Appendix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01	32.01 30.98 32.0	1 30.98	32.01 (57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder therr	mostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.2	6 22.51	23.26 (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m		
(61)m= 0 0 0 0 0 0	0 0 0	0	0 (61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m$	+ (46)m + (5	57)m + (59)m + (61)m
(62)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	128.3 127.39 141.3	39 147.5 1	157.36 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contri	bution to water h	heating)
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		
(63)m= 0 0 0 0 0 0	0 0 0	0	0 (63)
Output from water heater			
(64)m= 160.68 142.12 150.41 136.43 134.86 122.17 118.9	128.3 127.39 141.3	39 147.5 1	157.36
	Output from water hea	ater (annual) <sub>112</sub>	1667.51 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)	m + (57)m +	(59)m 1
	. , ,	` '	(00)111]
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38	68.5 67.36 72.8	<del></del>	78.16 (65)
(65)m= 79.27 70.6 75.85 70.37 70.68 65.63 65.38 include (57)m in calculation of (65)m only if cylinder is in the		6 74.05	78.16 (65)
		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the		6 74.05	78.16 (65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	dwelling or hot water is	6 74.05 s from commo	78.16 (65) unity heating
include (57)m in calculation of (65)m only if cylinder is in the  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04	Aug Sep Oc 64.04 64.04 64.0	6 74.05 s from commo	78.16 (65) unity heating  Dec
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oc 64.04 64.04 64.0	6 74.05 s from common to t Nov 4 64.04	78.16 (65) unity heating  Dec
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5	6 74.05 s from common to t Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)
include (57)m in calculation of (65)m only if cylinder is in the  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04  Lighting gains (calculated in Appendix L, equation L9 or L9a),	Aug Sep Oc 64.04 64.04 64.0 also see Table 5	6 74.05 s from commodet Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4	6 74.05 s from commodet Nov 4 64.04	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 66.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5	6 74.05 s from commodet Nov 4 64.04 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 67)  Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commodet Nov 4 64.04 6 10.11 9 97.16 1	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commis  tt Nov 4 64.04 6 10.11 9 97.16 1 4 29.4	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4	6 74.05 s from commis  tt Nov 4 64.04 6 10.11 9 97.16 1 4 29.4	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0	6 74.05 S from common st Nov 4 64.04 S 10.11 S	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0	6 74.05 s from commis  2t Nov 4 64.04 6 10.11 9 97.16 1 4 29.4 0 23 -51.23 -	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 67)m= 10.49 9.31 7.57 5.73 4.29 3.62 3.91  Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0  -51.23 -51.23 -51.2	6 74.05 s from commis  t Nov 4 64.04 6 10.11 9 97.16 1 4 29.4 0 23 -51.23 - 2 102.85 1 + (71)m + (72)m	78.16 (65) unity heating  Dec (64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oc 64.04 64.04 64.0 also see Table 5 5.08 6.82 8.66 13a), also see Table 5 80.56 83.41 89.4 a), also see Table 5 29.4 29.4 29.4 0 0 0  -51.23 -51.23 -51.2	6 74.05 s from commis  t Nov 4 64.04 6 10.11 9 97.16 1 4 29.4 0 23 -51.23 - 2 102.85 1 + (71)m + (72)m	78.16 (65) unity heating  Dec 64.04 (66)  10.78 (67)  104.38 (68)  29.4 (69)  0 (70)  -51.23 (71)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	11.28	x	0.4	x	0.7	] =	2.28	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	11.28	x	0.4	x	0.7	=	0.7	(75)
Northeast 0.9x 0.77	x	1.04	x	22.97	x	0.4	x	0.7	=	4.63	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	22.97	x	0.4	x	0.7	] =	1.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	41.38	x	0.4	x	0.7	=	8.35	(75)
Northeast 0.9x 0.77	x	0.32	x	41.38	x	0.4	x	0.7	=	2.57	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	67.96	x	0.4	x	0.7	=	13.71	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	67.96	x	0.4	X	0.7	=	4.22	(75)
Northeast 0.9x 0.77	x	1.04	x	91.35	x	0.4	x	0.7	=	18.43	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.35	x	0.4	x	0.7	=	5.67	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	97.38	x	0.4	x	0.7	=	19.65	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	97.38	x	0.4	x	0.7	=	6.05	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	91.1	x	0.4	x	0.7	=	18.38	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	91.1	x	0.4	x	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	72.63	x	0.4	x	0.7	=	14.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	72.63	x	0.4	X	0.7	=	4.51	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	50.42	x	0.4	x	0.7	=	10.17	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	50.42	x	0.4	x	0.7	=	3.13	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	28.07	x	0.4	X	0.7	=	5.66	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	28.07	x	0.4	x	0.7	=	1.74	(75)
Northeast 0.9x 0.77	x	1.04	x	14.2	x	0.4	x	0.7	=	2.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	14.2	x	0.4	x	0.7	=	0.88	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.04	x	9.21	x	0.4	x	0.7	=	1.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	9.21	x	0.4	x	0.7	=	0.57	(75)
Southwest <sub>0.9x</sub> 0.77	X	2	x	36.79	]	0.4	X	0.7	=	14.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	36.79	]	0.4	X	0.7	=	10.35	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	62.67	]	0.4	X	0.7	=	24.32	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	62.67	]	0.4	X	0.7	=	17.63	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	85.75	]	0.4	X	0.7	=	33.28	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	X	85.75	]	0.4	X	0.7	=	24.13	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	106.25	]	0.4	X	0.7	=	41.23	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	106.25	]	0.4	X	0.7	=	29.89	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	119.01	]	0.4	X	0.7	=	46.19	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	119.01	]	0.4	X	0.7	=	33.48	(79)
Southwest <sub>0.9x</sub> 0.77	x	2	x	118.15	]	0.4	x	0.7	=	45.85	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	118.15	]	0.4	x	0.7	=	33.24	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	x	113.91	]	0.4	x	0.7	=	44.21	(79)
Southwest <sub>0.9x</sub> 0.77	X	1.45	x	113.91	]	0.4	x	0.7	=	32.05	(79)
Southwest <sub>0.9x</sub> 0.77	X	2	×	104.39	]	0.4	x	0.7	=	40.51	(79)

Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	X	10	04.39			0.4	X	0.7	=	29.37	(79)
Southwest <sub>0</sub>	.9x 0.77	х	2	2	X	9	2.85			0.4	X	0.7	=	36.03	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	X	9	2.85			0.4	х	0.7	=	26.12	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	X	6	9.27			0.4	x	0.7	=	26.88	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	X	6	9.27			0.4	X	0.7	=	19.49	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	x	4	4.07			0.4	x	0.7	=	17.1	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	x	4	4.07			0.4	x	0.7	=	12.4	(79)
Southwest <sub>0</sub>	.9x 0.77	X	2	2	x	3	1.49			0.4	x	0.7	=	12.22	(79)
Southwest <sub>0</sub>	.9x 0.77	X	1.4	15	x	3	1.49			0.4	X	0.7	=	8.86	(79)
	'			_	•										
Solar gains	s in watts, c	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m= 27.	61 48.02	68.33	89.06	103.78	10	04.79	100.3	89.0	05	75.46	53.78	33.25	23.51		(83)
Total gains	– internal a	and solar	r (84)m =	= (73)m	+ (8	33)m	, watts					_	_	_	
(84)m= 296	314.92	327.54	336.14	339	32	28.28	315.98	308	.97	301.47	292.06	285.58	285.93		(84)
7. Mean i	nternal tem	perature	(heating	season	)										
Temperat	ure during h	neating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	, Th′	1 (°C)				21	(85)
•	factor for g	•			-					,					
	an Feb	Mar	Apr	May	Ė	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec	]	
(86)m= 0.9	93 0.91	0.88	0.83	0.74	(	).61	0.47	0.5	<del>-  </del>	0.67	0.83	0.9	0.93	1	(86)
Mean inte	rnal tempe	atura in	livina ar	 aa T1 (f(	الد	w eta	ne 3 to 7	in T	ahle	a 0c)			1	1	
(87)m= 19.	<del></del>	19.62	20.08	20.49	_	20.8	20.93	20.9		20.71	20.22	19.6	19.06	1	(87)
` ′		1	<u> </u>	<u> </u>				L						]	` '
· -	ure during h	20.45	20.46	20.46	_	eiiing 0.47	20.47	20.4	$\overline{}$	20.47	20.46	20.46	20.46	1	(88)
(88)m= 20.	45 20.45	20.45	20.46	20.40		0.47	20.47	20.4	47	20.47	20.46	20.46	20.40	]	(00)
	factor for g	1	1		_	·		r –						7	
(89)m= 0.9	0.91	0.88	0.82	0.72	(	).57	0.42	0.4	15	0.64	0.81	0.89	0.93	]	(89)
Mean inte	rnal tempe	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)			_	
(90)m= 18.	64 18.84	19.17	19.62	20.02	2	0.31	20.42	20.4	41	20.24	19.76	19.16	18.62		(90)
										f	LA = Liv	ing area ÷ (	4) =	0.63	(91)
Mean inte	rnal tempe	ature (fo	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2					
(92)m= 18.	93 19.12	19.45	19.91	20.31	2	0.62	20.74	20.	73	20.54	20.05	19.44	18.9	]	(92)
Apply adj	ustment to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate			4	
(93)m= 18.	93 19.12	19.45	19.91	20.31	2	0.62	20.74	20.	73	20.54	20.05	19.44	18.9		(93)
8. Space	heating req	uirement													
	he mean in		•		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	:(76)m an	d re-cal	culate	
	tion factor fo			1				· .	1			1	Γ_	1	
	an Feb	Mar	Apr	May	<u></u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(94)m= 0.9	factor for g	0.86	0.8	0.71		0.58	0.45	0.4	17	0.64	0.8	0.88	0.91	1	(94)
` '		<u> </u>				).56	0.45	0.4	+/	0.04	0.6	0.00	0.91	]	(34)
(95)m= 268	ins, hmGm .42 279.9	281.04	269.78	242.12	10	90.56	141.61	145	98	194.13	233.16	250.67	261.04	1	(95)
	verage exte	Į	l		<u> </u>			I 1-7-0		107.10	200.10	1 200.07	1 -01.04	]	(00)
(96)m= 4.		6.5	8.9	11.7	_	14.6	16.6	16.	.4	14.1	10.6	7.1	4.2	]	(96)
· · ·	rate for me											1		1	` '
(97)m= 562		495.07	414.5	323.43	_	22.64	153.11	159	<del>'</del> T	239.52	354.83	465.95	558.39	1	(97)
` '		<u> </u>	l	l					!			_!	<u> </u>	1	•

Space heating	require	ement fo	r each n	nonth kl	Mh/mont	th – 0 03	24 v [(Q7)	\m _ (95	i)ml v <i>(41</i>	1.)m			
·	178.1	159.23	104.2	60.5	0	0	0	0	90.52	155	221.23		
						ı	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1187.36	(98)
Space heating	require	ement in	kWh/m²	²/year							Ī	33.92	(99)
9a. Energy requ	iremer	ıts – Indi	vidual h	eating sy	ystems i	ncluding	g micro-C	HP)			_		
Space heating											F		_
Fraction of spa					mentary	system		(204)			ļ	0	(201)
Fraction of spa			-	` ,			(202) = 1 -		(000)1		Ļ	1	(202)
Fraction of tota		•	-				(204) = (204)	02) <b>x</b> [1 –	(203)] =		Ļ	1	(204)
Efficiency of ma			•			0.4						100	(206)
Efficiency of se				_		·	I .		I - I			0	(208)
Jan	Feb	Mar /a	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating 218.58	178.1	159.23	104.2	60.5	0	0	0	0	90.52	155	221.23		
$(211)$ m = {[(98)m		4)1 } x 1		<u> </u>		<u> </u>							(211)
	178.1	159.23	104.2	60.5	0	0	0	0	90.52	155	221.23		(211)
<u> </u>		!				ļ.	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	<u></u>	1187.36	(211)
Space heating	fuel (s	econdary	y), kWh/	month							_		_
= {[(98)m x (201				<u> </u>		I	Γ		ı				
(215)m= 0	0	0	0	0	0	0	0 Tota	0 L (k\\/b/\/e:	0 ar) =Sum(2	0	0		(215)
Water heating							Tota	i (KVVII) y C	ar) =0arri(2	10)15,1012		0	(213)
Water heating from	om sej	oarate co	ommunit	ty systen	n:								
Annual water h												1667.51	(64)
Fraction of hea	t from	commun	ity CHP	•								1	(303a)
Factor for charg	ging m	ethod fo	r comm	unity wat	er heati	ng					Ī	1	(305)
Distribution loss	s facto	r (Table	12c) for	commu	nity heat	ting syst	em				Ī	1.1	(306)
Water heat fron	n CHP							(64) x (3	03a) x (305	5) x (306) :	<u> </u>	1834.27	(310a)
Electricity used	for he	at distrib	oution				0.01	× [(307a)	(307e) +	(310a)(	[310e)] =	18.34	(313)
Annual totals								. ,		Nh/year	L	kWh/yea	
Space heating fu	uel use	ed, main	system	1					K	ivii, y cai	Γ	1187.36	<u>'</u>
Electricity for pu	mps, fa	ans and	electric	keep-ho	t						L		_
mechanical ver	•			•		nput fror	n outside	9			138.54		(230a)
Total electricity f						•			(230g) =			138.54	(231)
Electricity for ligh		abovo, 1	, y O a	•				( <del></del>	· - 3/		L F		(232)
, -	-	, D\/a									L	185.19	╡
Electricity generation											L	-937.91	(233)
12a. CO2 emis	sions -	- Individ	ual heat	ing syste	ems inclu	uding mi	icro-CHP						

Energy

kWh/year

**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

(211) x	0	.519	=	616.24	(261)
(215) x	0	.519	= [	0	(263)
	0,				
	fuels repeat (363) to (3	666) for the se	cond fuel	329	(367a)
[(307b)+(310b	)] x 100 ÷ (367b) x	0.52	=	289.36	(367)
[(313)	x	0.52	=	9.52	(372)
(363).	(366) + (368)(372)		=	298.88	(373)
(231) x	0	.519	= [	71.9	(267)
(232) x	0	.519	= [	96.11	(268)
	0	.519	= [	-486.78	(269)
	sum of (265)	.(271) =	[	596.35	(272)
	(272) ÷ (4) =		[	17.04	(273)
			[	90	(274)
	(215) x  ating (not CHP)  f there is CHP using two  [(307b)+(310b  [(313)  (363).	Energy kWh/year  ating (not CHP)  f there is CHP using two fuels repeat (363) to (3  [(307b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(372)  (231) x  (232) x  0  sum of (265)	Energy Emission (kWh/year kg CO2/kV) ating (not CHP) f there is CHP using two fuels repeat (363) to (366) for the se [(307b)+(310b)] x 100 ÷ (367b) x	Energy Emission factor kg CO2/kWh  ating (not CHP)  f there is CHP using two fuels repeat (363) to (366) for the second fuel  [(307b)+(310b)] x 100 ÷ (367b) x	Energy kWh/year kg CO2/kWh kg CO2/year ating (not CHP)  f there is CHP using two fuels repeat (363) to (366) for the second fuel  [(307b)+(310b)] x 100 ÷ (367b) x

		Llsor	Details:						
Accessed	A do no Ditalai	— User		- N'	L		OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Stroma Softwa					019516 on: 1.0.4.25	
Software Name.	Ottoma i OAI 2012		/ Address:			SHP + F		71. 1.0. <del>4</del> .25	
Address :									
1. Overall dwelling dime	ensions:								
0		Ar	ea(m²)			ight(m)	1	Volume(m <sup>3</sup>	<u>-</u>
Ground floor			35	(1a) x	3	.09	(2a) =	108.15	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	35	(4)					
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	108.15	(5)
2. Ventilation rate:									
		condary ating	other		total			m³ per hou	r
Number of chimneys	0 +	0 +	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	<b>x</b> '	10 =	20	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				<u>L</u>					
							Air ch	anges per ho	our
Infiltration due to chimne					20		÷ (5) =	0.18	(8)
	een carried out or is intended	, proceed to (17)	, otherwise o	ontinue fr	rom (9) to	(16)	ı	_	7(0)
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)	-1]x0.1 =	0	(9)
	.25 for steel or timber fra	ame or 0.35 f	or masonr	v constr	uction	[(0)	1]	0	(11)
	resent, use the value correspo	onding to the gre	ater wall are	a (after					` ′
deducting areas of opening	• / .	d) or 0.1 (000	lad) alaa	ontor O			i		7(40)
If no draught lobby, en	floor, enter 0.2 (unsealed ter 0.05, else enter 0	u) or o. r (sea	iea), eise	enter 0				0	(12)
•	s and doors draught stri	pped						0	(14)
Window infiltration		rr	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 cubic	metres per h	nour per so	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	•							0.43	(18)
	es if a pressurisation test has b	been done or a d	egree air pei	meability	is being u	sed	i		740
Number of sides sheltere Shelter factor	ed		(20) = 1 -	0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.43	(21)
Infiltration rate modified for								00	` ′
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	<u>-</u>				-		•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Faster (22a) (24									
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95 0.95	0.92	1	1.08	1.12	1.18	]	
1.27	0	0.35	0.52	1	1.00	1.12	1.10	I	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51	]	
Calculate effec		-	rate for t	he appli	cable ca	se	!	!	!	ļ	·	J	
If mechanica			and the NI (O	10h) (00	-) <b>- - -</b> (-		MEN - 11 -		) (00-)			С	
If exhaust air h		•	•	, ,	,	•	,,	,	) = (23a)			C	
If balanced with		-	•	_					21.) (	001 ) [	4 (00.)	4007	(23c)
a) If balance	ed mecha	anical ve	entilation 0	with he	at recove	ery (MVI	HR) (24a 	$\frac{a)m = (22)}{0}$	2b)m + (   0	23b) × [	1 – (23c) 1 <sub>0</sub>	i ÷ 100] 1	(24a)
		<u> </u>		<u> </u>		<u> </u>					0	J	(24a)
b) If balance (24b)m= 0	o mech	anicai ve	o tiliation	without 0	neat rec		0 (24)	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2b)m + (.	230)	0	1	(24b)
c) If whole h	<u> </u>	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>	<u> </u>				J	(210)
,				•	o); other				.5 × (23b	)		,	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n				•	ve input erwise (2				0.5]				
(24d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63	]	(24d)
Effective air	change	rate - er	nter (24a	) or (24l	b) or (24	c) or (24	d) in bo	x (25)				•	
(25)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63	]	(25)
3. Heat losse	s and he	at loss r	naramet	or.	•							•	
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		AXU	Z)	k-value		A X k kJ/K
	arca	(111)											
Doors Type 1									(W/l	N)	kJ/m²-	IX.	
Doors Type 1 Doors Type 2					2.13	x	1	= [	2.13	N)	KJ/III	K.	(26)
Doors Type 2					2.13	x x	1	= [	2.13	N)	KJ/III	· ·	(26) (26)
Doors Type 2 Doors Type 3					2.13 0.94 0.75	x x x	1 1	=	2.13 0.94 0.75		KJ/IIII	· ·	(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	a 1				2.13 0.94 0.75 0.68	x x x x x	1 1 1 1	= [ = [ = [	2.13 0.94 0.75 0.68	> 	KJ/IIII	· ·	(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type					2.13 0.94 0.75 0.68 1.77	x x x x x x x x 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35		KJ/IIII		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type	e 2				2.13 0.94 0.75 0.68 1.77 0.92	x x x x x x x 1 x 1	1 1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	2.13 0.94 0.75 0.68 2.35 1.22		KJ/IIII		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type	e 2 e 3				2.13 0.94 0.75 0.68 1.77 0.92 0.28	x x x x x x x x x 1 x x 1 x 1	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37		KJ/IIII		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type	e 2 e 3 e 4	10	4.09		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7		KJ/IIII	~ 	(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1	2 2 3 4 4 15.4		4.08	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05		KJ/IIII		(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2	2 2 2 3 4 4 15.4 2.00	4	0	3	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	2 2 2 3 4 4 15.4 2.0 2.8	7	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2 2 3 4 4 15.4 2.0 2.8 18.3	7	0 0 4.67		2.13 0.94 0.75 0.68 1.77 0.92 0.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= [ = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof	2.04 2.04 2.04 2.85 18.3	7 39	0		2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= [ = 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [ = = [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37		KJ/III		(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	2.8 18.3 15.4 2.0 2.8 18.3 35	4 7 89 , m <sup>2</sup>	0 0 4.67	·	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55				(26) (26) (26) (26) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 18.3 35 elements di roof winders on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55			13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area Fabric heat los	2.04 2.04 2.85 18.3 35 1 roof winddas on both	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x	0 0 4.67 0 effective winternal wal	indow U-va	2.13  0.94  0.75  0.68  1.77  0.92  0.28  1.28  11.4  2.04  2.87  13.72  35  73.78  alue calcul	x x x x x x x x x x x x x x x x x x x	1 1 1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18 0.13	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)
Doors Type 2 Doors Type 3 Doors Type 4 Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Roof Total area of e * for windows and ** include the area	2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	4 7 39 , m <sup>2</sup> ows, use e sides of ir = S (A x (A x k)	0 4.67 0 effective winternal wall	indow U-va	2.13 0.94 0.75 0.68 1.77 0.92 0.28 1.28 11.4 2.04 2.87 13.72 35 73.78 alue calculatitions	x x x x x1 x1 x1 x1 x1 x1 x2 x x x added using	1 1 1 1 1 1 1/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= [	2.13 0.94 0.75 0.68 2.35 1.22 0.37 1.7 2.05 0.37 0.52 2.47 4.55	as given in (2) + (32a).	ı paragraph	13.2	(26) (26) (26) (26) (27) (27) (27) (27) (29) (29) (29) (29) (30) (31)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instea	d of a day	tailad aala	ulation										
Thermal bridge:				usina An	nendix I	<						3.69	(36)
if details of thermal	•	,			•	•						3.09	(00)
Total fabric hea	0 0		, ,	,	,			(33) +	(36) =			23.78	(37)
Ventilation heat	t loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	'		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 23.33	23.12	22.91	21.93	21.75	20.89	20.89	20.73	21.22	21.75	22.12	22.51		(38)
Heat transfer co	oefficier	nt, W/K		-	-	-	_	(39)m	= (37) + (3	38)m	-		
(39)m= 47.11	46.9	46.69	45.71	45.52	44.67	44.67	44.51	45	45.52	45.9	46.28		
Heat loss parar	neter (H	ILP), W/	m²K						Average = = (39)m ÷		12 /12=	45.71	(39)
(40)m= 1.35	1.34	1.33	1.31	1.3	1.28	1.28	1.27	1.29	1.3	1.31	1.32		
Number of days	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.31	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heati	ng ener	gy requi	rement:								kWh/ye	ear:	
Assumed occup	nancy N	N									28		(42)
if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		20		(42)
Annual average	hot wa										.62		(43)
Reduce the annual not more that 125 li					_	-	to achieve	a water us	se target o	f			
		-					Α.	0		NI.	<b>D</b>		
Jan   Hot water usage in	Feb litres per	Mar day for ea	Apr ach month	Vd,m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 71.08	68.49	65.91	63.32	60.74	58.16	58.16	60.74	63.32	65.91	68.49	71.08		
(11)= 11.00	00.10	00.01	00.02	00.7 1	00.10	00.10	00.7 1		Total = Su	<u> </u>	l	775.4	(44)
Energy content of h	not water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	-	<b></b> ` '
(45)m= 105.41	92.19	95.13	82.94	79.58	68.67	63.64	73.02	73.89	86.12	94	102.08		
									Total = Su	m(45) <sub>112</sub> =	=	1016.67	(45)
If instantaneous wa			,					. ,			ı		
(46)m= 15.81 Water storage I	13.83	14.27	12.44	11.94	10.3	9.55	10.95	11.08	12.92	14.1	15.31		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	me ves	sel		150		(47)
If community he	, ,					_							
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage I													
a) If manufactu				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost from b) If manufactu		_	-		or is not		(48) x (49)	=		0.	75		(50)
Hot water stora			-								0		(51)
If community he	-			,		· ,					-		()
Volume factor f	rom Tal	hle 2a											(50)
Temperature fa	-4		Ol-							-	0		(52) (53)

Francis last franciscotor atomana LANIII / com	(47) (54) (50) (50)		
Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	0.75	(55)
			(56)
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 [50] If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷		22.58 23.33 (H11) is from Append	(56)
		· · · · · · · · · · · · · · · · · · ·	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	3 23.33 22.58 23.33	22.58 23.33	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	` '	otat)	
(modified by factor from Table H5 if there is solar water heat (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	<del></del>	22.51 23.26	(59)
` '		22.01 20.20	(33)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (4	<del>i ı ı ı </del>		(04)
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	<del></del>	<del>ì ì i</del>	·
(62)m= 152   134.28   141.73   128.03   126.18   113.76   110.2		139.1 148.68	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar		tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see /	<del>'i '' '</del>		(62)
(63)m= 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater		l l	l
(64)m= 152   134.28   141.73   128.03   126.18   113.76   110.2		139.1 148.68	4505.00 (64)
	Output from water heate	,	1565.29 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	<u> </u>	+ (57)m + (59)m	]
(65)m   72 22   64 22   69 01   62 65   62 74   59 01   59 43			(OF)
(65)m= 72.32 64.32 68.91 63.65 63.74 58.91 58.43		67.33 71.22	(65)
include (57)m in calculation of (65)m only if cylinder is in the		ļ ļ	` '
		ļ ļ	` '
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	e dwelling or hot water is fi	rom community h	` '
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	e dwelling or hot water is fi	rom community h	eating
include (57)m in calculation of (65)m only if cylinder is in the second	e dwelling or hot water is find the second s	rom community h	` '
include (57)m in calculation of (65)m only if cylinder is in the state of the state	e dwelling or hot water is find the second of the second o	Nov Dec 64.04	eating (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9	rom community h	eating
include (57)m in calculation of (65)m only if cylinder is in the second	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49	Nov Dec 64.04	eating (66)
include (57)m in calculation of (65)m only if cylinder is in the second	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08	(66)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49  5a), also see Table 5  29.4 29.4 29.4	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 8 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38	(66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 8 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3 -51.23 -51.23 -51.23	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04	Aug Sep Oct 4 64.04 64.04 64.04 4 also see Table 5 5.22 7.01 8.9 L13a), also see Table 5 9 80.56 83.41 89.49 5a), also see Table 5 29.4 29.4 29.4 3 3 3 3 -51.23 -51.23 -51.23	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3 3 -51.23 93.51 95.72	(66) (67) (68) (69) (70)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 64.04 67.00 Eighting gains (calculated in Appendix L, equation L9 or L9a). (67)m= 10.78 9.57 7.78 5.89 4.41 3.72 4.02  Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 109.19 110.33 107.47 101.39 93.72 86.51 81.69  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 29.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Aug Sep Oct 4 64.04 64.04 64.04  , also see Table 5  5.22 7.01 8.9  L13a), also see Table 5  9 80.56 83.41 89.49  5a), also see Table 5  29.4 29.4 29.4  3 3 3  3 -51.23 -51.23 -51.23  4 82.74 84.23 88.59  7)m + (68)m + (69)m + (70	Nov Dec 64.04 64.04 10.39 11.08 97.16 104.38 29.4 29.4 3 3 3 -51.23 93.51 95.72	(66) (67) (68) (69) (70)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0.92	x	11.28	x	0.63	x	0.7	] =	3.17	(75)
Northeast 0.9	0.77	X	0.28	x	11.28	X	0.63	X	0.7	=	0.97	(75)
Northeast 0.9	0.77	X	0.92	х	22.97	X	0.63	x	0.7	=	6.46	(75)
Northeast 0.9	0.77	X	0.28	x	22.97	x	0.63	x	0.7	=	1.97	(75)
Northeast 0.9	0.77	X	0.92	x	41.38	x	0.63	x	0.7	=	11.63	(75)
Northeast 0.9	0.77	X	0.28	х	41.38	X	0.63	x	0.7	=	3.54	(75)
Northeast 0.9	0.77	X	0.92	х	67.96	x	0.63	x	0.7	<u> </u>	19.11	(75)
Northeast 0.9	0.77	X	0.28	x	67.96	x	0.63	x	0.7	=	5.82	(75)
Northeast 0.9	0.77	X	0.92	x	91.35	X	0.63	x	0.7	=	25.68	(75)
Northeast 0.9	0.77	X	0.28	x	91.35	X	0.63	X	0.7	=	7.82	(75)
Northeast 0.9	0.77	X	0.92	x	97.38	X	0.63	X	0.7	=	27.38	(75)
Northeast 0.9	0.77	X	0.28	x	97.38	X	0.63	x	0.7	=	8.33	(75)
Northeast 0.9	0.77	X	0.92	х	91.1	X	0.63	X	0.7	=	25.61	(75)
Northeast 0.9	0.77	X	0.28	x	91.1	X	0.63	X	0.7	=	7.8	(75)
Northeast 0.9	0.77	X	0.92	x	72.63	x	0.63	x	0.7	] =	20.42	(75)
Northeast 0.9	0.77	X	0.28	х	72.63	x	0.63	x	0.7	<u> </u>	6.21	(75)
Northeast 0.9	0.77	X	0.92	x	50.42	X	0.63	X	0.7	=	14.18	(75)
Northeast 0.9	0.77	X	0.28	x	50.42	x	0.63	x	0.7	=	4.31	(75)
Northeast 0.9	0.77	X	0.92	х	28.07	x	0.63	x	0.7	<u> </u>	7.89	(75)
Northeast 0.9	0.77	X	0.28	x	28.07	x	0.63	x	0.7	=	2.4	(75)
Northeast 0.9	0.77	X	0.92	x	14.2	x	0.63	x	0.7	=	3.99	(75)
Northeast 0.9	0.77	X	0.28	x	14.2	x	0.63	х	0.7	] =	1.21	(75)
Northeast 0.9	0.77	X	0.92	х	9.21	x	0.63	x	0.7	<u> </u>	2.59	(75)
Northeast 0.9	0.77	X	0.28	x	9.21	x	0.63	x	0.7	=	0.79	(75)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	36.79		0.63	X	0.7	=	19.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	36.79		0.63	X	0.7	=	14.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	62.67		0.63	x	0.7	=	33.9	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	62.67		0.63	X	0.7	=	24.52	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	85.75		0.63	x	0.7	=	46.39	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	85.75		0.63	x	0.7	=	33.55	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	106.25		0.63	x	0.7	=	57.48	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	106.25		0.63	x	0.7	=	41.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	119.01	Ì	0.63	x	0.7	=	64.38	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	119.01	ĺ	0.63	x	0.7	=	46.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	118.15	ĺ	0.63	x	0.7	=	63.91	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	118.15	j	0.63	x	0.7	] =	46.22	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	x	113.91	j	0.63	x	0.7	] =	61.62	(79)
Southwest <sub>0.9</sub>	0.77	X	1.28	x	113.91	Ī	0.63	x	0.7	] =	44.56	(79)
Southwest <sub>0.9</sub>	0.77	X	1.77	х	104.39	j	0.63	х	0.7	=	56.47	(79)

Southwestip 9, 0.77																	
Southwest) 98	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	1	04.39	]		0.63	x	0.7	=	40.84	(79)
Southwesto 98	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	9	2.85			0.63	x [	0.7		50.23	(79)
Southwesto section   Southwe	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	g	2.85			0.63	x	0.7		36.32	(79)
Southwesto, as	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	6	9.27	]		0.63	x	0.7		37.47	(79)
Southwest0.3x	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	6	9.27			0.63	x [	0.7	=	27.1	(79)
Solutivesto, sx	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	4	4.07			0.63	x	0.7	=	23.84	(79)
Solar gains in watts, calculated for each month    (83)m = Sum(74)m(82)m	Southw	est <sub>0.9x</sub>	0.77	X	1.2	28	x	4	4.07			0.63	x	0.7	=	17.24	(79)
Solar gains in watts, calculated for each month   (83)m = Sum/74)m(82)m	Southw	est <sub>0.9x</sub>	0.77	X	1.7	77	x	3	1.49			0.63	x	0.7		17.03	(79)
(83)   (83)   (83)   (83)   (83)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (86)   (87)   (87)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (88)   (88)   (89)   (80)   (8	Southw	est <sub>0.9x</sub>	0.77	х	1.2	28	x	3	1.49			0.63	x	0.7		12.32	(79)
(83)   (83)   (83)   (83)   (83)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (84)   (85)   (86)   (87)   (87)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (88)   (88)   (89)   (80)   (8		_															
Total gains – intermal and solar (84)m = (73)m + (83)m, watts  (84)m= 300.83   327.67   348.19   364.86   373.44   363.1   349.05   337.67   324.9   307.05   292.56   289.12   (84)  7. Mean intermal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar	gains in	watts, ca	alculated	I for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
Relima   300.83   327.67   348.19   364.86   373.44   363.1   349.05   337.67   324.9   307.05   292.56   289.12     Relimant   14   14   10.6   7.1   4.2   4.86   14.3   4.9   5.5   8.9   1.8   1.9   1	(83)m=	38.43	66.84	95.11	123.96	144.43	14	45.84	139.59	123.	.94	105.04	74.86	46.29	32.73		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)ms 19.83 20.12 20.45 20.74 20.93 20.98 20.98 20.87 20.52 20.09 19.72 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)ms 19.81 19.81 19.84 19.84 19.86 19.86 19.86 19.85 19.85 19.85 19.84 19.83 19.82 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)ms 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.85 19.75 19.31 18.69 18.16 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)ms 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)ms 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  Sec Table 30, Sec Deating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  (94)ms 0.99 0.98 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m (95)ms 296.71 20.85 19.85 17.7 19.87 248.68 284.91 285.55 285.77 (95)  Honding area (14.1 10.6 7.1 4.2 (96))  Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m) ((93)m) (96)m)	Total g	jains – ii	nternal a	and solar	(84)m =	= (73)m ·	+ (8	33)m	, watts		•			!			
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	(84)m=	300.83	327.67	348.19	364.86	373.44	3	63.1	349.05	337	.67	324.9	307.05	292.56	289.12		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21 (85)	7 Me	an inter	nal temr	oerature	(heating	season	\ \							!			
Utilisation factor for gains for living area, h1,m (see Table 9a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (86)me   0.99   0.99   0.97   0.94   0.87   0.71   0.55   0.58   0.8   0.95   0.98   0.99   (86)    Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)					`		<i>'</i>	aroa i	from Tak	مام ۵	Th	1 (°C)				21	(85)
Sep			_	٠.			_			л <del>с</del> э,	, 111	1 ( 0)				21	(00)
(86)me   0.99   0.99   0.97   0.94   0.87   0.71   0.55   0.58   0.8   0.95   0.98   0.99   (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)me   19.73   19.88   20.12   20.45   20.74   20.93   20.98   20.98   20.87   20.52   20.09   19.72   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)me   19.8   19.81   19.81   19.84   19.84   19.86   19.86   19.86   19.85   19.84   19.83   19.82   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)me   0.99   0.98   0.97   0.92   0.82   0.61   0.41   0.45   0.72   0.92   0.98   0.99   0.99   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)me   18.16   18.38   18.73   19.21   19.59   19.81   19.85   19.85   19.75   19.31   18.69   18.16   (90)  ### Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)me   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)me   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (93)  8. Spece heating requirement  Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec  Utilisation factor for gains, hmmm   W = (94)m x (84)m   (95)me   296.74   320.86   335.54   337.52   313.51   244.36   173.21   179.87   248.68   284.91   285.55   285.77   (95)  Honthly average external temperature from Table 8  (96)me   4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)  Heat loss rate for mean internal temperature, Lm   W = ((39)m × ((93)m – (96)m)	Utilisa			i	<u>`</u>		Ė			Ι		Con	0 1	Nov	l Daa	٦	
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         (87)m= 19.73 19.88 20.12 20.46 20.74 20.93 20.98 20.98 20.98 20.87 20.52 20.09 19.72 (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)m= 19.8 19.81 19.81 19.84 19.84 19.84 19.86 19.86 19.86 19.85 19.85 19.84 19.83 19.82 (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m= 0.99 0.98 0.97 0.92 0.82 0.61 0.41 0.45 0.72 0.92 0.98 0.99 (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.75 19.31 18.69 18.16 (90)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2         (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Utilisation factor for gains, hmgm, W = (94)m x (84)m         (95)m= 296.74 320.85 335.54 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77	(0C)m				<del></del>	<del>-</del>	$\vdash$			_	Ť			+		-	(96)
(87)me	(00)111=	0.99	0.99	0.97	0.94	0.67		J. / I	0.55	0.5	00	0.6	0.95	0.98	0.99		(80)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.8 19.81 19.81 19.84 19.84 19.84 19.86 19.86 19.86 19.86 19.85 19.84 19.83 19.82 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.98 0.97 0.92 0.82 0.61 0.41 0.45 0.72 0.92 0.98 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.85 19.85 19.31 18.69 18.16 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 131.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm, W = ((93)m x (93)m x (93)m - (96)m)	Mean		<u>-</u>		<u> </u>	<del></del>	_				_	9c)		,		_	
(88)m=	(87)m=	19.73	19.88	20.12	20.45	20.74	2	0.93	20.98	20.9	98	20.87	20.52	20.09	19.72		(87)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99  0.98  0.97  0.92  0.82  0.61  0.41  0.45  0.72  0.92  0.98  0.99  (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.16  18.38  18.73  19.21  19.59  19.81  19.85  19.85  19.75  19.31  18.69  18.16  (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.15  19.32  19.61  19.99  20.31  20.51  20.56  20.56  20.46  20.07  19.57  19.14  (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15  19.32  19.61  19.99  20.31  20.51  20.56  20.56  20.46  20.07  19.57  19.14  (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, Institute obtained at step 11 of Table 9b,	Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Tr	n2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   FLA = Living area ÷ (4) = 0.63   (91)	(88)m=	19.8	19.81	19.81	19.84	19.84	1	9.86	19.86	19.8	86	19.85	19.84	19.83	19.82		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   FLA = Living area ÷ (4) = 0.63   (91)	l Itilie	ation fac	tor for a	aine for	rest of d	welling	h2	m (sc	a Tabla	02)				•			
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m= 18.16 18.38 18.73 19.21 19.59 19.81 19.85 19.85 19.75 19.31 18.69 18.16       (90)         LA = Living area + (4) = 0.63 (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2         (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)         8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Utilisation factor for gains, hm:         (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)         Useful gains, hmGm , W = (94)m x (84)m         (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77       (95)         Monthly average external temperature from Table 8         (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2       (96)         Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m – (96)m]					i	<del></del>	_		1	<u> </u>	15	0.72	0.92	0.98	0.99	٦	(89)
(90)me	, ,			<u>l</u>		<u> </u>								1 333			` ,
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]				1	r	1	Ť	<u> </u>		<del></del>	$\overline{}$			1		¬	(00)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m-(96)m]	(90)m=	18.16	18.38	18.73	19.21	19.59	1	9.81	19.85	19.8	85					_	``´
(92)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm: (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]												T	LA = LIVI	ng area ÷ (	4) =	0.63	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.15 19.32 19.61 19.99 20.31 20.51 20.56 20.56 20.46 20.07 19.57 19.14 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) x T2					
(93)   19.15   19.32   19.61   19.99   20.31   20.51   20.56   20.56   20.46   20.07   19.57   19.14   (93)   8. Space heating requirement    Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec    Utilisation factor for gains, hm:  (94)m= 0.99   0.98   0.96   0.93   0.84   0.67   0.5   0.53   0.77   0.93   0.98   0.99   0.94    Useful gains, hmGm , W = (94)m x (84)m    (95)m= 296.74   320.85   335.54   337.52   313.51   244.36   173.21   179.87   248.68   284.91   285.55   285.77   (95)    Monthly average external temperature from Table 8    (96)m= 4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)    Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(92)m=	19.15	19.32	19.61	19.99	20.31	2	0.51	20.56	20.	56	20.46	20.07	19.57	19.14		(92)
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Apply	adjustn	nent to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	(93)m=	19.15	19.32	19.61	19.99	20.31	2	0.51	20.56	20.	56	20.46	20.07	19.57	19.14		(93)
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	8. Sp	ace hea	ting requ	uirement													
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:           (94)m=           0.99         0.98         0.96         0.93         0.84         0.67         0.5         0.53         0.77         0.93         0.98         0.99         (94)           Useful gains, hmGm, W = (94)m x (84)m           (95)m=         296.74         320.85         335.54         337.52         313.51         244.36         173.21         179.87         248.68         284.91         285.55         285.77         (95)           Monthly average external temperature from Table 8           (96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2         (96)           Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m- (96)m]         [93)m- (96)m]					•		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-ca	lculate	
Utilisation factor for gains, hm:	the ut	ilisation		or gains	using Ta	able 9a										_	
(94)m= 0.99 0.98 0.96 0.93 0.84 0.67 0.5 0.53 0.77 0.93 0.98 0.99 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]				<u> </u>	<u> </u>	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = $(94)$ m x $(84)$ m (95)m= $296.74$ $320.85$ $335.54$ $337.52$ $313.51$ $244.36$ $173.21$ $179.87$ $248.68$ $284.91$ $285.55$ $285.77$ (95) Monthly average external temperature from Table 8 (96)m= $4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ (96) Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m – $(96)$ m $]$							_									_	
(95)m= 296.74 320.85 335.54 337.52 313.51 244.36 173.21 179.87 248.68 284.91 285.55 285.77 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]					l		(	0.67	0.5	0.5	53	0.77	0.93	0.98	0.99		(94)
Monthly average external temperature from Table 8 $(96)m = \begin{array}{c ccccccccccccccccccccccccccccccccccc$				<del>`</del>	<del></del>	·	_								-	_	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]				l			<u> </u>		173.21	179.	.87	248.68	284.91	285.55	285.77		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]				1	i	ı	_		ı	_				1	1	7	(n=1
					<u> </u>				<u> </u>					7.1	4.2		(96)
(97)m= 699.6 676.31 611.88 507.03 392.1 264.19 177.07 185.2 285.97 431.29 572.3 691.6 (97)				r		r	_		<del>-``                                   </del>	<del>- `</del>	<del>_</del> _	<u> </u>		1.		7	(0=)
	(97)m=	699.6	676.31	611.88	507.03	392.1	20	54.19	177.07	185	5.2	285.97	431.29	572.3	691.6		(97)

Total per year (kWh/year) = Sum(188) =   1542.01   (86)	Space heating requirement f	or each r	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	5)m] x (4	1)m			
Space heating requirement in kWh/m²/year  Space heating: Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year  Space heating requirement (calculated above)  299.73   298.87   206.59   122.40   58.47   0   0   0   0   108.9   206.46   301.94    211)m = f([08]m x (2014)] \} x 100 + (206)  320.57   255.48   219.88   30.53   62.54   0   0   0   0   116.47   220.81   322.93    Total (kWh/year) =Sum(211), xm., y* 0   166.29    216;m= 0   0   0   0   0   0   0   0   0   0	(98)m= 299.73 238.87 205.59	122.04	58.47	0	0			<u> </u>	<u> </u>			_
Space heating:						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	1542.01	(98)
Space heating	Space heating requirement i	n kWh/m²	²/year								44.06	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s)  Fraction of total heating from main system1  Efficiency of secondary/supplementary heating system1  Efficiency of secondary/supplementary heating system3  Efficiency of secondary/supplementary heating system3  In the secondary supplementary heating system3  Efficiency of secondary/supplementary heating system3  In the secondary supplementary heating system3  Efficiency of secondary/supplementary heating system3  In the secondary supplementary supp		dividual h	eating sy	/stems i	ncluding	g micro-C	HP)					
Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  299.73   298.87   205.99   122.04   58.47   0   0   0   0   108.9   206.46   301.94    (211) m = {((98)m x (204))} x 100 ÷ (206)  Space heating fuel (secondary), kWh/month = {((98)m x (204))} x 100 ÷ (208)  215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		secondar	v/sunnle	mentary	, system						0	7(201
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (204) = (202) × [1 - (203)] = (202) × [	-			mornary	oyotom		- (201) <b>=</b>					(202)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)  299.73   238.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94    (211)m = {[(98)m x (204)]}	·	•	, ,			(204) = (20	02) × [1 –	(203)] =				(204
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	_	-									93.5	(206)
Space heating requirement   Calculated   above   299.73   238.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94   (211) m = { (98)m × (204)  }	Efficiency of secondary/supp	lementar	y heating	g systen	າ, %						0	(208)
299.73   28.87   205.59   122.04   58.47   0   0   0   0   108.9   206.46   301.94	Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	<b>⊐</b> ar
(211)m = {[(98)m x (204)] } x 100 ÷ (206)   (211)m = {[(198)m x (204)] } x 100 ÷ (206)   (211)m = {[(198)m x (204)] } x 100 ÷ (208)   (211)m = {[(198)m x (201)] } x 100 ÷ (208)   (211)m = {[(198)m x (201)] } x 100 ÷ (208)   (215)m = 0   0   0   0   0   0   0   0   0   0	Space heating requirement (	calculate	d above)					•	•		· ·	
Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel secondary)   Space heating fuel secondary   Space heating fuel secondary   Space heating fuel used   Space heatin	299.73 238.87 205.59	122.04	58.47	0	0	0	0	108.9	206.46	301.94		
Total (kWhyear) = Sum(211),								T 440 47	T 000 04		1	(211)
Space heating fuel (secondary), kWh/month = { { ((98)m x (201)] } x 100 ÷ (208) }	320.57 255.48 219.88	130.53	62.54	0	0						1649.21	7(211)
Carrell   Carr		• •	month/									`
Water heating         Water heating from separate community system:         Annual water heating requirement         1565.29         (64)           Annual water heating requirement         kWh/year         kWh/year         kWh/year         kWh/year         1649.21 </td <td></td> <td>т —</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td>		т —	0	0	0	0	0	0	0	0		
Water heating fuel used  Electricity for pumps, fans and electric keep-hot  central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  Energy kWh/year  Space heating (main system 1)  (211) x  0.216  Emissions kg CO2/year  Space heating (secondary)  (215) x  0.519  Water heating	Water heating from separate		ty systen	n:				k'	Wh/yeaı	•		<b>」</b> ``
Electricity for pumps, fans and electric keep-hot  central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy  kWh/year  Energy  kWh/year  Energy  kWh/year  Space heating (main system 1)  (211) x  0.216  Emissions  kg CO2/kWh  kg CO2/kWh  Space heating (secondary)  (215) x  0.519  0  (263  (261  (262  (262  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (261  (263  (264  (264  (264  (264  (264  (265  (266  (26	Space heating fuel used, mai	n system	1								1649.21	
central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Space heating (main system 1)  (211) x  (215) x  (215) x  (216) =  (256.23  (264)  (264)  Water heating (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (217) x  (218) x  (219) x  (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (217) x  (218) x  (219) x  (219) x  (219) x  (219) x  (210) x  (210) x  (211) x  (211) x  (211) x  (212) x  (213) x  (214) x  (215) x  (215) x  (216) =  (217) x  (218) x  (218) x  (219) x  (219) x  (219) x  (219) x	Water heating fuel used										1870.3	
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  190.32  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year  KWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Energy kWh/year  Space heating (main system 1)  (211) x  (211) x  (212) x  (215) x  (216) =  (216) =  (216) =  (216) =  (217) x  (218) =  (218) (264) =  (219) x  (219) x  (219) x  (210) x  (210) x  (210) x  (210) x  (211) x  (211) x  (212) x  (212) x  (213) x  (224) x  (225) x  (226) x  (226) x  (227) x  (228) x  (228) x  (229) x  (229) x  (229) x  (220) x	Electricity for pumps, fans and	d electric	keep-ho	t								
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231 190.32) (232 12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261 Space heating (secondary) (215) x 0.519 = 0 (263 Water heating (219) x 0.216 = 403.98 (264 Water heating (219) x 0.216 = 403.98 (264 Water heating (230a)(230g) = 75 (231	central heating pump:									30		(230
Electricity for lighting  190.32 (232  12a. CO2 emissions – Individual heating systems including micro-CHP  Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261  Space heating (secondary) (215) x 0.519 = 0 (263  Water heating (219) x 0.216 = 403.98 (264	boiler with a fan-assisted fluo	9								45		(230
Energy Emission factor kg CO2/kWh Space heating (main system 1)  Space heating (secondary)  Energy Emission factor kg CO2/kWh  Space heating (secondary)  Emissions kg CO2/year  Space heating (secondary)  (211) x 0.216 = 356.23 (261)  (215) x 0.519 = 0 (263)  (219) x 0.216 = 403.98 (264)	Total electricity for the above,	kWh/yea	ar			sum	of (230a)	(230g) =	:		75	(231)
Energy kWh/year kg CO2/kWh kg CO2/year  Space heating (main system 1) (211) x 0.216 = 356.23 (261)  Space heating (secondary) (215) x 0.519 = 0 (263)  Water heating (219) x 0.216 = 403.98 (264)	Electricity for lighting										190.32	(232)
kWh/year       kg CO2/kWh       kg CO2/year         Space heating (main system 1)       (211) x       0.216       = 356.23       (261         Space heating (secondary)       (215) x       0.519       = 0 (263         Water heating       (219) x       0.216       = 403.98       (264	12a. CO2 emissions – Indivi	dual heat	ing syste	ems inclu	uding mi	icro-CHP	,					
Space heating (secondary)  Water heating  (215) x  (215) x  (216) = 0 (263)  (264)										tor		
Space heating (secondary)  (215) x  (215) x  (217) x  (218) x  (219) x  (219) x  (219) x  (219) x	Space heating (main system	1)			-			0.2	16	=	356.23	(261
Water heating (219) x 0.216 = 403.98 (264	Space heating (secondary)			(21	5) x					=		` (263
				(219	9) x					=		_
	Space and water heating					+ (263) + (	264) =	<u> </u>	. •		760.21	(265)

Water heating from community system

		Energy kWh/year	Emissior kg CO2/k			ssions O2/year	
Electrical energy for heat distribution		[(313) x	0		=	0	(372)
Total CO2 associated with community systems		(363)(366) + (368)(3	72)		=	0	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=		38.93	(267)
Electricity for lighting	(232) x		0.519	=		98.78	(268)
Total CO2, kg/year		sum of (26	5)(271) =			897.92	(272)
TER =						37.6	(273)

### **SAP Input**

#### Property Details: Flat Type C - ASHP + PV

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 35.12 m<sup>2</sup> 3.09 m

Living area: 23.9 m<sup>2</sup> (fraction 0.681)

Front of dwelling faces: North East

$\cap$	nanina	types:
$^{\circ}$	permig	types.

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D6_01	Manufacturer	Solid			Metal
Vent_06_01	Manufacturer	Solid			
Vent_06_05	Manufacturer	Solid			
Vent_06_04	Manufacturer	Solid			
Vent_06_06	Manufacturer	Solid			
V_D6_01	Manufacturer	Solid			Metal
Window_06_01	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_04	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_06_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	

Name:	Gap:	Frame Facto	r: g-value:	U-value:	Area:	No. of Openings:
D6_01	mm	0	0	1	2.13	1
Vent_06_01	mm	0	0	1	0.72	1
Vent_06_05	mm	0	0	1	0.99	1
Vent_06_04	mm	0	0	1	0.72	1
Vent_06_06	mm	0	0	1	0.72	1
V_D6_01	mm	0	0	1	0.63	1
Window_06_01	6mm	0.7	0.4	1.2	1.08	1
Window_06_04	6mm	0.7	0.4	1.2	1.97	1
Window_06_04	6mm	0.7	0.4	1.2	1.42	1
Window_06_05	6mm	0.7	0.4	1.2	1.45	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D6_01		06_01	North East	0	0
Vent_06_01		06_03	North East	0.6	1.2
Vent_06_05		06_03	South East	0.6	1.65
Vent_06_04		06_05	South West	0.6	1.2

### **SAP Input**

Vent_06_06	06_06	South West	0.6	1.2
V_D6_01	06_01	North East	0.3	2.11
Window_06_01	06_03	North East	0.9	1.2
Window_06_04	06_04	South East	1.195	1.65
Window_06_04	06_05	South West	1.185	1.2
Window_06_05	06_06	South West	1.21	1.2
Fanlight	06_01	North East	1.01	0.315

Overshading: Average or unknown

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
06_01	10.506	3.08	7.43	0.13	0	False	N/A
06_03	8.065	2.79	5.27	0.13	0	False	N/A
06_04	19.498	1.97	17.53	0.13	0	False	N/A
06_05	9.425	2.14	7.29	0.13	0	False	N/A
06_06	9.023	2.17	6.85	0.13	0	False	N/A
R6_01	35.12	0	35.12	0.1	0		N/A
Internal Element	<u>S</u>						

Thermal bridges:

Party Elements

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

### **SAP Input**

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329

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

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: 0.608

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Photovoltaic 2

Installed Peak power: 0.243

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Photovoltaic 3

Installed Peak power: 0.228

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		User De	etails:						
Assessor Name:	Adam Ritchie			a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012			are Vei				n: 1.0.4.25	
		Property A	\ddress:	Flat Ty	pe C - A	SHP + F	Pγ		
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		Area	<del>` '</del>	(10) v		ight(m)	(2a) =	Volume(m³	_
	\			(1a) x	3	.09	(2a) =	108.52	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 35	5.12	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	108.52	(5)
2. Ventilation rate:	main seconda		other		40401			m³ nor hou	-
	main seconda heating heating		otner		total			m³ per hou	r 
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X :	20 =	0	(6b)
Number of intermittent fa	ns				0	X	10 =	0	(7a)
Number of passive vents	1			Ī	0	X ·	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	x -	40 =	0	(7c)
				_				_	
							Air ch	anges per ho	ur
,	ys, flues and fans = $(6a)+(6b)+$				0		÷ (5) =	0	(8)
Number of storeys in t	neen carried out or is intended, proce the dwelling (ns)	ed to (17), oi	therwise o	continue tr	om (9) to	(16)	ı	0	(9)
Additional infiltration	ne awaiing (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 for	masonr	y constr	uction		-	0	(11)
	resent, use the value corresponding	to the greate	er wall are	a (after					_
deducting areas of openii	ngs);	0.1 (sealed	d). else	enter 0				0	(12)
If no draught lobby, en	,	(0000	/,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration		C	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelope	area	2.5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has been do	one or a degi	ree air pe	rmeability	is being u	sed	ĺ		7(40)
Shelter factor	eu .	(	(20) = 1 -	[0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor	(	(21) = (18)	) x (20) =				0.12	(21)
Infiltration rate modified f	-							•··· <u></u>	<b></b> ` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 Easter (22a)m (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(-20)	5	1 3.55	0.02		L	L '''2	Lo		

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se	-		•			'	
If mechanical If exhaust air he			andiv N (S	3h) - (23a	a) v Emy (e	aguation (l	NS)) other	wice (23h	) <b>–</b> (232)		[	0.5	(2
If balanced with									) = (25a)			0.5	(2
a) If balance		-		_					2h\m + ('	23h) ∨ [·	1 _ (23c)	75.65	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(2
b) If balance	L1		<u> </u>			<u> </u>			<u>.                                    </u>				·
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extin < 0.5 ×			•	•				.5 × (23b	·)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the				•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(2
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(2
oors Type 2					0.72	Х	1	=	0.72				(:
oors Type 3					0.99	Х	1	=	0.99				(:
oors Type 4					0.72	X	1	= [	0.72				(:
													(:
oors Type 5					0.72	X	1	= [	0.72				
• •					0.72	_	1	= [	0.72				(
oors Type 6	<del>)</del> 1					×		= [					
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				(; (; (;
oors Type 5 oors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				(2
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	2 3 4 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(:
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 falls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type indows Type	2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
pors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				(1)

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity	/ Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass	`	,	P = Cm -	- TFA) in	ı kJ/m²K			Indica	tive Value	: Low	`	100	(35)
For design asses	ssments wh	ere the de	tails of the	•			ecisely the				able 1f	100	(00)
Thermal bridg				usina An	nendix k	K						13.75	(36)
if details of therm	`	,			•							13.73	(30)
Total fabric he		aro mot nar	omn (00) -	- 0.00 x (0	• /			(33) +	(36) =			36.08	(37)
Ventilation he	eat loss ca	alculated	l monthly	V				(38)m	= 0.33 × (	25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 10.07	9.96	9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m		l	
(39)m= 46.15	46.04	45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss par	ameter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	45.34	(39)
(40)m= 1.31	1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
		· · · / <del>-</del> · · ·						,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.29	(40)
Number of da	Feb	nth (Tabl	le 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)
(41)1112	20	01	00	01	00	01	01	00	01	00	01		(**)
4.384 4 1											1.30/1./		
4. Water hea	ating ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occ if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (¯	ΓFA -13.		28		(42)
if TFA > 13 if TFA £ 13	.9, N = 1 .9, N = 1	+ 1.76 x		`	,	·	, <b>-</b>	,	ГҒА -13.	9)		<u> </u>	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu	9, N = 1 9, N = 1 ge hot way	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9) 64	.68		(42)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	9, N = 1 9, N = 1 ge hot way yal average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, f	ay Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan	9, N = 1 9, N = 1 ge hot way all average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 64			, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot wa ual average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr	es per da 5% if the d rater use, f May Vd,m = fac	y Vd,av welling is not and co Jun ctor from	erage = designed to ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target o	9) 64 Nov	.68 Dec		, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan	9, N = 1 9, N = 1 ge hot way all average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	y Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us  Sep  63.39	Oct	9) 64 Nov 68.56	.68  Dec  71.15	776.21	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot wa aal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 7	erage = designed to ld)  Jul Table 1c x  58.22	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44)112 =	.68  Dec  71.15	776.21	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12:  Jan Hot water usage  (44)m= 71.15	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per proper in litres per 68.56	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 60.8	ay Vd,av lwelling is not and co Jun ctor from 7	erage = designed to ld)  Jul Table 1c x  58.22	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44)112 =	.68  Dec  71.15	776.21	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of  (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per litres per li	+ 1.76 x ater usag hot water person per Mar day for ea 65.98 used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  63.39  73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44)12 = ables 1b, 1	.68  Dec  71.15  c, 1d)  102.19	776.21 1017.73	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per proper in litres per 68.56 of hot water 92.29 water heating	+ 1.76 x  ater usag hot water person per  Mar day for ea  65.98  used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the d vater use, I  May Vd,m = fac  60.8  onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  68.39  73.97  70 to (61)	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous (46)m= 15.83	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per proper in litres per feb. 68.56 of hot water 92.29 water heatin 13.84	+ 1.76 x ater usag hot water person per Mar day for ea 65.98 used - calc 95.23	ge in litre usage by s day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39  63.39  73.97	Oct  65.98  Fotal = Su th (see Ta 86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per process for	+ 1.76 x  ater usag hot water person per  Mar day for ea 65.98  used - calc 95.23  ng at point 14.28	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no	es per da 5% if the divater use, $I$ May $Vd,m = factors$ 60.8  79.66  hot water 11.95	y Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to ld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96	+ 36 a water us  Sep  63.39  73.97  70 (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 123  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous (46)m= 15.83  Water storage	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per per per per per per per per	+ 1.76 x  ater usag hot water person per  Mar day for ea  65.98  used - calc  95.23  ng at point  14.28  includin	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 x storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa	+ 36 a water us  Sep  63.39  73.97  70 (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volumes	.9, N = 1 .9, N = 1 ge hot was all average 5 litres per process for	ter usage hot water person per Mar day for ea 65.98 used - calc 95.23 ng at point 14.28 including and no ta	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw	es per da 5% if the da vater use, I May Vd,m = factor 60.8 onthly = 4. 79.66 o hot water 11.95 colar or Water velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74 10.31 /WHRS	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if many storage Water storage	.9, N = 1 .9, N = 1 ge hot way and average 5 litres per proper in litres per proper for	+ 1.76 x  ater usag hot water person per  Mar day for ea 65.98  used - calc 95.23  ng at point 14.28  includin and no ta hot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufactors  a) If manufactors	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per per per per per per per per per per	+ 1.76 x  ater usage hot water person per  Mar day for each of the second person per day for each of the second person per day for each of the second person per day for each of the second person per	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact Temperature	.9, N = 1 .9, N = 1 ge hot way and average 5 litres per proper form 1 litres per per proper form 1 litres per per proper form 1 litres per per per per per per per per per per	+ 1.76 x  ater usage hot water person per Mar  Gay for each 65.98  used - calconditions of the person per at point 14.28  including and no tale hot water eclared learned lear	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b	es per da 5% if the d rater use, I  May  Vd,m = fac  60.8  onthly = 4.  79.66  o hot water  11.95  color or W relling, e ocludes in	y Vd,av lwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  73.97  71.1  11.1  ame vess	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44)12 = ables 1b, 1 94.1 m(45)12 = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact a) If manufact Temperature Energy lost from	9, N = 1 9, N = 1 ge hot way al average 5 litres per p 68.56 of hot water 2 92.29 water heatin 13.84 e loss: me (litres) heating a no stored e loss: cturer's defactor froom water	ter usage hot water person per Mar day for ear 65.98 used - calc 95.23 ang at point 14.28 including and no tale hot water eclared lem Table is storage	ge in litre usage by s day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the director use, if the director use, if May $Vd,m = factor 0.8$ Onthly = 4.  79.66  Onthly = 4.  11.95  Dolar or Water or Water or Water or Water or Water or Use of the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the conclude in the concludes in the conclude in t	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47)	+ 36 a water us  Sep  63.39  68.39  73.97  11.1  ame vess  ers) ente	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12:  Jan Hot water usage  (44)m= 71.15  Energy content of (45)m= 105.52  If instantaneous  (46)m= 15.83 Water storage Storage volum If community Otherwise if manufact Temperature	9, N = 1 9, N = 1 ge hot way al average 5 litres per p 68.56 of hot water 2 92.29 water heatin 13.84 e loss: me (litres) heating a no stored e loss: cturer's defactor froom water	ter usage hot water person per Mar day for ear 65.98 used - calc 95.23 ang at point 14.28 including and no tale hot water eclared lem Table is storage	ge in litre usage by s day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the director use, if the director use, if May $Vd,m = factor 0.8$ Onthly = 4.  79.66  Onthly = 4.  11.95  Dolar or Water or Water or Water or Water or Water or Use of the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the concludes in the conclude in the concludes in the conclude in t	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa (47) mbi boil	+ 36 a water us  Sep  63.39  68.39  73.97  11.1  ame vess  ers) ente	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47) (48) (49)

Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month $ 0.02  1.03  (52)  0.6  (53)  1.03  (54)  (54)  (55)$
Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       1.03       (54)         Enter (50) or (54) in (55)       1.03       (55)
Temperature factor from Table 2b 0.6 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)  Enter (50) or (54) in (55) (55)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54) Enter (50) or (54) in (55) (55)
Enter (50) or (54) in (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 (57)
Primary circuit loss (annual) from Table 3
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (41)m
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$
(62)m= 160.79 142.21 150.51 136.52 134.94 122.24 118.98 128.37 127.46 141.48 147.59 157.46 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (63)
Output from water heater
(64)m= 160.79 142.21 150.51 136.52 134.94 122.24 118.98 128.37 127.46 141.48 147.59 157.46
Output from water heater (annual) <sub>112</sub> 1668.57 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]
(65)m= 79.31 70.63 75.89 70.4 70.71 65.65 65.4 68.53 67.39 72.89 74.08 78.2 (65)
(00)111   70.00   70.00   70.11   00.00   00.4   00.00   07.00   72.00   74.00   70.2
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)  Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 77.01 (66)  Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 24.98 22.18 18.04 13.66 10.21 8.62 9.31 12.11 16.25 20.63 24.08 25.67 (67)  Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 77.01 77

Total int $(73)$ m= $\boxed{3}$	364.63	362.04	350.52	Т	332.83	315.16	20	98.92	289.12	294	42	304.33	322.17	342.04	356.63	1	(73)
6. Solai			000.02		002.00	010.10	1 -	JO.02	200.12	257	. 72	004.00	OZZ.11	042.04	000.00		( /
			using so	lar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applic	able orientat	tion.		
Orientati		ccess Fable 6d	actor		Area m²			Flu Tal	x ble 6a		T	g_ able 6b		FF Table 6c		Gains (W)	
Northeas	t <sub>0.9x</sub>	0.77		х	1.0	18	x	1	1.28	x		0.4	x	0.7		2.36	(75)
Northeas	t 0.9x	0.77		X	0.3		x		1.28	)   x		0.4	×	0.7	=	0.7	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	1.0	18	x	2	22.97	x		0.4	x	0.7	<del>=</del> =	4.81	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	2	x	2	22.97	x		0.4	x	0.7		1.43	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	1.0	18	x	4	1.38	x		0.4	×	0.7	=	8.67	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	32	x	4	1.38	x		0.4	x	0.7	=	2.57	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	6	67.96	x		0.4	x	0.7	=	14.24	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	0.3	2	x	6	67.96	x		0.4	x	0.7	=	4.22	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	ç	1.35	x		0.4	x	0.7	<del>=</del>	19.14	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	0.3	2	x	ç	1.35	x		0.4	x	0.7	<del>=</del>	5.67	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	9	7.38	x		0.4	x	0.7	=	20.41	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	0.3	2	x	9	7.38	x		0.4	X	0.7	=	6.05	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	,	91.1	x		0.4	x	0.7	=	19.09	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	0.3	32	x	,	91.1	x		0.4	x	0.7	=	5.66	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	7	2.63	x		0.4	x	0.7	=	15.22	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	32	x	7	2.63	X		0.4	x	0.7	=	4.51	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	1.0	18	x	5	50.42	x		0.4	x	0.7	=	10.57	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	32	x	5	50.42	X		0.4	x	0.7	=	3.13	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	1.0	18	x	2	28.07	x		0.4	x	0.7	=	5.88	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	32	x	2	28.07	x		0.4	X	0.7	=	1.74	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	1.0	18	x		14.2	x		0.4	x	0.7	=	2.98	(75)
Northeas	t <sub>0.9x</sub>	0.77		x	0.3	2	x		14.2	x		0.4	x	0.7	=	0.88	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	1.0	18	x	,	9.21	x		0.4	x	0.7	=	1.93	(75)
Northeas	t <sub>0.9x</sub>	0.77		X	0.3	32	x	,	9.21	X		0.4	x	0.7	=	0.57	(75)
Southeas	t 0.9x	0.77		X	1.9	7	x	3	86.79	x		0.4	x	0.7	=	14.06	(77)
Southeas	t 0.9x	0.77		X	1.9	17	x	6	62.67	X		0.4	X	0.7	=	23.96	(77)
Southeas	t 0.9x	0.77		X	1.9	17	x	8	35.75	X		0.4	x	0.7	=	32.78	(77)
Southeas	t 0.9x	0.77		X	1.9	17	x	1	06.25	x		0.4	x	0.7	=	40.62	(77)
Southeas	t 0.9x	0.77		x	1.9	7	x	1	19.01	x		0.4	×	0.7	=	45.49	(77)
Southeas	t 0.9x	0.77		x	1.9	7	X	1	18.15	x		0.4	×	0.7	=	45.16	(77)
Southeas	t 0.9x	0.77		x	1.9	7	X	1	13.91	x		0.4	×	0.7	=	43.54	(77)
Southeas	t 0.9x	0.77		X	1.9	7	х	1	04.39	x		0.4	×	0.7	=	39.9	(77)
Southeas	t 0.9x	0.77		X	1.9	7	X	9	92.85	x		0.4	x	0.7	=	35.49	(77)
Southeas	t <sub>0.9x</sub>	0.77		x	1.9	7	x	6	9.27	x		0.4	×	0.7		26.48	(77)

								-			_					_
Southeast 0.9x	0.77	X	1.9	)7	X	4	4.07	X		0.4	X	0.7		=	16.85	(77)
Southeast 0.9x	0.77	X	1.9	7	X	3	1.49	X		0.4	X	0.7		=	12.04	(77)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	3	6.79	]		0.4	X	0.7		=	10.14	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>!</b> 5	X	3	6.79	]		0.4	X	0.7		=	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	6	2.67	]		0.4	X	0.7		=	17.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	X	6	2.67			0.4	x	0.7		=	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	8	5.75			0.4	x	0.7		=	23.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	<b>1</b> 5	X	8	5.75			0.4	x	0.7		=	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	1	06.25	]		0.4	x	0.7		=	29.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	1	06.25	]		0.4	x	0.7		=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	19.01	Ī		0.4	X	0.7		=	32.79	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	1	19.01	Ī		0.4	x	0.7		=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	18.15	Ī		0.4	X	0.7		=	32.55	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	15	X	1	18.15	Ī		0.4	x	0.7		=	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	2	X	1	13.91	ĺ		0.4	x	0.7		=	31.39	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	ļ5	X	1	13.91	ĺ		0.4	x	0.7		=	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	1	04.39	j		0.4	x	0.7		=	28.76	(79)
Southwest <sub>0.9x</sub>	0.77	х	1.4	ŀ5	X	1	04.39	ĺ		0.4	x	0.7		=	29.37	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	12	X	9	2.85	j		0.4	×	0.7		=	25.58	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	9	2.85	j		0.4	×	0.7		=	26.12	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	6	9.27	ĺ		0.4	x	0.7		=	19.09	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	6	9.27	ĺ		0.4	X	0.7		=	19.49	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	4	4.07	ĺ		0.4	x	0.7		=	12.14	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	4	4.07	ĺ		0.4	x	0.7		=	12.4	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	3	1.49	ĺ		0.4	X	0.7		=	8.68	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	15	X	3	1.49	ĺ		0.4	X	0.7		=	8.86	(79)
_								_								
Solar gains in	watts, ca	lculated	for eac	h month	า			(83)n	n = Sı	um(74)m .	(82)m					
(83)m= 37.62	65.1	91.78	118.25	136.58	1	37.42	131.73	117	7.77	100.9	72.68	3 45.25	32.0	)8		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts					_				
(84)m= 402.25	427.14	442.3	451.07	451.74	4	36.33	420.85	412	2.19	405.23	394.8	5 387.28	388.	71		(84)
7. Mean inter	nal temp	erature (	(heating	seaso	n)											
Temperature	during h	eating p	eriods ir	n the liv	ing	area	from Tal	ble 9	, Th	1 (°C)					21	(85)
Utilisation fac	tor for ga	ains for li	iving are	ea, h1,n	n (s	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug	Sep	Ос	t Nov	De	ЭС		
(86)m= 0.89	0.87	0.83	0.77	0.68	1	0.55	0.43	0.4	45	0.61	0.77	0.86	0.8	9		(86)
Mean internal	tempera	ature in I	iving ar	ea T1 (1	follo	w ste	ns 3 to 7	7 in 7	 Γable	9c)			•		l	
(87)m= 19.01	19.21	19.57	20.03	20.46	_	20.78	20.91	20		20.69	20.19	19.54	18.9	97		(87)
Temperature	during h	ooting n	oriode ir	roct of	f du	olling	from To	hlo i	 0 Th				I			
(88)m= 20.34	20.34	20.35	20.35	20.36	$\overline{}$	20.36	20.36	20.		20.36	20.30	3 20.35	20.3	35		(88)
` '	l l							<u> </u>				1	1			V= =/
Utilisation fac	tor for ga	0.82	0.76	welling, 0.66	$\overline{}$	, <b>m (se</b> 0.51	e Table	9a) 0.	<u>, 1</u>	0.57	0.75	0.84	0.8	ο		(89)
(89)m= 0.88	0.00	0.02	0.76	0.00	<u>L</u> '	U.U I	0.37	1 0.	· <del>·</del>	0.07	0.75	0.84	J 0.8	<b>J</b>		(69)

0)m=	interna 18.48	18.69	19.03	19.49	19.9	20.2	20.31	20.3	20.12	19.65	19.02	18.45		(90
L						l			f	fLA = Livin	g area ÷ (	4) =	0.68	(91
Леап	internal	l temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) x T2					
2)m=	18.84	19.05	19.4	19.86	20.28	20.59	20.72	20.71	20.51	20.01	19.37	18.8		(92
ı Vlqq <i>l</i>	adjustn	nent to tl	ne mean	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate		<u> </u>		
3)m=	18.84	19.05	19.4	19.86	20.28	20.59	20.72	20.71	20.51	20.01	19.37	18.8		(93
B. Spa	ace hea	ting requ	uirement											
			ernal ter or gains i	•		ed at ste	ep 11 of	Table 9b	o, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
ſ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ء Jtilisa	tion fac	tor for g	ains, hm		,									
4)m=	0.86	0.84	0.8	0.74	0.65	0.53	0.4	0.43	0.58	0.74	0.82	0.87		(94
ء Jsefu	I gains,	hmGm .	W = (94	1)m x (84	4)m									
5)m=	345.36	357.5	354.66	334.87	295.24	229.51	169.75	175.2	235.8	290.41	319.02	336.73		(98
ı lonth/	lly avera	age exte	rnal tem	perature	from Ta	able 8						<u>.                                    </u>		
s)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		(9
leat l	oss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
')m=	671.06	651.2	592.26	497.16	388.12	267.79	184.2	192.09	287.99	426.04	558.19	667.4		(9
pace	heating	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
Г		·				i			· `	<del></del>				
)m=	242.32	197.37	176.77	116.85	69.11	0	0	0	0	100.91	172.2	246.01		
3)m= [	242.32	197.37	176.77	116.85	69.11	0	0					└──┤	1321.54	(9
΄ [						0	0			100.91 (kWh/year		└──┤		닠`
pace	heating	g require	ement in	kWh/m²	?/year			Tota	l per year			└──┤	1321.54 37.63	닠`
Space	e heating	g require	ement in	kWh/m²	?/year				l per year			└──┤		닠`
i. Ene	e heating	g require quiremer	ement in nts – Indi	kWh/m² vidual h	?/year eating sy	ystems i	ncluding	Tota	l per year			└──┤	37.63	(98
Space  Tene	e heating ergy reo e heating on of sp	g require quiremer ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdar	eating sy	ystems i	ncluding system	Tota	I per year			└──┤		(99)
Space  Ene	e heating ergy reo e heating on of sp	g require quiremer ng: pace hea	ement in nts – Indi	kWh/m² vidual h econdar	eating sy	ystems i	ncluding system	Tota	I per year			└──┤	37.63	(9
Space Space Fraction	e heating ergy rec e heating on of sp on of sp	g require quiremen ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdary ain syst	eating sy y/supple em(s)	ystems i	ncluding system	Tota	I per year CHP) - (201) =	(kWh/year		└──┤	37.63	(9)
pace pace raction raction	e heating ergy receive heating on of spon of spon of toton	g require quiremen ng: pace hea pace hea tal heatin	ement in ats – Indi at from se at from m	kWh/m² vidual h econdary ain syst main syst	eating sy y/supple em(s) stem 1	ystems i	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	0 1	(9)
Epace Epace Fraction Fraction Fraction Fraction	e heating ergy receive heating on of spon of spon of total	g require quiremen ng: pace hea pace hea tal heatin	ement in ts – Indi t from se t from m	kWh/m² vidual he econdary ain systemain system	eating sy y/supple em(s) stem 1	ystems i mentary	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	0 1	(2)
pace. Energy pace. Fraction raction fraction fra	e heating ergy receive heating on of sp on of total	g require quirement ng: pace hea pace hea tal heatin main spa	ement in ats – Indi at from se at from m ag from a ace heati ry/supple	kWh/m² vidual h econdary ain systemain systementary	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary	ncluding system	Tota micro-C (202) = 1 - (204) = (204)	T per year  CHP)  - (201) =  02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	37.63 0 1 1 100 0	(9)
Epace Fraction Fraction Fraction Efficie	e heating e heating on of sp on of total ency of se uncy of se	g require  quiremen  ng:  pace hea  pace hea  tal heatin  main spa  seconda	ement in  outs - Indi  out from secut from mang from outling from outl	kWh/m² vidual h econdary ain systemain systementary Apr	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary g system Jun	ncluding system	Tota    micro-C	I per year CHP) - (201) =	(kWh/year		└──┤	37.63 0 1 1 100	(9)
pace pace raction raction fraction fraction	e heating ergy receive heating on of spon of total ency of receive of spon of spon of total ency of spon of sp	g require  quiremen  ng:  pace hea  pace hea  tal heatil  main spa  seconda  Feb  g require	ement in  Its – Indi  It from se  It from m  Ing from I  Ing from I  Ing heati  Ing Mar  Ing ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 -  (204) = (204)	I per year  CHP)  - (201) =  02) × [1 -	(kWh/year	Nov	8) <sub>15,912</sub> =	37.63 0 1 1 100 0	(9)
Space  Space Fraction  Fra	e heating requirements on of spon of to ency of spon of spon of to ency of spon of spon of to ency of spon of	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  197.37	ement in  at from set from mag from ace heating  Mar  ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota micro-C (202) = 1 - (204) = (204)	T per year  CHP)  - (201) =  02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	37.63 0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction  Fra	e heating e heating on of sp on of to ency of r ency of s Jan e heating 242.32 = {[(98)	g require  ng: pace hea pace hea tal heatin main spa seconda  Feb g require  197.37	ement in  Its – Indi  It from set from many from in  It from many	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug	per year   CHP)	(kWh/year	Nov	8) <sub>15,912</sub> =	37.63 0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction  Fra	e heating requirements on of spon of to ency of spon of spon of to ency of spon of spon of to ency of spon of	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  197.37	ement in  at from set from mag from ace heating  Mar  ement (c	kWh/m² vidual h econdary ain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	I per year   CHP)	(kWh/year	Nov 172.2	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space  Space Fraction  Fra	e heating e heating on of sp on of to ency of r ency of s Jan e heating 242.32 = {[(98)	g require  ng: pace hea pace hea tal heatin main spa seconda  Feb g require  197.37	ement in  Its – Indi  It from set from many from in  It from many	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	I per year   CHP)	(kWh/year	Nov 172.2	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	37.63 0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
pace pace raction raction fraction heating e heating e heating on of sp on of to ency of r ency of s  Jan 242.32 = {[(98) 242.32	g require  quirement  ng:  pace head  pace head  tal heatin  main space  seconda  Feb  g require  197.37  )m x (20  197.37  g fuel (se	ement in  at from set from mag from ace heating the set of the set	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	I per year   CHP)	(kWh/year	Nov 172.2	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	
Space Fraction Fracti	e heating e heating on of sp on of too ency of se ncy of se de heating 242.32 e heating e heating 242.32	g require  ruiremen  ruire	ement in  at from set from mag from ace heati  ry/supple  Mar  ement (c  176.77  4)] } x 1	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating syly/supple em(s) stem 1 em 1 y heating May d above 69.11 em 1 em 1 em 1 em 1 em 1 em 1 em 1 e	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 211) <sub>15,1012</sub>	8) <sub>15,912</sub> =	0 1 1 100 0 kWh/ye	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space Fraction Fracti	e heating e heating e heating on of sp on of to ency of r ency of s  Jan 242.32 = {[(98) 242.32	g require  quirement  ng:  pace head  pace head  tal heatin  main space  seconda  Feb  g require  197.37  )m x (20  197.37  g fuel (se	ement in  at from set from mag from ace heating the set of the set	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 69.11	ystems i mentary g system Jun	ncluding system n, % Jul	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating on of sp on of too ency of se ncy of se de heating 242.32 e heating e heating 242.32	g require  ruiremen  ruire	ement in  Its – Indi  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from secondary  It from set from many from the secondary  It from secondary  It from set from secondary  It fro	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating syly/supple em(s) stem 1 em 1 y heating May d above 69.11 em 1 em 1 em 1 em 1 em 1 em 1 em 1 e	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
space space fraction	e heating e heating on of sp on of too ency of se ncy of se de heating 242.32 e heating e heating 242.32	g require  ruiremen  rig:  pace hea  pace hea  tal heatin  main spa  seconda  Feb  g require  197.37  )m x (20  197.37  g fuel (second)  0	ement in  Its – Indi  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from many from the secondary  It from set from secondary  It from set from many from the secondary  It from secondary  It from set from secondary  It fro	kWh/m² vidual h econdary ain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85	eating syly/supple em(s) stem 1 em 1 y heating May d above 69.11 em 1 em 1 em 1 em 1 em 1 em 1 em 1 e	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating e heating on of sp on of sp on of to ency of se de heating 242.32  = {[(98) 242.32  e heating m x (20) neating	g require  ng: pace head pace head pace head tal heatin main space seconda  Feb g require 197.37 )m x (20 197.37  g fuel (so 01)] } x 1 0	ement in  Its – Indi  It from set from many from it from many from it from many from it from many from it from many from it from from from from from from from from	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May dabove) 69.11 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	37.63  0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Fraction Fracti	e heating e heating e heating on of sp on of sp on of to ency of se de heating 242.32  = {[(98) 242.32  e heating m x (20) neating	g require  ng: pace head pace head pace head tal heatin main space seconda  Feb g require 197.37 )m x (20 197.37  g fuel (so 01)] } x 1 0	ement in  at from set from many from in  ace heating ment (content from many from in  ace heating ment (content from many from in  ace heating ment (content from many from in  ace heating many from in	kWh/m² vidual h econdary ain systemain systemain systementary Apr alculated 116.85 00 ÷ (20 116.85 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May dabove) 69.11 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0  Tota	I per year	(kWh/year (203)] = Oct 100.91 100.91 ar) =Sum(2	Nov 172.2 172.2 0	8) <sub>15,912</sub> = [  Dec  246.01	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2

				7
Factor for charging method for comm	unity water heating		1	(305)
Distribution loss factor (Table 12c) for	community heating system		1.05	(306)
Water heat from CHP		(64) x (303a) x (305) x (306) =	1752	(310a)
Electricity used for heat distribution		0.01 x [(307a)(307e) + (310a)(310e)] =	17.52	(313)
Annual totals		kWh/year	kWh/year	1
Space heating fuel used, main system			1321.54	J
Electricity for pumps, fans and electric	•		1	
mechanical ventilation - balanced, ex	·			(230a)
Total electricity for the above, kWh/yea	ar	sum of (230a)(230g) =	139.02	(231)
Electricity for lighting			176.43	(232)
Electricity generated by PVs			-876.05	(233)
10a. Fuel costs - individual heating sy	vstems:			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19 × 0.01 =	174.31	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0	(242)
Water heating from CHP	(310a) x	4.24 × 0.01 =	74.28	(342a)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	18.34	(249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) separately as applicab (232)	elle and apply fuel price according to $\frac{1}{13.19}$ x $\frac{0.01}{13.19}$	Table 12a 23.27	(250)
Additional standing charges (Table 12)			60	(251)
	one of (233) to (235	5) x)	-115.55	_ ](252)
Appendix Q items: repeat lines (253) a		13.19	-115.55	_(232)
Total energy cost	(245)(247) + (250)(254) =		234.65	(255)
11a. SAP rating - individual heating s	ystems			
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =		1.23	(257)
SAP rating (Section 12)			82.84	(258)
12a. CO2 emissions – Individual heat	ing systems including micro-	CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.519	685.88	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating from community system				

Energy kWh/year Emission factor Emissions kg CO2/kWh kg CO2/year

CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ting (not CHP) here is CHP using two fu	els repeat (363) to (3	66) for the seco	nd fuel 329	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0.52	= 276.38	(367)
Electrical energy for heat distribution	[(313) x	[	0.52	9.09	(372)
Total CO2 associated with community systems	(363)(	366) + (368)(372)		= 285.47	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.	519 =	72.15	(267)
Electricity for lighting	(232) x	0.	519 =	91.57	(268)
Energy saving/generation technologies Item 1		0.	519 =	-454.67	(269)
Total CO2, kg/year		sum of (265)	.(271) =	680.4	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		19.37	(273)
EI rating (section 14)				89	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Prim</b> a factor	•	<b>P. Energy</b> kWh/year	,
Space heating (main system 1)	(211) x	3	= .07	4057.12	(261)
Space heating (secondary)	(215) x	3	= .07	0	(263)
Water heating from community system					
		•	Primary factor	Emissions kWh/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ting (not CHP) here is CHP using two fu	els reneat (363) to (3	GG) for the sees	nd fuel	(367a)
		310 repeat (000) to (0	oo) for the seco	nd fuel 329	(307a)
Energy associated with heat source 1	[(307b)+(310b)]		3.07	= 1634.84	(367)
Energy associated with heat source 1 Electrical energy for heat distribution	[(307b)+(310b)] : [(313) x			1 -	<u>-</u> ]`
-	[(313) x		3.07	= 1634.84	(367)
Electrical energy for heat distribution	[(313) x	x 100 ÷ (367b) x  (366) + (368)(372)	3.07	= 1634.84 = 51.16 = 285.47	(367)
Electrical energy for heat distribution  Total Energy associated with community systems	[(313) x	x 100 ÷ (367b) x  (366) + (368)(372)	3.07 2.92	= 1634.84 = 51.16 = 285.47 426.78	(367) (372) (373)
Electrical energy for heat distribution  Total Energy associated with community systems  Electricity for pumps, fans and electric keep-hot	[(313) x (363)( (231) x	x 100 ÷ (367b) x	3.07 2.92	= 1634.84 = 51.16 = 285.47 426.78	(367) (372) (373) (267)
Electrical energy for heat distribution  Total Energy associated with community systems  Electricity for pumps, fans and electric keep-hot  Electricity for lighting  Energy saving/generation technologies	[(313) x (363)( (231) x	x 100 ÷ (367b) x	3.07 2.92 .07 = 0 =	= 1634.84 = 51.16 = 285.47 426.78	(367) (372) (373) (267) (268)

		Us <u>er I</u>	Details:						
Assessor Name:	Adam Ritchie		Strom	a Num	ber:		STRO	019516	
Software Name:	Stroma FSAP 2012	_	Softwa					n: 1.0.4.25	
A dalana a a		Property	Address	: Flat Ty	pe C - A	SHP +	PV		
Address: 1. Overall dwelling dime	ensions:								
The Overall arrelling all in		Are	a(m²)		Av. He	ight(m	)	Volume(m³	*)
Ground floor		_		(1a) x		3.09	(2a) =	108.52	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	35.12	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+.	(3n) =	108.52	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	r
Number of chimneys		+ [	0	] = [	0	,	< 40 =	0	(6a)
Number of open flues	0 + 0	<b>=</b> +	0		0		(20 =	0	(6b)
Number of intermittent fa	ans				0	,	< 10 =	0	(7a)
Number of passive vents	3			F	0	,	c 10 =	0	(7b)
Number of flueless gas f	ires			Ĺ	0		< 40 =	0	(7c)
-				L					`
							Air ch	nanges per ho	our
	eys, flues and fans = $(6a)+(6b)+$				0		÷ (5) =	0	(8)
If a pressurisation test has l Number of storeys in t	been carried out or is intended, proce	ed to (17),	otherwise (	continue fi	rom (9) to (	(16)			<b>7</b> (0)
Additional infiltration	ne aweiling (ns)					[(9	9)-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	0.25 for steel or timber frame of	or 0.35 fc	or mason	ry consti	ruction	10	., .]	0	(11)
• • • • • • • • • • • • • • • • • • • •	present, use the value corresponding	to the grea	iter wall are	a (after					_
deducting areas of openi If suspended wooden	ings); if equal user 0.35 floor, enter 0.2 (unsealed) or (	0.1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, er	,	(	,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate					12) + (13)			0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	envelop	e area	2.5	(17)
·	lity value, then $(18) = [(17) \div 20] +$ es if a pressurisation test has been de				is haina u	ead.		0.12	(18)
Number of sides sheltere		nic or a de	gree all pe	Titleability	is being u	300		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.12	(21)
Infiltration rate modified	for monthly wind speed			,			_	,	
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	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		
		-			•				

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
alculate effec		-	rate for t	he appli	cable ca	se	-		•			'	
If mechanical If exhaust air he			andiv N (S	3h) - (23a	a) v Emy (e	aguation (l	NS)) other	wice (23h	) = (23a)		[	0.5	(2
If balanced with									) = (25a)			0.5	(2
a) If balance		-		_					2h\m + ('	23h) ∨ [·	1 _ (23c)	75.65	(2
4a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	÷ 100j	(2
b) If balance	L1		<u> </u>			<u> </u>			<u>.                                    </u>				·
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extin < 0.5 ×			•	•				.5 × (23b	·)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilatio n = 1, the				•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change r	ate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(2
. Heat losse	s and he	at loss	paramet	er:									
LEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
oors Type 1					2.13	X	1	=	2.13				(2
oors Type 2					0.72	Х	1	=	0.72				(:
oors Type 3					0.99	Х	1	=	0.99				(:
oors Type 4					0.72	X	1	= [	0.72				(:
													(:
oors Type 5					0.72	X	1	= [	0.72				
• •					0.72	_	1	= [	0.72				(
oors Type 6	<del>)</del> 1					×		= [					
oors Type 6 indows Type					0.63	x x1	1	0.04] =	0.63				(
oors Type 6 indows Type indows Type	2				0.63	x x1 x1	1/[1/( 1.2 )+	0.04] = [ 0.04] = [	0.63				(:
oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.63 1.08 1.97	x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4				0.63 1.08 1.97 1.42	x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63				(; (; (;
oors Type 5 oors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1	e 2 e 3 e 4		3.08		0.63 1.08 1.97 1.42 1.45	x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+		0.63 1.24 2.26 1.63 1.66				(2
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1	2 3 4 5	=	3.08	=	0.63 1.08 1.97 1.42 1.45 0.32	x x1 x1 x1 x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$ \begin{vmatrix} 0.04 \\ 0.04 \end{vmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	0.63 1.24 2.26 1.63 1.66 0.37				(:
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 falls Type2	2 2 3 4 4 5 5 10.51				0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x1 x1 x1 x1	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				(; (; (; (;
oors Type 6 indows Type indows Type indows Type indows Type indows Type	2 2 3 4 4 5 5 10.51 8.06		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43	x x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = = [	0.63 1.24 2.26 1.63 1.66 0.37 0.97				()
pors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.51 8.06 19.5		2.79		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27	x x1 x1 x1 x1 x1 x1 x x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28				
oors Type 6 indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3	2 2 3 4 4 5 5 10.51 8.06 19.5 9.43		2.79 1.97 2.14		0.63 1.08 1.97 1.42 1.45 0.32 7.43 5.27 17.53 7.29	x x1 x1 x1 x1 x1 x x1 x x x x x x x x x	1 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.13	=	0.63 1.24 2.26 1.63 1.66 0.37 0.97 0.69 2.28 0.95				(1)

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.33

(33)

Heat capacity Cm = S	S(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass param	eter (TMF	c = Cm -	÷ TFA) ir	n kJ/m²K	·		Indica	tive Value	Low		100	(35)
For design assessments w	here the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	.00	
Thermal bridges : S (	,		• .	•	K						13.75	(36)
if details of thermal bridging Total fabric heat loss	g are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			36.08	(37)
Ventilation heat loss of	calculated	d monthly	v					` '	25)m x (5)		00.00	(0.7
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 10.07 9.96	9.84	9.28	9.17	8.61	8.61	8.5	8.84	9.17	9.4	9.62		(38)
Heat transfer coefficie	ent, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 46.15 46.04	45.92	45.36	45.25	44.69	44.69	44.58	44.92	45.25	45.48	45.7		
Heat loss parameter (	HLP), W/	/m²K			•			Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	45.34	(39)
(40)m= 1.31 1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
Number of days in mo	onth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.29	(40)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating end	ergy requi	irement:								kWh/ye	ear:	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		28		(42)
if TFA $> 13.9$ , N = 1	+ 1.76 x vater usaç e hot water	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage =	(25 x N)	+ 36		9) 64	.68		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual averag not more that 125 litres per	+ 1.76 x vater usaç e hot water	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is	erage =	(25 x N) to achieve	+ 36 a water us	se target o	9) 64			` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual averag not more that 125 litres per	+ 1.76 x vater usage hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed to bld)	(25 x N) to achieve	+ 36		9) 64	.68		` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual averag not more that 125 litres per	+ 1.76 x vater usage hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed to bld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 64	.68		` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual averag not more that 125 litres per  Jan Feb Hot water usage in litres per	+ 1.76 x rater usage hot water person per Mar er day for ea	ge in litre usage by a r day (all w Apr Apr ach month 63.39	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av fwelling is that and co Jun ctor from 1	erage = designed in designed i	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	` '
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56	+ 1.76 x rater usage hot water person per Mar er day for ea	ge in litre usage by a r day (all w Apr Apr ach month 63.39	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av fwelling is that and co Jun ctor from 1	erage = designed in designed i	(25 x N) to achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> =	.68  Dec  71.15	776.21	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual averag not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29	rater usage hot water person per Mar 65.98 frused - call 95.23	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of	ay Vd,av Iwelling is that and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Fotal = Su th (see Ta  86.21	9) 64 Nov 68.56 m(44)112 = ables 1b, 1	.68  Dec  71.15  c, 1d)  102.19	776.21 1017.73	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water hear	rater usage hot water person per Mar 65.98 rused - call 95.23	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66	ay Vd,av Iwelling is that and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  68.39  73.97  70 to (61)	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43) (44) (45)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84	rater usage hot water person per Mar 65.98 frused - call 95.23	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02	es per da 5% if the of	ay Vd,av Iwelling is that and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve  Aug (43)  60.8  73.1	+ 36 a water us  Sep  63.39 c) kWh/mon 73.97	Oct  65.98  Fotal = Su th (see Ta  86.21	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1	.68  Dec  71.15  c, 1d)  102.19		(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water hear	rater usage hot water reperson per Mar 65.98 rused - calc 95.23 ting at point 14.28	ge in litre usage by a r day (all w Apr ach month 63.39 culated me 83.02 f of use (no	es per da 5% if the a vater use, $I$ May $Vd, m = fa$ $60.8$ $79.66$ $O$ hot water $O$	ay Vd,av Iwelling is hot and co Jun ctor from 7 58.22 190 x Vd,r 68.74	rerage = designed to sld)  Jul Table 1c x  58.22  m x nm x E  63.7  enter 0 in  9.56	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96	+ 36 a water us  Sep  63.39  6Wh/more 73.97  1 to (61)  11.1	Oct  65.98  Fotal = Su  th (see Ta  86.21  Fotal = Su  12.93	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> =	.68  Dec  71.15  c, 1d)  102.19		(43) (44) (45)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water  (45)m= 105.52 92.29  If instantaneous water head  (46)m= 15.83 13.84  Water storage loss:  Storage volume (litres) If community heating Otherwise if no stored	rater usage hot water reperson per Mar 65.98 rused - calculating at point 14.28 s) includinand no talculating and no talculatin	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  r of use (no	es per da 5% if the of the office of the office of the office of the office of the office of the office of the office of the office of the office of the office of the office of the office office of the office of	ay Vd,av twelling is that and co  Jun ctor from 5 58.22  190 x Vd,r 68.74  r storage), 10.31  /WHRS	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.11 ame vess	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44)112 = 94.1 m(45)112 = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot was Reduce the annual average not more that 125 litres per Jan Feb.  Hot water usage in litres per (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84  Water storage loss: Storage volume (litres of the litres of t	rater usage hot water reperson per Mar 65.98 65.98 95.23 14.28 s) including and no tall hot water states and no tall hot water state	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  f of use (no 12.45  ang any so ank in dw er (this in	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 7  58.22  190 x Vd,r  68.74  r storage),  10.31  /WHRS  Inter 110 Instantar	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.11 ame vess	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84  Water storage loss: Storage volume (litres of the storage volume) If community heating of the storage loss: Water storage loss:	rater usage hot water person per Mar 65.98 65.98 95.23 ting at point 14.28 s) including and no tall hot water declared lies.	ge in litre usage by r day (all w  Apr ach month 63.39  culated me 83.02  for use (no 12.45  and any so ank in dw er (this in	es per da 5% if the of vater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av Iwelling is that and co  Jun ctor from 7  58.22  190 x Vd,r  68.74  r storage),  10.31  /WHRS  Inter 110 Instantar	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.11 ame vess	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per  Jan Feb Hot water usage in litres per  (44)m= 71.15 68.56  Energy content of hot water (45)m= 105.52 92.29  If instantaneous water head (46)m= 15.83 13.84  Water storage loss: Storage volume (litres) If community heating Otherwise if no stored Water storage loss: a) If manufacturer's of	rater usage hot water reperson per Mar 65.98 65.98 95.23 ting at point 14.28 s) including and no tall hot water declared learn Table er storage	ge in litre usage by r day (all w  Apr ach month 63.39  culated mo 83.02  fof use (no 12.45  and any so ank in dw er (this in oss facto 2b	es per da $5\%$ if the a vater use, I May $Vd,m = fa$ $60.8$ $0$ that water $11.95$ plar or W velling, encludes it or is known ear	ay Vd,av Iwelling is hot and co  Jun ctor from 1  58.22  190 x Vd,r  68.74  r storage),  10.31  /WHRS enter 110 nstantar wn (kWh	rerage = designed to designed	(25 x N) to achieve  Aug (43)  60.8  73.1  boxes (46)  10.96  within sa (47)	+ 36 a water us  Sep  63.39 b kWh/mor  73.97 11.1 ame vess ers) ente	Oct  65.98  Fotal = Su  86.21  Fotal = Su  12.93  sel	9) 64 Nov 68.56 m(44) <sub>112</sub> = ables 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	.68  Dec  71.15  c, 1d)  102.19  15.33		(43) (44) (45) (46) (47)

Hot water stor	•			e 2 (kWl	h/litre/da	ay)				0.	02		(51)
If community I	_		on 4.3									Ī	(==)
Volume factor Temperature	-		2h							_	.03		(52) (53)
·							(47) (54)	··· ( <b>50</b> ) ··· (	EO)		.6	]	` '
Energy lost from Enter (50) or		_	, KVVN/ye	ear			(47) X (51)	x (52) x (	53) =		03		(54) (55)
, ,	. , .	,	or oooh	month			((EG)m - (	EE) (41)	~	1.	.03		(55)
Water storage							· · ·	55) × (41)ı	1	1		1	(==)
(56)m= 32.01 If cylinder contain	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	 	(56)
												X   - 	(EZ)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	,				F0\	(50) . 20	·F (44)				0		(58)
Primary circuit (modified by				•	•	` '	, ,		r tharmo	etat)			
(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	1	(59)
` ′					<u> </u>	<u>l</u>	<u> </u>					l	()
Combi loss ca	1				<del>`</del>	<u> </u>	i	_			I .	1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	128.37	127.46	141.48	147.59	157.46		(62)
Solar DHW input									r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)		,	1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
												,	
(64)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	128.37	127.46	141.48	147.59	157.46		
(64)m= 160.79	142.21	150.51	136.52	134.94	122.24	118.98	l		l	147.59 r (annual) <sub>1</sub>	l	1668.57	(64)
(64)m= 160.79 Heat gains from					<u> </u>		Outp	out from wa	ater heate	I r (annual)₁	12		(64)
. ,					<u> </u>		Outp	out from wa	ater heate	I r (annual)₁	12		(64) (65)
Heat gains fro	om water 70.63	heating, 75.89	kWh/mo	onth 0.29	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31	70.63 m in calc	heating, 75.89 culation o	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal g	om water 70.63 om in calc ains (see	heating, 75.89 culation of	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)	om water 70.63 om in calc ains (see	heating, 75.89 culation of	kWh/mo 70.4 of (65)m	onth 0.25 70.71 only if c	5 ´ [0.85 65.65	× (45)m	Outp + (61)m 68.53	out from wa n] + 0.8 x 67.39	ater heate ( [(46)m 72.89	r (annual) <sub>1</sub> + (57)m 74.08	+ (59)m	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal g	om water 70.63 Im in calc ains (see	heating, 75.89 culation of Table 5 5), Wat	kWh/mo 70.4 of (65)m 5 and 5a	onth 0.29 70.71 only if c	5 ´ [0.85 65.65 ylinder is	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling	out from wa n] + 0.8 x 67.39 or hot w	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08	+ (59)m 78.2 munity h	]	],
Heat gains from (65)m= 79.31 include (57)  5. Internal grade Metabolic gain Jan	om water 70.63 om in calc ains (see ns (Table Feb 64.18	heating, 75.89 culation of Table 5 5), Wat Mar 64.18	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18	70.71 only if constant May	5 ´ [0.85 65.65 cylinder is Jun 64.18	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling Aug 64.18	out from wa 67.39 or hot w Sep 64.18	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08 rom com	+ (59)m 78.2 munity h	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan (66)m= 64.18	om water 70.63 om in calc ains (see ns (Table Feb 64.18	heating, 75.89 culation of Table 5 5), Wat Mar 64.18	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18	70.71 only if constant May	5 ´ [0.85 65.65 cylinder is Jun 64.18	× (45)m 65.4 s in the o	Outp + (61)m 68.53 dwelling Aug 64.18	out from wa 67.39 or hot w Sep 64.18	ater heate ( [(46)m 72.89 ater is fr	+ (57)m 74.08 rom com	+ (59)m 78.2 munity h	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains	om water 70.63 om in calc ains (see ns (Table Feb 64.18 c (calculat 8.87	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08	5 ´ [0.85 65.65 ylinder is Jun 64.18 ion L9 o	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84	Sep 64.18 66.5	ott 64.18	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal grading Jan (66)m= 64.18  Lighting gains (67)m= 9.99	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08	5 ´ [0.85 65.65 ylinder is Jun 64.18 ion L9 o	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84	Sep 64.18 66.5	ott 64.18	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65)
Heat gains from (65)m= 79.31 include (57)  5. Internal g  Metabolic gain  Jan  (66)m= 64.18  Lighting gains  (67)m= 9.99  Appliances gains  (68)m= 109.48	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 of 3.45 uation L	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Tal 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 o 3.45 uation L 86.74	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Fable 5 6.5 See Table 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62 c (calculat 29.42	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 Append 101.66 opendix 29.42	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97	Jun 64.18 ion L9 of 3.45 uation L	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Table 5 6.5 see Tal 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 79.31 include (57)  5. Internal graph Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and fa	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ns gains	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ted in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 70.4 of (65)m 6 and 5a ts Apr 64.18 opendix 5.46 Appendix 101.66 opendix 29.42	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat	Jun 64.18 ion L9 of 3.45 uation L 86.74 tion L15	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63	+ (59)m 78.2 munity h Dec 64.18 10.27	]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 79.31 include (57)  5. Internal grain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gar (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and far (70)m= 0	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calc 110.62 c (calculat 29.42 ans gains 0	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5	kWh/mo 70.4 of (65)m 5 and 5a ts Apr 64.18 opendix 5.46 a Appendix 101.66 opendix 29.42 5a)	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a)	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77	Sep 64.18 Fable 5 6.5 See Table 83.63	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18	+ (59)m 78.2 munity h Dec 64.18	]	(65) (66) (67) (68)
Heat gains from (65)m= 79.31 include (57)  5. Internal good Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. expenses the cooking gains (70)m= 0	m water 70.63 m in calc ains (see ns (Table Feb 64.18 c (calculat 8.87 ains (calculat 110.62 c (calculat 29.42 ans gains 0 vaporatio	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 n Append 101.66 opendix 29.42 5a) 0 tive valu	onth 0.29 70.71 only if co  May 64.18 L, equati 4.08 dix L, eqi 93.97 L, equati 29.42  0 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42 0	x (45)m 65.4 s in the o  Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 also se 29.42	Sep 64.18 Table 5 6.5 see Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63  97.42	+ (59)m 78.2 munity h Dec 64.18 10.27 104.65	]	(65) (66) (67) (68) (69) (70)
Heat gains from (65)m= 79.31 include (57)  5. Internal gradies Metabolic gains Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. even (71)m= -51.34	m water 70.63 m in calculations (see ms (Table Feb 64.18 c (calculations) 110.62 s (calculations) 29.42 ms gains 0 vaporatio -51.34	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m 5 and 5a ts Apr 64.18 opendix 5.46 a Appendix 101.66 opendix 29.42 5a)	onth 0.29 70.71 only if c  May 64.18 L, equati 4.08 dix L, eq 93.97 L, equat 29.42	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42	x (45)m 65.4 s in the o Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 ), also se 29.42	Sep 64.18 Table 5 6.5 See Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63	+ (59)m 78.2 munity h Dec 64.18 10.27	]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 79.31 include (57)  5. Internal good Metabolic gain Jan (66)m= 64.18 Lighting gains (67)m= 9.99 Appliances gains (68)m= 109.48 Cooking gains (69)m= 29.42 Pumps and faction (70)m= 0 Losses e.g. expenses the cooking gains (70)m= 0	m water 70.63 m in calculations (see ms (Table Feb 64.18 c (calculations) 110.62 s (calculations) 29.42 ms gains 0 vaporatio -51.34	heating, 75.89 culation of Table 5 5), Wat Mar 64.18 ded in Ap 7.22 ulated in 107.76 ted in Ap 29.42 (Table 5 0 n (negat	kWh/mo 70.4 of (65)m and 5a ts Apr 64.18 opendix 5.46 n Append 101.66 opendix 29.42 5a) 0 tive valu	onth 0.29 70.71 only if co  May 64.18 L, equati 4.08 dix L, eqi 93.97 L, equati 29.42  0 es) (Tab	Jun 64.18 ion L9 o 3.45 uation L 86.74 tion L15 29.42 0	x (45)m 65.4 s in the o  Jul 64.18 r L9a), a 3.73 13 or L1 81.91 or L15a) 29.42	Outp + (61)m 68.53 dwelling Aug 64.18 lso see 4.84 3a), also 80.77 also se 29.42	Sep 64.18 Table 5 6.5 see Tal 83.63 ee Table 29.42	oter heate ( [(46)m	r (annual), + (57)m 74.08 rom com Nov 64.18  9.63  97.42	+ (59)m 78.2 munity h Dec 64.18 10.27 104.65	]	(65) (66) (67) (68) (69) (70)

Total internal gains =				(66)	)m + (67)n	n + (68	3)m +	(69)m + (7	0)m +	(71)m + (72)	m		
(73)m= 268.32 266.85 259.	.22	247.16 235.35	5 2	23.62	215.79	219	.97	225.98	238.2	252.2	262.28		(73)
6. Solar gains:		,	<u> </u>			·							
Solar gains are calculated using	solar	flux from Table 6	a and	d assoc	iated equa	tions t	to cor	overt to the	applic	able orientat	ion.		
Orientation: Access Facto Table 6d	r	Area m²		Flu Ta	x ble 6a			g_ able 6b		FF Table 6c		Gains (W)	
Northeast <sub>0.9x</sub> 0.77	x	1.08	x		1.28	x		0.4	x	0.7	_	2.36	(75)
Northeast 0.9x 0.77	x	0.32	X		1.28	x		0.4	X	0.7	=	0.7	(75)
Northeast 0.9x 0.77	x	1.08	X	2	22.97	X		0.4	X	0.7	=	4.81	(75)
Northeast 0.9x 0.77	x	0.32	X	2	22.97	X		0.4	X	0.7	=	1.43	(75)
Northeast 0.9x 0.77	x	1.08	X	4	11.38	x		0.4	X	0.7	=	8.67	(75)
Northeast 0.9x 0.77	x	0.32	X	4	11.38	X		0.4	X	0.7	=	2.57	(75)
Northeast 0.9x 0.77	x	1.08	X	(	67.96	X		0.4	X	0.7	=	14.24	(75)
Northeast 0.9x 0.77	x	0.32	X	(	67.96	x		0.4	X	0.7	=	4.22	(75)
Northeast 0.9x 0.77	x	1.08	X	9	1.35	x		0.4	X	0.7	=	19.14	(75)
Northeast 0.9x 0.77	x	0.32	X	9	1.35	X		0.4	X	0.7	=	5.67	(75)
Northeast 0.9x 0.77	x	1.08	X	9	7.38	x		0.4	X	0.7	=	20.41	(75)
Northeast 0.9x 0.77	x	0.32	X	9	7.38	X		0.4	X	0.7	=	6.05	(75)
Northeast 0.9x 0.77	x	1.08	X		91.1	x		0.4	X	0.7	=	19.09	(75)
Northeast <sub>0.9x</sub> 0.77	X	0.32	X		91.1	X		0.4	X	0.7	=	5.66	(75)
Northeast 0.9x 0.77	X	1.08	X	7	72.63	X		0.4	X	0.7	=	15.22	(75)
Northeast <sub>0.9x</sub> 0.77	X	0.32	X	7	72.63	X		0.4	X	0.7	=	4.51	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.08	x		50.42	X		0.4	X	0.7	=	10.57	(75)
Northeast <sub>0.9x</sub> 0.77	X	0.32	X		50.42	X		0.4	X	0.7	=	3.13	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.08	x	2	28.07	X		0.4	X	0.7	=	5.88	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x	2	28.07	x		0.4	X	0.7	=	1.74	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.08	x		14.2	x		0.4	X	0.7	=	2.98	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	x		14.2	x		0.4	X	0.7	=	0.88	(75)
Northeast <sub>0.9x</sub> 0.77	x	1.08	x		9.21	X		0.4	X	0.7	=	1.93	(75)
Northeast <sub>0.9x</sub> 0.77	x	0.32	X		9.21	x		0.4	X	0.7	=	0.57	(75)
Southeast 0.9x 0.77	x	1.97	x	3	36.79	x		0.4	X	0.7	=	14.06	(77)
Southeast 0.9x 0.77	x	1.97	X	(	62.67	x		0.4	X	0.7	=	23.96	(77)
Southeast 0.9x 0.77	x	1.97	x	8	35.75	X		0.4	X	0.7		32.78	(77)
Southeast 0.9x 0.77	x	1.97	x	1	06.25	X		0.4	X	0.7	=	40.62	(77)
Southeast 0.9x 0.77	x	1.97	x	1	19.01	x		0.4	X	0.7		45.49	(77)
Southeast 0.9x 0.77	x	1.97	X	1	18.15	x		0.4	X	0.7	<u> </u>	45.16	(77)
Southeast 0.9x 0.77	x	1.97	X	1	13.91	x		0.4	x	0.7	<u> </u>	43.54	(77)
Southeast 0.9x 0.77	x	1.97	X	1	04.39	x		0.4	x	0.7	<u> </u>	39.9	(77)
Southeast 0.9x 0.77	x	1.97	X		92.85	x		0.4	x	0.7	<u> </u>	35.49	(77)
Southeast 0.9x 0.77	x	1.97	x	(	9.27	x		0.4	x	0.7	=	26.48	(77)

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Southeast <sub>0.9x</sub>	0.77	X	1.9	7	X	4	4.07	X		0.4	X	0.7		=	16.85	(77)
Southeast <sub>0.9x</sub>	0.77	X	1.9	7	X	3	1.49	X		0.4	X	0.7		=	12.04	(77)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	3	6.79	]		0.4	X	0.7		=	10.14	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	3	6.79	]		0.4	X	0.7		=	10.35	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	x	6	2.67	]		0.4	X	0.7		=	17.27	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	6	2.67	]		0.4	X	0.7		=	17.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	8	5.75	]		0.4	X	0.7		=	23.63	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	8	5.75	]		0.4	X	0.7		=	24.13	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	10	06.25	]		0.4	X	0.7		=	29.28	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	10	06.25	]		0.4	X	0.7		=	29.89	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	19.01	]		0.4	X	0.7		=	32.79	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	1	19.01	]		0.4	X	0.7		=	33.48	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	2	X	1	18.15	]		0.4	X	0.7		=	32.55	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	1	18.15	]		0.4	X	0.7		=	33.24	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	1	13.91	]		0.4	X	0.7		=	31.39	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	1	13.91	Ī		0.4	X	0.7		=	32.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	10	04.39	Ī		0.4	X	0.7		=	28.76	(79)
Southwest <sub>0.9x</sub>	0.77	X	1.4	5	X	10	04.39	ĺ		0.4	X	0.7		=	29.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	9	2.85	ĺ		0.4	X	0.7		=	25.58	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	9	2.85	ĺ		0.4	x	0.7		=	26.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	6	9.27	ĺ		0.4	X	0.7		=	19.09	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	6	9.27	j		0.4	= x	0.7		=	19.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	4	4.07	j		0.4	X	0.7		=	12.14	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	4	4.07	ĺ		0.4	X	0.7		=	12.4	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	2	X	3	1.49	j		0.4	i x	0.7		=	8.68	(79)
Southwest <sub>0.9x</sub>	0.77	x	1.4	5	X	3	1.49	j		0.4	X	0.7		=	8.86	(79)
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Solar gains in	watts, calc	culated	for each	n montl	า			(83)m	n = Su	m(74)m	.(82)m	1			_	
(83)m= 37.62	65.1	91.78	118.25	136.58	1:	37.42	131.73	117	7.77	100.9	72.6	3 45.25	32.0	8		(83)
Total gains – i	nternal and	d solar	(84)m =	: (73)m	+ (8	83)m	, watts								•	
(84)m= 305.94	331.95	351	365.4	371.93	3	61.04	347.52	337	7.74	326.88	310.8	8 297.45	294.	36		(84)
7. Mean inter	nal tempe	rature (	heating	seaso	n)											
Temperature	during hea	ating pe	eriods in	the liv	ing	area 1	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisation fac	tor for gair	ns for li	ving are	a, h1,r	n (s	ee Ta	ble 9a)									
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oc	t Nov	De	ес		
(86)m= 0.93	0.92	0.89	0.84	0.75	(	0.62	0.5	0.5	52	0.69	0.84	0.91	0.9	4		(86)
Mean interna	I temperat	ure in li	ving are	ea T1 (	follo	w ste	ps 3 to 7	in T	able	9c)						
(87)m= 18.66	<del> </del>	19.29	19.82	20.31	$\overline{}$	20.7	20.88	20.	$\overline{}$	20.59	19.9	3 19.25	18.6	62		(87)
Temperature	during he	ating ne	eriods in	rest o	f dw	elling	from Ta	hle (	a Th	2 (°C)			-		ı	
(88)m= 20.34		20.35	20.35	20.36	$\overline{}$	20.36	20.36	20.		20.36	20.3	6 20.35	20.3	35		(88)
` '	<u> </u>							l							1	
Utilisation fac	0.91	0.88	0.82	veiling, 0.73	$\overline{}$	,m (se <sub>0.58</sub>	0.44	9a) 0.4	<sub>17</sub> T	0.65	0.82	0.9	0.9	3		(89)
(00)=	1 5.51	3.30	J.UL	50			1	L	··	0.00	0.02	1 0.0	1 3.3	-	I	(-0)

0)m=	interna 18.14	18.37	18.76	19.29	19.77	20.14	20.29	20.27	20.03	19.45	18.73	18.11		(90
· L						ļ	<u> </u>	<u> </u>	<u>f</u>	LA = Livin	g area ÷ (4	4) =	0.68	(91
/lean	internal	l temper	ature (fo	r the wh	ole dwel	lling) = f	I A 🗴 T1	+ (1 – fL	A) x T2			•		
2)m=	18.5	18.73	19.12	19.65	20.14	20.52	20.69	20.67	20.41	19.81	19.08	18.46		(92
L		nent to t	ne mean	internal	tempera	L ature fro	ı m Table	4e, whe	ere appro	L opriate				·
3)m=	18.5	18.73	19.12	19.65	20.14	20.52	20.69	20.67	20.41	19.81	19.08	18.46		(93
	ace hea	tina reau	uirement				l							
Set Ti	to the r	mean int		nperatur		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Itilisa			ains, hm		Iviay	<u> </u>		_ /tug	ССР		1101			
4)m=	0.91	0.89	0.86	0.8	0.72	0.59	0.47	0.49	0.66	0.8	0.88	0.91		(94
L			W = (94											`
г	277.81	294.91	300.74	293.22	267.19	214.58	162.73	166.89	215.08	249.99	261.98	269.17		(9
Ĺ			rnal tem											•
6)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		(9
L	oss rate	e for mea	an intern	al tempe	erature.	Lm . W :	 =[(39)m :	x [(93)m	L _ (96)m	<u> </u> 				
')m=	655.16	636.48	579.63	487.61	381.9	264.68	182.82	190.44	283.54	416.79	544.89	651.6		(9
L								24 x [(97)						`
paog	riodini	groquire	71110111110			i	i		<u>`</u>	<del></del>				
3)m=	280.75	229.54	207.49	139.96	85.34	I 0	I 0	0	0	I 124.1	203.7	l 284.53 l		
3)m=	280.75	229.54	207.49	139.96	85.34	0	0			124.1 (kWh/year	203.7	284.53	1555 42	
´ L						0	0		l per year	<u> </u>		<u> </u>	1555.42	닠`
´ L			207.49 ement in			0	0			<u> </u>		<u> </u>	1555.42 44.29	닠`
Space	heatin	g require	ement in	kWh/m²	/year				l per year	<u> </u>		<u> </u>		닠`
Space . Ene	heating	g require quiremer	ement in nts – Indi	kWh/m²	/year eating sy	ystems i	ncluding	Tota	l per year	<u> </u>		<u> </u>	44.29	(9
pace Epace raction	heating ergy receive heating on of sp	g require quiremer ng: pace hea	ement in ats – Indi	kWh/m² ividual h	eating sy	ystems i	ncluding	Tota	l per year	<u> </u>		<u> </u>		(9
pace Epace raction	heating ergy receive heating on of sp	g require quiremer ng: pace hea	ement in nts – Indi	kWh/m² ividual h	eating sy	ystems i	ncluding system	Tota	I per year	<u> </u>		<u> </u>	44.29	(9
Space Space Fraction	heating ergy receive heating on of spon of spon of spon of spon of spon of spon of spon erging the heating the hea	g require quiremen ng: pace hea	ement in ats – Indi	kWh/m² vidual h econdary nain syst	eating sy y/supple em(s)	ystems i	ncluding system	Tota	DHP) - (201) =	(kWh/year		<u> </u>	44.29	(9)
Epace  Space  Fraction  Fraction  Fraction	heating receive heating on of spon of toton	g require quiremen ng: pace hea pace hea tal heatin	ement in ats – Indi at from se at from m	kWh/m² vidual h econdary nain syst main syst	eating sy y/supple em(s) stem 1	ystems i	ncluding system	Tota    micro-C	DHP) - (201) =	(kWh/year		<u> </u>	0 1	(9)
Space  Description  Ending  Ending  Fraction  Ending  Endind  Endind  Endind  Endind  Endind  Endind  Endind	e heating receive heating on of spon of total necy of received to the contract of the contract	g require quiremen ng: pace hea pace hea tal heatin	ement in ts – Indi at from se at from m ag from a	kWh/m² vidual ha econdary nain systemain system	eating sy y/supple em(s) stem 1	ystems i mentary	ncluding system	Tota    micro-C	DHP) - (201) =	(kWh/year		<u> </u>	0 1 1 100	(9)
Epace Epace Fraction Fraction Fraction Fraction	heating receive heating on of spon of total necy of spon of spon of total necy of spon	g require quirement ng: pace hea pace hea tal heatin main spa	ement in ats – Indi at from se at from m ag from a ace heati ry/supple	kWh/m² vidual h econdary nain syst main syst ing syste	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)	per year   CHP)  - (201) =   02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	0 1 1 100 0	(9)
pace pace raction raction fraction fraction	heating heating heating on of sp on of to ncy of r ncy of s	g require  quiremen  ng:  pace hea  pace hea  tal heatin  main spa  seconda	ement in  outs - Indi  out from secut from mang from outling from outl	kWh/m²  vidual h  econdary  nain syst  main syst  ing syste  ementary	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary g system Jun	ncluding system	Tota    micro-C	DHP) - (201) =	(kWh/year		<u> </u>	0 1 1 100	(9)
Epace Fraction Fraction Fraction Efficie	heating regy receive heating on of sp on of to ncy of receive of se Jan heating	g require  quiremen  ng:  pace hea  pace hea  tal heatil  main spa  seconda  Feb  g require	ement in  Its – Indi  It from set from mang from it from from it from from it from from it from from it from from it from from from from from from from from	kWh/m² econdary nain systemain systementary Apr	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)	per year   CHP)	(kWh/year	Nov	8) <sub>15,912</sub> =	0 1 1 100 0	(9)
pace pace raction raction fraction fraction	heating heating heating on of sp on of to ncy of r ncy of s	g require  quiremen  ng:  pace hea  pace hea  tal heatin  main spa  seconda	ement in  outs - Indi  out from secut from mang from outling from outl	kWh/m²  vidual h  econdary  nain syst  main syst  ing syste  ementary	eating sy y/supple em(s) stem 1 em 1 y heating	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)	per year   CHP)  - (201) =   02) × [1 -	(kWh/year	) = Sum(9	8)15,912 =	0 1 1 100 0	(9)
Space  Space Fraction Fraction  Frac	e heating e heating on of sp on of to ncy of r ncy of s Jan e heating	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  229.54	ement in  Its – Indi  It from set from mang from it from from it from from it from from it from from it from from it from from from from from from from from	kWh/m² econdary nain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)	per year   CHP)	(kWh/year	Nov	8) <sub>15,912</sub> =	0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction	e heating e heating on of sp on of to ncy of r ncy of s Jan e heating	g require  quirement  ng:  pace head  tal heatin  main spa  seconda  Feb  g require  229.54	ement in  at from set from mag from ace heating  Mar  ement (c. 207.49)	kWh/m² econdary nain systemain systementary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	ystems i mentary g system Jun	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	Der year   CHP   CHP	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0	(9 (2 (2 (2 (2 (2 (2 (2
Space  Space Fraction	heating heating heating heating on of sp on of to ncy of r ncy of s Jan heating 280.75 = {[(98)	g require  ng: pace hea pace hea tal heatin main spa seconda  Feb g require 229.54	ement in  Its – Indi  It from set from many from in  It from many from in  It from many from in  It from many from in  It from set from many from in  It f	kWh/m² vidual h econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 85.34	ystems i mentary g system Jun 0	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	per year   CHP)	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space Space Fraction	e heating e heating e heating on of sp on of to ncy of r ncy of s  Jan e heating 280.75  = {[(98)	g require  quirement  ng: pace head pace head tal heatin main space seconda  Feb g require 229.54  )m x (20 229.54	ement in  Its – Indi  It from set from many from in  It from many	kWh/m² econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96	eating syly/supple em(s) stem 1 em 1 y heating May d above) 85.34	ystems i mentary g system Jun 0	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	Der year   CHP   CHP	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space  Space  Fractic	e heating e heating e heating on of sp on of sp on of to ncy of r ncy of s  Jan e heating 280.75  = {[(98) 280.75	g require  quirement  ng:  pace head  pace head  tal heatin  main space  seconda  Feb  g require  229.54  )m x (20  229.54  g fuel (se	ement in  at from set from mag from ace heati  ry/supple  Mar  ement (c  207.49  4)] } x 1	kWh/m² econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96	eating syly/supple em(s) stem 1 em 1 y heating May d above) 85.34	ystems i mentary g system Jun 0	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	Der year   CHP   CHP	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0 kWh/ye	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space Fraction Fracti	e heating e heating e heating on of sp on of sp on of to ncy of r ncy of s  Jan e heating 280.75  = {[(98) 280.75	g require  quirement  ng:  pace head  pace head  tal heatin  main space  seconda  Feb  g require  229.54  )m x (20  229.54  g fuel (se	ement in  at from set from mag from ace heating the set of the set	kWh/m² econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96	eating syly/supple em(s) stem 1 em 1 y heating May d above) 85.34	ystems i mentary g system Jun 0	ncluding system	Tota  micro-C  (202) = 1 - (204) = (204)  Aug  0	Der year   CHP   CHP	(kWh/year	Nov 203.7	8) <sub>15,912</sub> = [	0 1 1 100 0 kWh/ye	(9 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2
Space Fraction Fracti	heating heating heating heating heating heating heating heating 280.75  heating heating heating heating heating heating heating	g require  ruiremen  ruire	ement in  Its – Indi  It from set from many from the secondary  1 207.49  1 207.49  2 207.49	kWh/m²  vidual h econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96 y), kWh/ 8)	eating syly/supple em(s) stem 1 em 1 y heating May d above) 85.34 em 1 em 1 em 1 em 1 em 1 em 1 em 1 em	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota    micro-C  (202) = 1 - (204) = (204)    0    Tota    0	per year	(kWh/year (203)] = Oct 124.1 124.1 ar) =Sum(2	Nov 203.7 203.7 0	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space  Space Fraction	e heating e heating e heating on of sp on of sp on of to ncy of r ncy of s  Jan 280.75  = {[(98) 280.75  e heating m x (20) 0	g require  ruiremen  ruire	ement in  Its – Indi  It from set from many from the secondary  1 207.49  1 207.49  2 207.49	kWh/m²  vidual h econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96 y), kWh/ 8)	eating syly/supple em(s) stem 1 em 1 y heating May d above) 85.34 em 1 em 1 em 1 em 1 em 1 em 1 em 1 em	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota    micro-C  (202) = 1 - (204) = (204)    0    Tota    0	Der year	(kWh/year (203)] = Oct 124.1 124.1 ar) =Sum(2	Nov 203.7 203.7 0	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/yd	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space  Space Fractic F	e heating e heating e heating on of sp on of sp on of to ncy of r ncy of s  Jan e heating 280.75  e heating m x (20 0	g require  quiremer  ng:  pace hea  pace hea  tal heatin  main spa  seconda  Feb  229.54  )m x (20  229.54  g fuel (so  01)] } x 1  0	ement in  Its – Indi  It from set from many from the secondary  1 207.49  1 207.49  2 207.49	kWh/m² econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May d above) 85.34 ef) 85.34 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota    micro-C  (202) = 1 - (204) = (204)    0    Tota    0	Der year	(kWh/year (203)] = Oct 124.1 124.1 ar) =Sum(2	Nov 203.7 203.7 0	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/yd	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Efficie  Space  Fractic  Fract	e heating e heating e heating on of sp on of sp on of to ncy of s Jan e heating 280.75 e heating m x (20 neating	g require  ng: pace head pace head pace head tal heatin main space seconda  Feb g require 229.54  )m x (20 229.54  g fuel (so 01)] } x 1 0	ement in  at from set from mag from the	kWh/m² econdary nain systemain systementary Apr alculated 139.96 00 ÷ (20 139.96 y), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 May d above) 85.34 ef) 85.34 month	ystems i mentary g system Jun 0	ncluding y system n, % Jul 0	Tota    micro-C  (202) = 1 - (204) = (204)    0    Tota    0	Der year	(kWh/year (203)] = Oct 124.1 124.1 ar) =Sum(2	Nov 203.7 203.7 0	8) <sub>15,912</sub> = [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [	0 1 1 100 0 kWh/yd	(98) (99) (20) (20) (20) (20) (20) (20) (20) (20

Factor for charging method for community water	1	(305)				
Distribution loss factor (Table 12c) for community	1.05	(306)				
Water heat from CHP	(64) x (303a)	x (305) x (306)	=	1752	(310a)	
Electricity used for heat distribution	0.01 × [(307a)(3	07e) + (310a)	(310e)] =	17.52	(313)	
Annual totals			r	kWh/year	_	
Space heating fuel used, main system 1					1555.42	_
Electricity for pumps, fans and electric keep-hot						
mechanical ventilation - balanced, extract or pos	itive input from o	outside		139.02		(230a)
Total electricity for the above, kWh/year		sum of (230a)(2	30g) =		139.02	(231)
Electricity for lighting					176.43	(232)
Electricity generated by PVs					-876.05	(233)
12a. CO2 emissions – Individual heating system	s including micro	o-CHP				
	<b>Energy</b> kWh/year		mission fac CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.519	=	807.26	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating from community system						
		Energy kWh/year	Emissior kg CO2/k		Emissions kg CO2/year	
CO2 from other sources of space and water hea Efficiency of heat source 1 (%)		wo fuels repeat (363)	to (366) for the s	second fuel	329	(367a)
CO2 associated with heat source 1	[(307b)+(3 <sup>2</sup>	10b)] x 100 ÷ (367b) x	0.52	=	276.38	(367)
Electrical energy for heat distribution	[(3	13) x	0.52	=	9.09	(372)
Total CO2 associated with community systems	(36	63)(366) + (368)(3	B72)	=	285.47	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	Г	0.519	=	72.15	(267)
Electricity for lighting	(232) x	Ē	0.519	=	91.57	(268)
Energy saving/generation technologies Item 1		Γ	0.519	=	-454.67	(269)
Total CO2, kg/year		sum of (20	65)(271) =		801.78	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4	) =		22.83	(273)
EI rating (section 14)					87	
·						

		llsor F	Details:								
Accesser Name:											
Assessor Name: Software Name:		Stroma Number: Software Version:				STRO019516 Version: 1.0.4.25					
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.4.25  Property Address: Flat Type C - ASHP + PV											
Address :											
Overall dwelling dime	ensions:	•	4 0						<b>.</b> .		
Ground floor			<b>a(m²)</b> 35.12	(1a) x		ight(m) :.09	(2a) =	Volume(m <sup>2</sup>	<b>3)</b> (3a)		
	a)+(1b)+(1c)+(1d)+(1e)+(1			(4)				100.52	(ou)		
	a)+(1b)+(1c)+(1d)+(1e)+(1	'''	35.12	J	) . (20) . (20	d)+(3e)+	(3n) -		<b>7</b>		
Dwelling volume				(3a) <del>+</del> (3b	)+(30)+(30	J)+(3e)+	(311) =	108.52	(5)		
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır		
Number of chimneys	heating heating	,   +	0	<b>7</b> = F	0	x 4	40 =	0	(6a)		
Number of open flues		`	0	]			20 =		(6b)		
Number of intermittent fa		」 ` L	0	┙┟	0		10 =	0	╡`′		
				Ļ	2		10 =	20	(7a)		
Number of passive vents				Ļ	0			0	(7b)		
Number of flueless gas f	ires				0	x -	40 =	0	(7c)		
Air changes per hour											
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(	7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.18	(8)		
	peen carried out or is intended, proced	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			<u> </u>		
Number of storeys in the	he dwelling (ns)					[(0)	41-04	0	(9)		
Additional infiltration	.25 for steel or timber frame o	r 0 35 fo	r masoni	rv consti	ruction	[(9)	-1]x0.1 =	0	(10)		
	resent, use the value corresponding t			•	detion			0	(11)		
deducting areas of openia	<b>5</b> /·	\	ماد الم						<b></b>		
If no draught lobby, en	floor, enter 0.2 (unsealed) or ( ter 0.05, else enter 0	).1 (seale	ea), eise	enter 0				0	(12)		
•	s and doors draught stripped							0	(14)		
Window infiltration	o ama accio anaagiii ciiippoa		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)		
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)		
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area									(17)		
•	lity value, then $(18) = [(17) \div 20] +$							0.43	(18)		
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed		_	7(40)		
Number of sides sheltere Shelter factor	eu		(20) = 1 -	[0.075 x ( <sup>2</sup>	19)] =			0	(19) (20)		
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.43	(21)		
Infiltration rate modified f	for monthly wind speed										
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	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	]			
, ,,	1 1 1 1 1 1 1 1 1	1	1					J			

0.55	0.54	0.53	0.48	0.47	0.41	0.41	0.4	0.43	0.47	0.49	0.51		
a <i>lcul<mark>ate effe</mark></i> If mechanic		-	rate for t	he appli	cable ca	se	•	•	•		•	•	
If exhaust air h			andiv N (2	13h) - (23	a) v Emv (e	aguation (	N5N othe	rwica (23h	n) = (23a)			(	
If balanced with									) = (23a)			(	
a) If balance		•	•	_					2h\m + (	23h) <b>√</b> [•	1 _ (23c)	± 1001	) (
a) II balance	0	0	0	0	0	0	0	0	0	0	0		(
b) If balance	ed mech	anical ve	ļ	without	heat rec	overv (I	MV) (24h	l = (2)	2b)m + (	23b)		J	·
b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
c) If whole h if (22b)r				•	•				.5 × (23b	·)		I	
-c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)r	ventilation $n = 1$ , the								0.5]			ı	
d)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	ld) in box	(25)	-		-	•	
)m= 0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.59	0.61	0.62	0.63		(
Heat losse	es and he	eat loss	paramet	er:									
EMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		A X k kJ/K
ors Type 1					2.13	x	1	=	2.13				(
ors Type 2					0.72	X	1	=	0.72				(
ors Type 3													
					0.99	X	1	=	0.99				(
ors Type 4					0.99	=	1	= = =	0.99				·
• •						×		_					(
oors Type 5					0.72	x x	1	=	0.72				( ( (
oors Type 4 pors Type 5 pors Type 6 indows Type	e 1				0.72	x x x x	1	= = = =	0.72				(
oors Type 5 oors Type 6 indows Type					0.72 0.72 0.63	x x x x x x1	1 1	= = = 0.04] =	0.72 0.72 0.63				(
oors Type 5 oors Type 6 ndows Type ndows Type	e 2				0.72 0.72 0.63 0.5	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= = = = = = = = = = = = = = = = = = =	0.72 0.72 0.63 0.66				(
oors Type 5 oors Type 6 indows Type indows Type indows Type	e 2 e 3				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 1 /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
oors Type 5	e 2 e 3 e 4				0.72 0.72 0.63 0.5 0.91	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21				(
pors Type 5 nors Type 6 indows Type indows Type indows Type indows Type indows Type	e 2 e 3 e 4	1	2.91		0.72 0.72 0.63 0.5 0.91 0.65	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89			<b>¬</b> г	
ors Type 5 ors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type ndows Type	e 2 e 3 e 4 e 5		2.91	=	0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89				
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type ndows Type alls Type1	e 2 e 3 e 4 e 5	6			0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37				()
oors Type 5 nors Type 6 ndows Type ndows Type ndows Type ndows Type alls Type1 alls Type2	e 2 e 3 e 4 e 5 10.5	6 5	2.21		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6	x x x x x x x x x x x x x x x x x x x	1 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	= 0.04] = 0.04	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type	e 2 e 3 e 4 e 5 10.5 8.06	6 5 3	0.91		0.72 0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35				
pors Type 5 pors Type 6 indows Type indows Type indows Type indows Type indows Type indows Type alls Type1 alls Type2 alls Type3 alls Type4	2 2 3 4 4 5 5 10.5 8.00 19.4	6 5 3	2.21 0.91		0.72 0.63 0.5 0.91 0.65 0.67 0.15 7.6 5.85 18.59	x x x x x x x x x x x x x x x x x x x	1 1 1 1/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.18	= 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] =	0.72 0.72 0.63 0.66 1.21 0.86 0.89 0.2 1.37 1.05 3.35 1.45				

(26)...(30) + (32) =

Fabric heat loss,  $W/K = S (A \times U)$ 

22.88

(33)

	y Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	316.08	(34)
Thermal mass parameter (TMP = $Cm \div TFA$ ) in $kJ/m^2K$ Indicative Value: Medium										, , ,	,	250	(35)
For design asse	•	`		,			ecisely the				able 1f	250	(00)
can be used ins	tead of a de	tailed calcu	ulation.										
Thermal brid	ges : S (L	x Y) cal	culated (	using Ap	pendix I	K						4.58	(36)
if details of therr Total fabric h	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(22)	(26)				¬(07)
		مامانامام	را ملامر م مص					(33) +	` '	05) m v (5)		27.47	(37)
Ventilation he	1			<del></del>	1	11	A	·	,	25)m x (5)	_		
Jan	Feb 23.18	Mar 22.97	Apr 21.99	May 21.81	Jun 20.95	Jul 20.95	Aug 20.8	Sep 21.28	Oct 21.81	Nov 22.18	22.57		(38)
(38)m= 23.4		l .	21.99	21.01	20.95	20.95	20.0				22.37		(30)
Heat transfer		·						<u> </u>	= (37) + (3			I	
(39)m= 50.86	50.65	50.44	49.46	49.28	48.42	48.42	48.26	48.75	49.28	49.65	50.04	40.40	<b>—</b> (20)
Heat loss par	rameter (H	HLP), W/	m²K						average = = (39)m ÷	Sum(39) <sub>1.</sub> (4)	12 /12=	49.46	(39)
(40)m= 1.45	1.44	1.44	1.41	1.4	1.38	1.38	1.37	1.39	1.4	1.41	1.42		
						•		A	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.41	(40)
Number of da	<del>i</del>	<del>`</del>				l			0.1			1	
Jan	+	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 he	ating ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	( <u>-</u> 0.0003	)40 v /TI	- 40.0					28		(42)
			[ OAP	(-0.0003	949 X (11	-A -13.9)	)2)] + 0.0	0013 x (T	ΓFA -13.	9)			
	-	ater usad			,			·	ΓFA -13.		68	1	(43)
Annual avera Reduce the ann	nge hot wa ual average	hot water	ge in litre	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		64	.68		(43)
Annual avera Reduce the ann not more that 12	age hot wa ual average 25 litres per p	hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,av Iwelling is thot and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	e target o	64	_		(43)
Annual avera Reduce the ann not more that 12 Jan	age hot wa ual average 25 litres per p	hot water person per Mar	ge in litre usage by : day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t	(25 x N) to achieve	+ 36		64	.68 Dec		(43)
Annual avera Reduce the ann not more that 12 Jan Hot water usage	age hot wa ual average 25 litres per Feb e in litres per	hot water person per Mar day for ea	ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed to ld)  Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target of	Nov	Dec		(43)
Annual avera Reduce the ann not more that 12 Jan	age hot wa ual average 25 litres per Feb e in litres per	hot water person per Mar	ge in litre usage by : day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t	(25 x N) to achieve	+ 36 a water us  Sep  63.39	Oct	Nov 68.56	Dec 71.15	776.21	
Annual avera Reduce the ann not more that 12 Jan Hot water usage	rige hot waverage per litres per	hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Sur	Nov  68.56 m(44) <sub>112</sub> =	Dec 71.15	776.21	(43)
Annual avera Reduce the ann not more that 12 Jan Hot water usage (44)m= 71.15	rige hot waverage per litres per	hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 60.8	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8	+ 36 a water us  Sep  63.39	Oct  65.98  Fotal = Sur	Nov  68.56 m(44) <sub>112</sub> =	Dec 71.15	776.21	_
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52	rige hot waverage 25 litres per 16 litres pe	Mar Mar 65.98  used - calc	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 73.1	+ 36 a water us  Sep  63.39  6 kWh/mon  73.97	Oct  65.98  Fotal = Sur th (see Ta	Nov  68.56 m(44) <sub>112</sub> = ables 1b, 1	71.15 c, 1d)	776.21 1017.73	_
Annual avera Reduce the ann not more that 12  Jan Hot water usage (44)m= 71.15  Energy content (45)m= 105.52	rige hot waverage 25 litres per 16 litres pe	Mar day for ea  65.98  used - calc 95.23	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no	es per da 5% if the orater use, I May Vd,m = far 60.8 onthly = 4.	ay Vd,av Iwelling is not and co Jun ctor from 5 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43)  60.8  73.1  boxes (46)	+ 36 a water us  Sep  63.39  63.39  73.97  70 to (61)	Oct  65.98  Fotal = Sunth (see Tail 86.21  Fotal = Sunth (see Tail 86.21	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> =	71.15 c, 1d) 102.19		(44) (45)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83	rige hot waverage 25 litres per 16 litres pe	Mar Mar 65.98  used - calc	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 60.8 73.1	+ 36 a water us  Sep  63.39  6 kWh/mon  73.97	Oct  65.98  Fotal = Sur th (see Ta	Nov  68.56  m(44) <sub>112</sub> = ables 1b, 1  94.1	71.15 c, 1d)		(44)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storage	rige hot waverage is litres per less. Feb 68.56 of hot water 2 92.29 water heating 13.84 e loss:	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no	es per da $5\%$ if the a vater use, $I$ May $Vd,m = fa$ $60.8$ $79.66$ $hot water$ $11.95$	ay Vd,av lwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96	+ 36 a water us  Sep  63.39 b kWh/mon  73.97 b to (61)  11.1	Oct  65.98  Fotal = Surth (see Tall 86.21  Fotal = Surth 12.93	Nov  68.56  m(44) <sub>112</sub> = ables 1b, 1  94.1  m(45) <sub>112</sub> =	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volume	rige hot waverage as litres per less in litres per less for hot water less less less less less less less le	Mar day for ea  65.98  used - calc  95.23  ng at point  14.28	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45	es per da 5% if the orater use, I May Vd,m = far 60.8	ay Vd,av Iwelling is not and co Jun ctor from 7 58.22 190 x Vd,r 68.74 storage),	erage = designed to designed t	(25 x N) o achieve  Aug (43) 60.8  73.1  boxes (46) 10.96  within sa	+ 36 a water us  Sep  63.39 b kWh/mon  73.97 b to (61)  11.1	Oct  65.98  Fotal = Surth (see Tall 86.21  Fotal = Surth 12.93	Nov  68.56  m(44) <sub>112</sub> = ables 1b, 1  94.1  m(45) <sub>112</sub> =	71.15 c, 1d) 102.19		(44) (45)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storage	rige hot waverage (25 litres per le le litres per le le le le le le le le le le le le le	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28  includin	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ng any so nk in dw	es per da 5% if the of water use, I  May  Vd,m = fact 60.8  79.66  o hot water 11.95  colar or W  velling, e	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  storage), 10.31  /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = hbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volum If community Otherwise if instantaneous  Water storag	rige hot waverage as litres per less in litres per less less less less less less less le	Mar day for ea  65.98  used - calc  95.23  ng at point  14.28  including and no talchot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in	es per da 5% if the orater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = hbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volumed to the reduc	rige hot waverage (25 litres per per litres	Mar day for ea 65.98  used - cale 95.23  ng at point 14.28  includinated no tale hot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in	es per da 5% if the orater use, I May Vd,m = far 60.8  onthly = 4.  79.66  o hot water 11.95  olar or Welling, encludes i	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 71.1 11.1 ame vess	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56 m(44) <sub>112</sub> = hbles 1b, 1 94.1 m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volu  If community Otherwise if instantaneous  a) If manufactory Temperature	rige hot waverage (25 litres per le 168.56)  of hot water (2 92.29)  water heating a no stored e loss: cturer's de factor fro	Mar day for ea  65.98  used - calc 95.23  ng at point 14.28  including and no tale hot water	ge in litre usage by a day (all w  Apr ach month 63.39  culated mo 12.45  ag any so nk in dw er (this in  oss facto 2b	es per da 5% if the of water use, I  May Vd,m = fac 60.8  onthly = 4. 79.66  o hot water 11.95  olar or W velling, e ocludes i	ay Vd,av lwelling is not and co  Jun ctor from 58.22  190 x Vd,r 68.74  10.31  /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47) mbi boil	+ 36 a water us  Sep  63.39 73.97 11.1 11.1 ame vess ers) ente	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12	Dec 71.15 c, 1d) 102.19 15.33		(44) (45) (46) (47)
Annual avera Reduce the ann not more that 12  Jan Hot water usage  (44)m= 71.15  Energy content  (45)m= 105.52  If instantaneous  (46)m= 15.83  Water storag  Storage volumed to the reduc	rege hot waverage (25 litres per per per per per per per per per per	Mar Gay for each  95.23  ng at point  14.28  including and no tale hot water eclared learned l	ge in litre usage by a day (all w Apr ach month 63.39  culated mo 83.02  of use (no 12.45  ag any so nk in dw er (this in oss facto 2b , kWh/ye	es per da $5\%$ if the orater use, I May $Vd,m = fa$ $60.8$ $0$ that water $11.95$ olar or W relling, encludes it or is known ear	ay Vd,av Iwelling is not and co Jun ctor from 1 58.22 190 x Vd,r 68.74 10.31 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve  Aug (43) 60.8 73.1 boxes (46) 10.96 within sa (47)	+ 36 a water us  Sep  63.39 73.97 11.1 11.1 ame vess ers) ente	Oct  65.98  Fotal = Sur  86.21  Fotal = Sur  12.93	Nov  68.56  m(44) <sub>112</sub> = sbles 1b, 1  94.1  m(45) <sub>112</sub> = 14.12  47)	Dec 71.15 = c, 1d) 102.19 = 15.33		(44) (45) (46) (47)

Hot water storag	je loss factor fi	rom Tabl	e 2 (kWl	h/litre/da	ay)					0		(51)
If community he	•	on 4.3									•	
Volume factor from									-	0		(52)
Temperature fac										0		(53)
Energy lost from	ū	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (5	, , ,								0.	75		(55)
Water storage lo	ss calculated	for each	month			((56)m = (	55) × (41)ı 	m				
` '	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 of	ledicated solar sto	orage, (57)r	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.33	21.07 23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit lo	oss (annual) fro	om Table	3							0		(58)
Primary circuit lo	ss calculated	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by fa	actor from Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01 23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calc	ulated for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0 0	0	0	0	0	0	0	0	0	0		(61)
Total heat requir	ed for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
	134.37 141.83	128.12	126.26	113.84	110.3	119.69	119.06	132.8	139.19	148.78		(62)
Solar DHW input cal	culated using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	r heating)	l	
(add additional li												
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
Output from wat	er heater											
· -	134.37 141.83	128.12	126.26	113.84	110.3	119.69	119.06	132.8	139.19	148.78		
L L	<b>.</b>			l		Outp	out from wa	ater heate	r (annual)₁	12	1566.35	(64)
Heat gains from	water heating	, kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	_
	64.35 68.94	63.68	63.76	58.93	58.46	61.58	60.67	65.94	67.36	71.25		(65)
include (57)m	in calculation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	ı leating	
5. Internal gair		. ,		,							· · · · · · · · · · · · · · · · · · ·	
	•	<i>'</i>	) •									
Metabolic gains  Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	64.18 64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18	64.18		(66)
Lighting gains (c	ļ .							••	00	0	l	()
	10.42 8.47	6.41	4.79	4.05	4.37	5.68	7.63	9.69	11.31	12.05	1	(67)
	ļ .			<u> </u>	<u> </u>		ļ.		11.01	12.00		(0.)
Appliances gains	<u> </u>					, .			07.40	404.05	1	(68)
` '	110.62 107.76	101.66	93.97	86.74	81.91	80.77	83.63	89.73	97.42	104.65		(00)
Cooking gains (d		<del> </del>								I	Ī	(00)
` ′	29.42 29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42		(69)
Pumps and fans	<del>'</del> '	<del> </del>							1		1	
(70)m= 3	3 3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva			es) (Tab	le 5)					1		1	
(71)m= -51.34	-51.34 -51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34	-51.34		(71)
Water heating g	ains (Table 5)										•	
(72)m= 97.26	95.76 92.66	88.44	85.7	81.85	78.57	82.77	84.26	88.63	93.56	95.77		(72)

Total inter	<b>Total internal gains =</b> $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$																
(73)m= 263	.72	262.05	254.14	1	241.77	229.72	2	17.89	210.1	214	.48	220.78	233.3	247.54	257.73	]	(73)
6. Solar g	ains:															•	
Solar gains	are ca	alculated	using so	lar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orientation		ccess F able 6d	actor		Area m²			Flu Tal	x ble 6a		T	g_ able 6b		FF Table 6c		Gains (W)	
Northeast 0.	9x	0.77		х	0.9	5	x	1	1.28	x		0.63	х	0.7	=	1.72	(75)
Northeast 0.	9x	0.77		х	0.1	5	x		1.28	x		0.63	X	0.7		0.52	(75)
Northeast 0.	9x	0.77		x	0.	5	x	2	22.97	x		0.63	x	0.7	=	3.51	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	2	22.97	x		0.63	x	0.7	=	1.05	(75)
Northeast 0.	9x	0.77		X	0.	5	x	4	1.38	X		0.63	x	0.7	=	6.32	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	4	1.38	x		0.63	x	0.7	=	1.9	(75)
Northeast 0.	9x	0.77		x	0.	5	X	6	67.96	X		0.63	x	0.7	=	10.38	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	6	7.96	X		0.63	x	0.7	=	3.12	(75)
Northeast 0.	9x	0.77		x	0.9	5	X	9	1.35	X		0.63	x	0.7	=	13.96	(75)
Northeast 0.	9x	0.77		x	0.1	5	X	9	1.35	X		0.63	x	0.7	=	4.19	(75)
Northeast 0.	9x	0.77		x	0.9	5	X	9	7.38	X		0.63	x	0.7	=	14.88	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	9	7.38	x		0.63	x	0.7	=	4.46	(75)
Northeast 0.	9x	0.77		x	0.9	5	x		91.1	x		0.63	x	0.7	=	13.92	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		91.1	X		0.63	x	0.7	=	4.18	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	7	72.63	x		0.63	x	0.7	=	11.1	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	7	72.63	x		0.63	x	0.7	=	3.33	(75)
Northeast 0.	9x	0.77		x	0.	5	X	5	50.42	X		0.63	x	0.7	=	7.7	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	5	50.42	X		0.63	x	0.7	=	2.31	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	2	28.07	x		0.63	x	0.7	=	4.29	(75)
Northeast 0.	9x	0.77		x	0.1	5	x	2	28.07	x		0.63	x	0.7	=	1.29	(75)
Northeast 0.	9x	0.77		x	0.	5	X		14.2	X		0.63	x	0.7	=	2.17	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		14.2	x		0.63	x	0.7	=	0.65	(75)
Northeast 0.	9x	0.77		x	0.9	5	x	(	9.21	x		0.63	x	0.7	=	1.41	(75)
Northeast 0.	9x	0.77		x	0.1	5	x		9.21	x		0.63	x	0.7	=	0.42	(75)
Southeast 0.	9x	0.77		x	0.9	91	x	3	86.79	x		0.63	x	0.7	=	10.23	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	6	2.67	X		0.63	x	0.7	=	17.43	(77)
Southeast 0.	9x	0.77		x	0.9	)1	x	8	35.75	x		0.63	x	0.7	=	23.85	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	1	06.25	X		0.63	x	0.7	=	29.55	(77)
Southeast 0.	9x	0.77		x	0.9	)1	X	1	19.01	X		0.63	x	0.7	=	33.1	(77)
Southeast 0.	9x	0.77		x	0.9	)1	x	1	18.15	x		0.63	x	0.7	=	32.86	(77)
Southeast 0.	9x	0.77		х	0.9	)1	x	1	13.91	x		0.63	x	0.7	=	31.68	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	1	04.39	x		0.63	x	0.7	=	29.03	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	9	2.85	x		0.63	x	0.7	=	25.82	(77)
Southeast 0.	9x	0.77		х	0.9	91	x	6	9.27	x		0.63	X	0.7	=	19.26	(77)

Southeas																		
	느	0.77	X	0.9	)1	X	4	4.07	Х		0.63		× L	0.7		=	12.26	(77)
Southeas	느	0.77	X	0.9	)1	X	3	1.49	X		0.63	)	× L	0.7		=	8.76	(77)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	3	6.79			0.63	)	x [	0.7		=	7.31	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	3	6.79			0.63	)	× [	0.7		=	7.53	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	6	2.67	]		0.63	)	x [	0.7		=	12.45	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	6	2.67			0.63	)	× [	0.7		=	12.83	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	8	5.75			0.63	,	× [	0.7		=	17.03	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	0.6	57	X	8	5.75			0.63	)	x [	0.7		=	17.56	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	55	X	1	06.25			0.63	)	x [	0.7		=	21.11	(79)
Southwe	est <sub>0.9x</sub>	0.77	X	0.6	57	X	1	06.25	]		0.63	)	× [	0.7		=	21.76	(79)
Southwe	st <sub>0.9x</sub>	0.77	X	0.6	55	X	1	19.01	]		0.63	)	x [	0.7		=	23.64	(79)
Southwe	st <sub>0.9x</sub>	0.77	X	0.6	57	X	1	19.01	]		0.63	)	× [	0.7		=	24.37	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	1	18.15	]		0.63	)	x [	0.7		=	23.47	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	1	18.15	]		0.63	)	x [	0.7		=	24.19	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	1	13.91	]		0.63	)	x [	0.7		=	22.63	(79)
Southwe	est <sub>0.9x</sub>	0.77	Х	0.6	57	X	1	13.91			0.63	)	× [	0.7		=	23.32	(79)
Southwe	est <sub>0.9x</sub>	0.77	х	0.6	55	X	1	04.39	]		0.63	)	×	0.7		=	20.74	(79)
Southwe	est <sub>0.9x</sub>	0.77	х	0.6	57	X	1	04.39	]		0.63	)	×	0.7		=	21.38	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	9	2.85	]		0.63	,	× [	0.7		=	18.44	(79)
Southwe	st <sub>0.9x</sub>	0.77	x	0.6	57	X	9	2.85	]		0.63	,	x [	0.7		=	19.01	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	6	9.27	ĺ		0.63	= ,	× [	0.7		=	13.76	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	6	9.27	ĺ		0.63	= ,	× Ē	0.7		=	14.18	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	4	4.07	ĺ		0.63	= ,	× [	0.7		=	8.75	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	4	4.07	ĺ		0.63	= ,	× [	0.7		=	9.02	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	55	X	3	1.49	ĺ		0.63	= ,	× Ī	0.7		=	6.26	(79)
Southwe	est <sub>0.9x</sub>	0.77	x	0.6	57	X	3	1.49	ĺ		0.63	= ,	× [	0.7		=	6.45	(79)
									•									
Solar ga	ains in v	vatts, ca	lculated	for eac	n month	1			(83)m	ı = Su	m(74)m .	(82)	)m					
(/	27.32	47.28	66.66	85.91	99.25		9.87	95.73	85.	57	73.3	52.	78	32.85	23.	29		(83)
Total ga	ains – in			(84)m =		+ (8	83)m	, watts						1			1	
(84)m=	291.04	309.33	320.8	327.68	328.97	3	17.75	305.83	300	.05	294.08	286	80.8	280.4	281	.02		(84)
7. Mea	an intern	al tempe	erature	(heating	seaso	า)												
Tempe	erature o	during he	eating p	eriods ir	the liv	ing	area t	from Tal	ole 9	, Th1	(°C)						21	(85)
Utilisat	ion fact	or for ga	ins for I	iving are	ea, h1,n	n (s	ee Ta	ble 9a)										
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	0	ct	Nov	D	ес		
(86)m=	0.99	0.99	0.98	0.96	0.92		8.0	0.65	0.6	88	0.86	0.9	96	0.99	0.9	99		(86)
Mean i	internal	tempera	ture in	living are	ea T1 (1	ollo	w ste	ps 3 to 7	7 in T	able	9c)							
_	19.58	19.71	19.94	20.28	20.6	_	20.86	20.96	20.		20.79	20.	.39	19.95	19.	57		(87)
Tempe	erature d	during he	eating p	eriods ir	rest of	dw	ellina	from Ta	hle 9	Th	2 (°C)			•			•	
· –	19.73	19.73	19.74	19.76	19.76	_	9.78	19.78	19.		19.77	19.	.76	19.75	19.	74	]	(88)
	tion fact	or for ga	ine for	ract of d	walling	h?	m /sc	a Tabla	02/					ı			ı	
Julisal	-					_	,111 (SE 0.71	0.49	<del>_</del>	-2	0.70	0.0	24	0.98	0.0	99	l	(89)
(89)m=	0.99	0.99	0.98	0.95	0.88	1 (	U.1 I	0.49	0.5	oo i	0.79	0.9	<del>74</del>	1 0.90	U.:			(00)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 17.88 18.07 18.42 18.91 19.36 19.68 19.76 19.76 19.6 19.08 18.43 17.88		
(		(90)
fLA = Living area ÷ (4) =	0.68	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2		J
(92)m= 19.04 19.18 19.45 19.84 20.2 20.48 20.58 20.57 20.41 19.97 19.46 19.03		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 19.04 19.18 19.45 19.84 20.2 20.48 20.58 20.57 20.41 19.97 19.46 19.03		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculated to the mean internal temperature obtained to the mean internal	te	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:		
(94)m= 0.99 0.98 0.97 0.95 0.89 0.77 0.6 0.63 0.83 0.95 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 287.66 304.32 312.51 311.5 294.4 243.53 182.24 188.18 244.19 271.01 274.96 278.19		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 749.54 723.49 653.43 541.18 418.99 284.86 192.62 201.3 307.59 461.93 613.77 742.08		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		
(98)m= 343.64 281.68 253.65 165.37 92.7 0 0 0 142.04 243.94 345.14	1000.17	1,000
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	1868.17	(98)
Space heating requirement in kWh/m²/year	53.19	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		(201)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =	0	
Tradition of opens that the tradition of	1	] `
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		(202)
	1	(202) (204)
Efficiency of main space heating system 1	93.5	(202) (204) (206)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %		(202) (204)
<u> </u>	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64 281.68 253.65 165.37 92.7 0 0 0 142.04 243.94 345.14  (211)m = {[(98)m x (204)] } x 100 ÷ (206)	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5	(202) (204) (206) (208)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  343.64	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) r
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea	(202) (204) (206) (208) (208) r (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea 1998.04	(202) (204) (206) (208) (211) (211)
Efficiency of secondary/supplementary heating system, %    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	93.5 0 kWh/yea 1998.04	(202) (204) (206) (208) (211) (211)

Water heating fuel used 1862.95	
Electricity for pumps, fans and electric keep-hot	
central heating pump: 30	230c)
boiler with a fan-assisted flue	230e)
Total electricity for the above, kWh/year sum of (230a)(230g) = 75	231)
Electricity for lighting	232)
12a. CO2 emissions – Individual heating systems including micro-CHP	
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	
Space heating (main system 1) (211) × 0.216 = 431.58 (2	261)
Space heating (secondary) (215) $\times$ 0.519 = 0 (2	263)
Water heating (219) x 0.216 = 402.4 (2	264)
Space and water heating (261) + (262) + (263) + (264) = 833.97 (264)	265)
Water heating from community system	
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	
Electrical energy for heat distribution [(313) x 0 = 0	372)
Total CO2 associated with community systems (363)(366) + (368)(372) = 0	373)
Electricity for pumps, fans and electric keep-hot (231) × 0.519 = 38.93 (2	267)
Electricity for lighting $(232) \times 0.519 = 107.49$	268)
Total CO2, kg/year sum of (265)(271) = 980.39 (2	272)

TER =

(273)

40.98

#### **SAP 2012 Overheating Assessment**

Calculated by Stroma FSAP 2012 program, produced and printed on 12 May 2020

**Dwelling type:** Flat Located in: England Region: Thames valley

**Cross ventilation possible:** Yes Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach): 0.8 (Windows slightly open (50 mm))

Summer ventilation heat loss coefficient: (P1) 28.65

Transmission heat loss coefficient: 36.1

Summer heat loss coefficient: 64.73 (P2)

#### Overhangs:

Overhangs:

Night ventilation:

Orientation:	Ratio:	Z_overhang	s:
North East (Window_0	06_ <b>0</b> 1)	1	
South East (Window_	06 <b>_0</b> 4)	1	

South West (Window\_06<u>0</u>04) 1 South West (Window\_06<u>0</u>05) 1 1

North East (Fanlight)

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North East (Window_06	5_01)	0.9	1	0.9	(P8)
South East (Window_0	5_104)	0.9	1	0.9	(P8)
South West (Window_C	6 <u>1</u> 04)	0.9	1	0.9	(P8)
South West (Window_C	6 <u>1</u> 05)	0.9	1	0.9	(P8)
North East (Fanlight)	1	0.9	1	0.9	(P8)

Orientation	Area	Flux	$g_{-}$	FF	Shading	Gains
North East (Window_06_0.19) x	1.08	98.85	0.4	0.7	0.9	24.21
South East (Window_06_ <b>0</b> .49) x	1.97	119.92	0.4	0.7	0.9	53.58
South West (Window_06 <u>0</u> 094)x	1.42	119.92	0.4	0.7	0.9	38.62
South West (Window_06 <u>0</u> 05)x	1.45	119.92	0.4	0.7	0.9	39.44
North East (Fanlight) 0.9 x	0.32	98.85	0.4	0.7	0.9	7.17
-					Total	163.03 <b>(P3/P4)</b>

	June	July	August
Internal gains	298.92	289.12	294.42
Total summer gains	470.99	452.15	442.9 <b>(P5)</b>
Summer gain/loss ratio	7.28	6.99	6.84 <b>(P6)</b>
Mean summer external temperature (Thames valley)	16	17.9	17.8

# **SAP 2012 Overheating Assessment**

Thermal mass temperature increment 1.3 1.3 1.3

Threshold temperature 24.58 26.19 25.94 (P7)

Likelihood of high internal temperature High High

Assessment of likelihood of high internal temperature: <u>High</u>

#### **SAP Input**

#### Property Details: Flat Type D - ASHP + PV

Address:

Located in: England Region: Thames valley

**UPRN**:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

1.2

0.32

1

Floor 0  $25 \text{ m}^2$  3.09 m

Living area: 21.1 m<sup>2</sup> (fraction 0.844)

Front of dwelling faces: West

#### Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D4_01	Manufacturer	Solid			Metal
Vent_04_02	Manufacturer	Solid			
Vont 04 04	Manufacturor	Solid			

Vent\_04\_02 Manufacturer Solid
Window\_04\_01 Manufacturer Window

6mm

Window\_04\_01ManufacturerWindowslow-E, En = 0.05, soft coatYesWindow\_04\_05ManufacturerWindowslow-E, En = 0.05, soft coatYesFanlightManufacturerWindowslow-E, En = 0.05, soft coatNo

0.7

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:	
D4_01	mm	0	0	1	2.13	1	
Vent_04_02	mm	0	0	1	0.35	1	
Vent_04_04	mm	0	0	1	0.99	1	
Window_04_01	6mm	0.7	0.4	1.2	0.7	1	
Window 04 05	6mm	0.7	0.4	1.2	1.96	1	

0.4

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D4_01		4_01	West	0	0
Vent_04_02		4_01	West	0.295	1.2
Vent_04_04		4_05	East	0.6	1.65
Window_04_01		4_01	West	0.585	1.2
Window_04_05		4_05	East	1.185	1.65
Fanlight		4_01	West	1.01	0.315

Overshading: Average or unknown

#### Opaque Elements

Fanlight

Карра:
N/A
N/A
N/A
N/A
1

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

#### **SAP Input**

R4\_01 25 0 25 0.1 0 N/A

Internal Elements
Party Elements

Thermal bridges:

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: False

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 2.5

Main heating system:

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature  $>45\,^{\circ}\text{C}$ 

Room-sealed Boiler interlock: Yes

Main heating Control:

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329 Piping>=1991, pre-insulated, medium temp, variable flow

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: 0.448

Tilt of collector: 30°

Overshading: None or very little

#### **SAP Input**

Collector Orientation: South West

Photovoltaic 2

Installed Peak power: 0.179

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Photovoltaic 3

Installed Peak power: 0.168

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: N

		l lsor-F	Details:						
Accesser Name:	Adam Ritchie	– USEFL	Strom	o Nives	hor:		QTD (	019516	
Assessor Name: Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.4.25	
		Property	Address			SHP + F			
Address :									
Overall dwelling dime	ensions:	•	4 0						<b>.</b> .
Ground floor		Are	<b>a(m²)</b> 25	(1a) x		ight(m) :.09	(2a) =	<b>Volume(m</b> <sup>2</sup>	<b>3)</b> (3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)		(4)			(24)	17.25	(ou)
	a)+(1b)+(16)+(1a)+(16)+(1	'''	25	J	) . (20) . (20	d)+(3e)+	(3n) -		<b>7</b>
Dwelling volume				(3a) <del>+</del> (3b	)+(30)+(30	л) <del>т</del> (Зе)т	(311) =	77.25	(5)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating  0 + 0	, 	0	<b>7</b> = F	0	x	40 =	0	(6a)
Number of open flues	0 + 0		0	」	0		20 =	0	(6b)
Number of intermittent fa				┙┟			10 =		╡`′
				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0			0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(	7a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			<u> </u>
Number of storeys in the	he dwelling (ns)					[(0)	41.04	0	(9)
Additional infiltration	.25 for steel or timber frame o	r 0 35 fo	r masoni	rv consti	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	dollori			0	(11)
deducting areas of opening	· .	) <b>1</b> (===1:	ماد الم						<b></b>
If no draught lobby, en	floor, enter 0.2 (unsealed) or (	). i (seale	ea), eise	enter 0				0	(12)
	s and doors draught stripped							0	(14)
Window infiltration	o ana accio araagin emippea		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	our per s	quare m	etre of e	envelope	area	2.5	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed		_	7(40)
Number of sides sheltere Shelter factor	eu		(20) = 1 -	[0.075 x ( <sup>2</sup>	19)] =			0	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed							-	
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.	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
	1 1 1 1 1 1 1 1 1 1	1	1					J	

Adjusted infiltra	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15		
Calculate effect		-	rate for t	he appli	cable ca	ise	•	•	•	•	•	,	
If mechanica			andiv N. (2	3h) - (23	a) v Emy (	oguation (	NEV otho	nuico (22h	) - (232)			0.5	(23a
If balanced with		•		, ,	,	•		,	) = (23a)			0.5	(23b
		-	-	_					Ola \	00h) [	4 (00-)	75.65	(23c)
a) If balance (24a)m= 0.28	0.28	o.27	0.26	0.26	at recov	0.24	0.24	0.25	0.26	0.26	$\frac{1 - (230)}{0.27}$	) ÷ 100] ]	(24a
b) If balance		<u> </u>					<u> </u>	<u> </u>			0.27		(214
(24b)m= 0	0	o 0	0	0 Williout	0	overy (	0	0	0	0	0	1	(24b
		<u> </u>			ļ		<u>!</u>					J	(=
c) If whole he if (22b)m				•	•				.5 × (23b	o)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0	1	(24c
d) If natural v	ventilatio	on or wh	ole hous	e positi	ve input	ventilati	on from l	oft			<u>.                                    </u>	J	
if (22b)m				•	•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	ld) in box	(25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27		(25)
3. Heat losses	s and he	eat loss i	naramete	ər.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doors Type 1					2.13	х	1		2.13				(26)
Doors Type 2					0.35	x	1		0.35	一			(26)
Doors Type 3					0.99	x	1	<del>-</del>	0.99				(26)
Windows Type	: 1				0.7	x1	/[1/( 1.2 )+	0.04] =	0.8	Ħ			(27)
Windows Type	2				1.96	x1	/[1/( 1.2 )+	0.04] =	2.24	Ħ			(27)
Windows Type					0.32	ऱ .	/[1/( 1.2 )+	0.04] =	0.37	=			(27)
Walls Type1	10.0	7	3.5	$\neg$	6.57		0.13		0.85	=			(29)
Walls Type2	12.9				10.03	=	0.13	=	1.3	믁 ¦			(29)
Walls Type3		=	2.95	<u>'</u>				_		륵 片		$\dashv$ $\vdash$	_
Walls Type3	1.87		0	_	1.87		0.13	=	0.24	믁 ¦		╡	(29)
• •	2.9	=	0	<b>=</b>	2.9	X	0.13	=	0.38	닠 ¦			(29)
Roof	25		0		25	×	0.1	=	2.5				(30)
Total area of el					52.82								(31)
* for windows and ** include the area						lated usin	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat los				,			(26)(30)	) + (32) =				12.16	(33)
Heat capacity (		•	•					((28).	(30) + (32	2) + (32a).	(32e) =	225	(34)
Thermal mass		,	= Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Low		100	(35)
For design assess can be used instea	: ments wh	ere the de	tails of the	•			recisely the	e indicative	e values of	TMP in Ta	able 1f		` ′
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix I	K						7.92	(36)

Total fabric he	at loss							(33) +	(36) =		ı	20.08	(37)
Ventilation hea		alculated	d monthl	V					, ,	25)m x (5)		20.00	(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 7.17	7.09	7.01	6.61	6.53	6.13	6.13	6.05	6.29	6.53	6.69	6.85		(38)
Heat transfer of	coefficier	nt, W/K	<u>I</u>	l .	<u>I</u>			(39)m	= (37) + (37)	38)m	ı	l	
(39)m= 27.25	27.17	27.09	26.69	26.61	26.22	26.22	26.14	26.37	26.61	26.77	26.93		
Heat loss para	meter (H	HLP), W	/m²K	•	•	•			Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	26.67	(39)
(40)m= 1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of day	ys in mor	nth (Tab	le 1a)	•	•	•		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.07	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
			ı		ı				<u> </u>			l	
4. Water hea	ting ener	rgy requi	irement:								kWh/ye	ear:	
												ı	
Assumed occu if TFA > 13.5			[1 - exp	(-0 0003	849 x (TF	FA -13 9	1211 + 0 (	0013 x (	ΓFA -13		.09		(42)
if TFA £ 13.		11.70 %	i OAP	( 0.0000	) 10 X (11	71 10.0	<i>/</i> 2/] . O.(	) 10 10 11 (		.0)			
Annual averag											0.05		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	t			
				·	<del> </del>	•	A	Can	0-4	Nav	Dag		
Jan Hot water usage i	Feb in litres per	Mar dav for ea	Apr ach month	May   Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		
(11)	00.00	01.20	00.00	00.10	01.00	0 1.00	00.10			m(44) <sub>112</sub> =		720.62	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600					. 20.02	` ′
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
	•	•		•	•	•	•		Total = Su	m(45) <sub>112</sub> =	=	944.85	(45)
If instantaneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)	) to (61)				•	
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage Storage volum		includir	na anv e	olar or M	WHDC	etorago	within so	me vec	col			1	(47)
If community h	, ,		•			_		airie ves	361		0		(47)
Otherwise if no	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			(					,		,			
a) If manufact	turer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/y	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-									! !	
Hot water stor	-			ie 2 (KVV	n/litre/da	ay)				0.	.02		(51)
Volume factor	_		011 4.3							1	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				, , ,	. , ,	•		03		(55)
												•	

Water	storage	loss cal	culated t	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)
	Ller contains	s dedicate	l d solar sto	<u>I</u> rage, (57)ı	n = (56)m	x [(50) – (	<u>I</u> H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (	H11) is fro	m Append	l ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	ry circuit	loss (an	nual) fro	m Table	3							0		(58)
	ry circuit	•	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(mc	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Comb	i loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total	heat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		(62)
Solar D	HW input	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add a	additiona	I lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	<b>3</b> )					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter	-	-	-	-	-	-	-	-	-		
(64)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		
			•			•		Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	1595.69	(64)
Heat (	gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m=	76.79	68.43	73.62	68.42	68.81	64.02	63.89	66.79	65.63	70.83	71.84	75.77		(65)
			ı	1		00_	1 00.00	00.73	05.05	10.03	/ 1.04	13.11		()
incl	ude (57)	m in cald	ulation (	L of (65)m	ļ	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ		l eating	()
	. ,				only if c	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ		eating	(55)
5. In	ternal ga	ains (see	e Table 5	and 5a	only if c	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ		eating	(55)
5. In	. ,	ains (see	e Table 5	and 5a	only if c	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ		eating	
5. In	ternal ga polic gain Jan	ains (see	Table 5	and 5a	only if o	ylinder i	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. In Metab	oolic gain Jan 65.31	ains (see s (Table Feb 65.31	E Table 5 2 5), Wat Mar 65.31	ts Apr 65.31	only if co:  May  65.31	Jun 65.31	Jul 65.31	Aug 65.31	or hot w	ater is fr	om com	munity h	eating	
5. In Metab	ternal gan Jan 65.31	ains (see s (Table Feb 65.31	E Table 5 2 5), Wat Mar 65.31	ts Apr 65.31	only if co:  May  65.31	Jun 65.31	Jul 65.31	Aug 65.31	or hot w	ater is fr	om com	munity h	eating	
5. In Metab (66)m= Lightin (67)m=	Jan 65.31 ng gains	s (Table Feb 65.31 (calcula	65), Wat Mar 65.31 ted in Ap	ts Apr 65.31 opendix 11.73	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the c	Jun 65.31 ion L9 o	Jul 65.31 r L9a), a	Aug 65.31 Iso see	Sep 65.31 Table 5	Oct 65.31	Nov 65.31	Dec 65.31	eating	(66)
5. In Metab (66)m= Lightin (67)m=	oolic gain Jan 65.31 ng gains 21.45	s (Table Feb 65.31 (calcula	65), Wat Mar 65.31 ted in Ap	ts Apr 65.31 opendix 11.73	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the c	Jun 65.31 ion L9 o	Jul 65.31 r L9a), a	Aug 65.31 Iso see	Sep 65.31 Table 5	Oct 65.31	Nov 65.31	Dec 65.31	eating	(66)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m=	dernal gain Jan 65.31 ng gains 21.45 ances ga	reins (see Feb 65.31 (calcula 19.05 ins (calc	E Table 5 E 5), Wat Mar 65.31 ted in Ap 15.49 ulated ir 126.78	s and 5a ts Apr 65.31 ppendix 11.73 Appendix 119.61	only if construction only if c	Jun 65.31 ion L9 of 7.4 uation L	Jul 65.31 r L9a), a 8 13 or L1	Aug 65.31 Iso see 10.39 3a), also	Sep 65.31 Table 5 13.95 see Ta 98.4	Oct 65.31 17.72 ble 5 105.57	Nov 65.31 20.68	Dec 65.31	eating	(66) (67)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m=	Jan 65.31 ng gains 21.45 nnces ga 128.81 ng gains	reins (see Feb 65.31 (calcula 19.05 ins (calc	E Table 5 E 5), Wat Mar 65.31 ted in Ap 15.49 ulated ir 126.78	s and 5a ts Apr 65.31 ppendix 11.73 Appendix 119.61	only if construction only if c	Jun 65.31 ion L9 of 7.4 uation L	Jul 65.31 r L9a), a 8 13 or L1	Aug 65.31 Iso see 10.39 3a), also	Sep 65.31 Table 5 13.95 see Ta 98.4	Oct 65.31 17.72 ble 5 105.57	Nov 65.31 20.68	Dec 65.31	eating	(66) (67)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	dernal garage polic gain Jan 65.31 ang gains 21.45 ances ga 128.81 ang gains 42.62	reb 65.31 (calcular 19.05 ins (calcular 130.15 (calcular 42.62	Mar 65.31 ted in Ap 15.49 ulated in 126.78 atted in A	ts	only if only i	Jun 65.31 ion L9 of 7.4 uation L 102.05	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a)	Aug 65.31 Iso see 10.39 3a), also 95.03	Sep 65.31 Table 5 13.95 see Ta 98.4	Oct 65.31 17.72 ble 5 105.57	Nov 65.31 20.68	Dec 65.31 22.04	eating	(66) (67) (68)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	Jan 65.31 ng gains 21.45 nnces ga 128.81 ng gains 42.62 s and fai	reb 65.31 (calcular 19.05 ins (calcular 130.15 (calcular 42.62	Mar 65.31 ted in Ap 15.49 ulated in 126.78 atted in A	ts	only if only i	Jun 65.31 ion L9 of 7.4 uation L 102.05	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a)	Aug 65.31 Iso see 10.39 3a), also 95.03	Sep 65.31 Table 5 13.95 see Ta 98.4	Oct 65.31 17.72 ble 5 105.57	Nov 65.31 20.68	Dec 65.31 22.04	eating	(66) (67) (68)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m=	Jan 65.31 ng gains 21.45 nnces ga 128.81 ng gains 42.62 s and fai	resins (see Feb 65.31 (calcular 19.05 ins (calcular 130.15 (calcular 42.62 ins gains 0	Mar 65.31 ted in Ap 15.49 ulated in 126.78 ated in A 42.62 (Table 5	s and 5a ts Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a)	only if constructions only its construction of constructions on the construction of constructions on the const	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62	Sep 65.31 Table 5 13.95 see Ta 98.4 ee Table 42.62	Oct 65.31  17.72 ble 5 105.57 5 42.62	Nov 65.31 20.68 114.62	Dec 65.31 22.04 123.13	eating	(66) (67) (68)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m=	oolic gain Jan 65.31 ng gains 21.45 nnces ga 128.81 ng gains 42.62 s and fai	resins (see Feb 65.31 (calcular 19.05 ins (calcular 130.15 (calcular 42.62 ins gains 0	Mar 65.31 ted in Ap 15.49 ulated in 126.78 ated in A 42.62 (Table 5	s and 5a ts Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a)	only if constructions only its construction of constructions on the construction of constructions on the const	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62	Sep 65.31 Table 5 13.95 see Ta 98.4 ee Table 42.62	Oct 65.31  17.72 ble 5 105.57 5 42.62	Nov 65.31 20.68 114.62	Dec 65.31 22.04 123.13	eating	(66) (67) (68)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	polic gain Jan 65.31 ng gains 21.45 nnces ga 128.81 ng gains 42.62 s and fai 0 s e.g. ev	s (Table Feb 65.31 (calculations) 19.05 ins (calculations) (calculations) 42.62 ns gains 0 raporation -43.54	ted in Apulated in 126.78  (Table 5 on (negar	ts Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0 tive valu	only if construction only if c	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62 0 ble 5)	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62	Sep 65.31 Table 5 13.95 see Ta 98.4 ee Table 42.62	Oct 65.31  17.72 ble 5 105.57 5 42.62	Nov 65.31 20.68 114.62 42.62	Dec 65.31 22.04 123.13	eating	(66) (67) (68) (69)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	dernal garage polic gain Jan 65.31 and gains 21.45 ances ga 128.81 ang gains 42.62 and fair 0 as e.g. ev 43.54 and heating	s (Table Feb 65.31 (calculations) 19.05 ins (calculations) (calculations) 42.62 ns gains 0 raporation -43.54	ted in Apulated in 126.78  (Table 5 on (negar	ts Apr 65.31 ppendix 11.73 Appendix 119.61 ppendix 42.62 5a) 0 tive valu	only if construction only if c	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62 0 ble 5)	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62	Sep 65.31 Table 5 13.95 see Ta 98.4 ee Table 42.62	Oct 65.31  17.72 ble 5 105.57 5 42.62	Nov 65.31 20.68 114.62 42.62	Dec 65.31 22.04 123.13	eating	(66) (67) (68) (69)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	dernal garage polic gain Jan 65.31 and gains 21.45 ances ga 128.81 ang gains 42.62 and fair 0 as e.g. ev 43.54 and heating	raporatious (see	E Table 5 E 5), Wat Mar 65.31 ted in Ap 15.49 ulated in 126.78 ted in A 42.62 (Table 5 0 on (negative displayed) -43.54 Table 5) 98.95	ts	only if constructions only if constructions	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62  0 ole 5) -43.54	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62 0	Sep 65.31 Table 5 13.95 See Ta 98.4 ee Table 42.62 0 -43.54	Oct 65.31  17.72 ble 5 105.57 5 42.62  0  -43.54	Nov 65.31 20.68 114.62 42.62 0	Dec 65.31 22.04 123.13 42.62 0 -43.54	eating	(66) (67) (68) (69) (70) (71)
5. In Metab  (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	dernal garage olic gain  Jan 65.31  ng gains 21.45  nnces ga 128.81  ng gains 42.62  s and far 0  s e.g. ev -43.54 heating 103.22 internal	raporatious (see	E Table 5 E 5), Wat Mar 65.31 ted in Ap 15.49 ulated in 126.78 ted in A 42.62 (Table 5 0 on (negative displayed) -43.54 Table 5) 98.95	ts	only if constructions only if constructions	Jun 65.31 ion L9 of 7.4 uation L 102.05 tion L15 42.62  0 ole 5) -43.54	Jul 65.31 r L9a), a 8 13 or L1 96.37 or L15a) 42.62	Aug 65.31 Iso see 10.39 3a), also 95.03 ), also se 42.62 0	Sep 65.31 Table 5 13.95 See Ta 98.4 ee Table 42.62 0 -43.54	Oct 65.31  17.72 ble 5 105.57 5 42.62  0  -43.54	Nov 65.31 20.68 114.62 42.62 0	Dec 65.31 22.04 123.13 42.62 0 -43.54	eating	(66) (67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientat		Access Fac Table 6d	tor	Area m²		Flu Tal	x ole 6a		g_ Table 6l	b	T	FF able 6c			Gains (W)	
East	0.9x	0.77	X	1.96	X	1	9.64	x	0.4	×		0.7		=	7.47	(76)
East	0.9x	0.77	x	1.96	X	3	8.42	x	0.4	X		0.7		=	14.61	(76)
East	0.9x	0.77	X	1.96	X	6	3.27	x	0.4	X		0.7		=	24.06	(76)
East	0.9x	0.77	x	1.96	X	9	2.28	x	0.4	X		0.7		=	35.1	(76)
East	0.9x	0.77	X	1.96	X	1	13.09	x	0.4	X		0.7		=	43.01	(76)
East	0.9x	0.77	X	1.96	X	1	15.77	x	0.4	X		0.7		=	44.03	(76)
East	0.9x	0.77	x	1.96	X	1	10.22	X	0.4	X		0.7		=	41.92	(76)
East	0.9x	0.77	x	1.96	X	9	4.68	x	0.4	X		0.7		=	36.01	(76)
East	0.9x	0.77	x	1.96	X	7	3.59	x	0.4	X		0.7		=	27.99	(76)
East	0.9x	0.77	x	1.96	X	4	5.59	x	0.4	X		0.7		=	17.34	(76)
East	0.9x	0.77	x	1.96	X	2	4.49	x	0.4	X		0.7		=	9.31	(76)
East	0.9x	0.77	x	1.96	X	1	6.15	x	0.4	x		0.7		=	6.14	(76)
West	0.9x	0.77	x	0.7	X	1	9.64	x	0.4	x		0.7		=	2.67	(80)
West	0.9x	0.77	x	0.32	X	1	9.64	x	0.4	X		0.7		=	1.22	(80)
West	0.9x	0.77	x	0.7	X	3	8.42	x	0.4	X		0.7		=	5.22	(80)
West	0.9x	0.77	x	0.32	X	3	8.42	x	0.4	X		0.7		=	2.39	(80)
West	0.9x	0.77	x	0.7	X	6	3.27	X	0.4	×		0.7		=	8.59	(80)
West	0.9x	0.77	×	0.32	x	6	3.27	x	0.4	×		0.7		=	3.93	(80)
West	0.9x	0.77	×	0.7	X	9	2.28	x	0.4	×		0.7		=	12.53	(80)
West	0.9x	0.77	×	0.32	X	9	2.28	x	0.4	×		0.7		=	5.73	(80)
West	0.9x	0.77	×	0.7	= x	1	13.09	x	0.4	×	Ē	0.7		=	15.36	(80)
West	0.9x	0.77	×	0.32	T	1	13.09	x	0.4	×	┌	0.7		=	7.02	(80)
West	0.9x	0.77	×	0.7	X	1	15.77	x	0.4	×		0.7		=	15.72	(80)
West	0.9x	0.77	×	0.32	x	1	15.77	x	0.4	×		0.7		=	7.19	(80)
West	0.9x	0.77	x	0.7	X	1	10.22	x	0.4	×		0.7		=	14.97	(80)
West	0.9x	0.77	x	0.32	x	1	10.22	x	0.4	×		0.7		=	6.84	(80)
West	0.9x	0.77	x	0.7	X	9	4.68	x	0.4	x		0.7		=	12.86	(80)
West	0.9x	0.77	x	0.32	X	9	4.68	x	0.4	×		0.7		=	5.88	(80)
West	0.9x	0.77	x	0.7	x	7	'3.59	x	0.4	×		0.7		=	10	(80)
West	0.9x	0.77	×	0.32	X	7	'3.59	x	0.4	×		0.7		=	4.57	(80)
West	0.9x	0.77	×	0.7	X	4	5.59	x	0.4	×		0.7		=	6.19	(80)
West	0.9x	0.77	x	0.32	x	4	5.59	x	0.4	×		0.7		=	2.83	(80)
West	0.9x	0.77	×	0.7	X	2	4.49	x	0.4	×		0.7		=	3.33	(80)
West	0.9x	0.77	×	0.32	X	2	4.49	x	0.4	X		0.7		=	1.52	(80)
West	0.9x	0.77	×	0.7	x	1	6.15	x	0.4	×		0.7		=	2.19	(80)
West	0.9x	0.77	x	0.32	X	1	6.15	x	0.4	×		0.7		=	1	(80)
Solar ga	ains in	ı watts, calcı	ulated	for each mo	onth_			(83)m	ı = Sum(74)n	n(82)	m			•		
(83)m=	11.36		6.59	53.36 65.		66.94	63.73	54.	75 42.55	26.3	36	14.16	9.0	34		(83)
		internal and		<del></del>								, ,			Ī	
(84)m=	329.22	337.63 3	42.2	344.12 341	1.6	329.69	318.35	314	.33 310.44	4 309.	.24	313.63	320	).73		(84)

7. Me	an inter	nal temp	perature	(heating	season	)								
				· ·		•	from Tal	ole 9, Th	1 (°C)				21	(85)
-		_	ains for			_			,			ļ		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.83	0.82	0.78	0.71	0.61	0.47	0.35	0.37	0.52	0.69	0.79	0.84		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.68	19.82	20.08	20.42	20.7	20.9	20.97	20.96	20.85	20.53	20.09	19.66		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	0.83	0.81	0.77	0.69	0.58	0.44	0.31	0.33	0.49	0.67	0.78	0.83		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)	-	-		
(90)m=	19.22	19.36	19.61	19.95	20.22	20.4	20.45	20.45	20.36	20.06	19.63	19.21		(90)
			•		•		•	•	1	fLA = Livin	g area ÷ (4	4) =	0.84	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			·		
(92)m=		19.75	20	20.34	20.63	20.82	20.89	20.88	20.77	20.46	20.02	19.59		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.61	19.75	20	20.34	20.63	20.82	20.89	20.88	20.77	20.46	20.02	19.59		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains	•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
uie u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		l	ains, hm	<u> </u>			<u> </u>	19	<u> </u>					
(94)m=	0.81	0.79	0.75	0.69	0.59	0.46	0.34	0.36	0.51	0.67	0.77	0.82		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	266.46	267.15	258.1	236.5	201.57	150.41	108.21	112.24	157.93	207.19	240.4	261.97		(95)
Mont			rnal tem	perature	from Ta	able 8	1	1			1		I	
(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)
		i e	î .	· ·	i e	1	<del>-``</del>	x [(93)m		r –	0.45.00	444.50		(07)
(97)m=	417.28	403.38	365.81	305.48	237.59	163.05	112.37	117.12	176.05	262.43	345.82	414.53		(97)
Spac (98)m=	112.21	91.55	80.14	49.67	26.8	/vn/mon 0	$\ln = 0.02$	24 x [(97]	)m – (95 0	41.1	75.9	113.51		
(50)111=	112.21	01.00	00.14	40.07	20.0				l per year		l	l	590.87	(98)
Cnaa	o bootin	a roauir	omant in	Is\A/b/pp3	2h cor			7010	ii poi youi	(KVVII) your	) = Gam(o	O)15,912 —		_
•		• .	ement in		•								23.63	(99)
		•	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	<b>e heatir</b> ion of sp	_	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain svst	em(s)			(202) = 1	- (201) =				1	(202)
					( . )			(/	,					,
Fract	ion of to	tal heati	ng from	-	, ,			(204) = (2		(203)] =			1	(204)
				main sys	stem 1					(203)] =			1	=
Effici	ency of r	main spa	ng from	main syste	stem 1 em 1	g systen				(203)] =				(204)

				_					_	_	
Jan Feb Ma		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement	<u> </u>	d above) 26.8	0	0	0	0	41.1	75.9	113.51	1	
$(211)m = \{[(98)m \times (204)]\}$			0				41.1	75.9	110.01		(211)
112.21 91.55 80.14		26.8	0	0	0	0	41.1	75.9	113.51	]	(211)
1					Tota	l (kWh/yea	ar) =Sum(2	211)	=	590.87	(211)
Space heating fuel (second	• .	month									_
$= \{[(98)m \times (201)] \} \times 100 \div (215)m = 0  0  0$	208)   0	0	0	0	0	0	0	0	0	1	
(213)111- 0 0 0			0			l (kWh/yea		_		0	(215)
Water heating											]
Water heating from separate Annual water heating require		ty system	า:							1595.69	(64)
Fraction of heat from comm	unity CHP	•								1	(303a)
Factor for charging method	for comm	unity wat	er heatii	ng						1	(305)
Distribution loss factor (Tab	le 12c) for	commur	nity heat	ing syst	em					1.1	(306)
Water heat from CHP						(64) x (30	03a) x (30	5) x (306)	=	1755.26	(310a)
Electricity used for heat dis	ribution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	17.55	(313)
Annual totals							k\	Wh/yeaı	•	kWh/year	_
Space heating fuel used, ma	in system	1								590.87	
Electricity for pumps, fans ar	d electric	keep-hot									
mechanical ventilation - bal	anced, ext	ract or po	ositive in	nput fror	n outside	Э			98.96	]	(230a)
mechanical ventilation - bal  Total electricity for the above			ositive ir	nput fror		e of (230a).	(230g) =		98.96	98.96	(230a) (231)
			ositive ir	nput fror			(230g) =		98.96	98.96 151.5	_
Total electricity for the above			ositive ir	nput fror			(230g) =		98.96		(231)
Total electricity for the above Electricity for lighting	, kWh/yea	ır	ositive in	nput fror			(230g) =		98.96	151.5	(231)
Total electricity for the above Electricity for lighting Electricity generated by PVs	, kWh/yea	ır	Fu	el			Fuel P	rice	98.96	151.5 -645.46 Fuel Cost	(231)
Total electricity for the above Electricity for lighting Electricity generated by PVs	, kWh/yea	ır	Fu kW					rice 12)	98.96 x 0.01 =	151.5	(231)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual	heating sy	ır	Fu kW (211	<b>el</b> /h/year			Fuel P (Table	rice 12)		151.5 -645.46 <b>Fuel Cost</b> £/year	(231) (232) (233)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system	heating sy	ır	Fu kW (211	<b>el</b> /h/year			Fuel P (Table	<b>Price</b> 12)	x 0.01 =	151.5 -645.46 Fuel Cost £/year	(231) (232) (233) (240)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system Space heating - main system	heating sy	ır	Fu kW (211 (213 (218	el /h/year 1) x 3) x			Fuel P (Table	<b>Price</b> 12) 19	x 0.01 = x 0.01 =	151.5 -645.46  Fuel Cost £/year  77.94	(231) (232) (233) (233) (240) (241)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system Space heating - main system Space heating - secondary	heating sy	ır	Fu kW (211 (213 (218	el /h/year 1) x 3) x 5) x			Fuel P (Table 13.	Price 12)	x 0.01 = x 0.01 = x 0.01 =	151.5 -645.46  Fuel Cost £/year  77.94 0 0	(231) (232) (233) (240) (241) (242)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system Space heating - main system Space heating - secondary Water heating from CHP	heating synthesis 1	stems:	Fu kW (211 (213 (215 (310 (231	el /h/year 1) x 3) x 5) x 0a) x	sum	of (230a).	Fuel P (Table 13. 0 13. 13.	Price 12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  -645.46  Fuel Cost £/year  77.94  0  0  74.42  13.05	(231) (232) (233) (240) (241) (242) (342a)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual  Space heating - main system Space heating - main system Space heating - secondary Water heating from CHP Pumps, fans and electric kee (if off-peak tariff, list each of	heating syntax	stems:	Fu kW (211 (213 (215 (310 (234 eparately	el /h/year 1) x 3) x 5) x 0a) x	sum	of (230a).	Fuel P (Table  13.  0  13.  4.2  13.	Price 12) 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  -645.46  Fuel Cost £/year  77.94  0  74.42  13.05  Table 12a	(231) (232) (233) (240) (241) (242) (342a) (249)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system Space heating - main system Space heating - secondary Water heating from CHP Pumps, fans and electric kee (if off-peak tariff, list each of Energy for lighting	heating syntax	stems:	Fu kW (213 (215 (310 (234 parately (232	el /h/year 1) x 3) x 5) x 0a) x 1) / as app	sum	of (230a).	Fuel P (Table  13.  0  13.  4.2  13.  fuel pric  13.	Price 12) 19 19 19 19 19 19 19 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	151.5  -645.46  Fuel Cost £/year  77.94  0  74.42  13.05  Table 12a  19.98  60	(231) (232) (233) (233) (240) (241) (242) (342a) (249) (250) (251)
Total electricity for the above Electricity for lighting Electricity generated by PVs 10a. Fuel costs - individual Space heating - main system Space heating - main system Space heating - secondary Water heating from CHP Pumps, fans and electric kee (if off-peak tariff, list each of Energy for lighting	heating synthesis of the strin	stems:	Fu kW (213 (215 (310 (233 parately (232	el /h/year 1) x 3) x 5) x 0a) x 1) y as app	sum	of (230a).	Fuel P (Table  13.  0  13.  4.2  13.	Price 12) 19 19 19 19 19 19 19 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	151.5  -645.46  Fuel Cost £/year  77.94  0  0  74.42  13.05  Table 12a  19.98	(231) (232) (233) (240) (241) (242) (342a) (249) (250)

11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	(256) ÷ $(4)$ + 45.0] =		0.96 (257)
SAP rating (Section 12)			86.59 (258)
12a. CO2 emissions – Individual heating sys	stems including micro-CHF		
	<b>Energy</b> kWh/year	Emission fact kg CO2/kWh	or Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519	= 306.66 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating from community system			
		ergy Emission h/year kg CO2/k\	factor Emissions Wh kg CO2/year
CO2 from other sources of space and water Efficiency of heat source 1 (%)		s repeat (363) to (366) for the se	econd fuel 329 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x 0.52	= 276.89 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 9.11 (372)
Total CO2 associated with community system	ns (363)(3	66) + (368)(372)	= 286 (373)
Electricity for pumps, fans and electric keep-h	not (231) x	0.519	= 51.36 (267)
Electricity for lighting	(232) x	0.519	= 78.63 (268)
Energy saving/generation technologies Item 1		0.519	= -335 (269)
Total CO2, kg/year		sum of (265)(271) =	387.65 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	15.51 (273)
El rating (section 14)			93 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	3.07	= 1813.97 (261)
Space heating (secondary)	(215) x	3.07	= 0 (263)
Water heating from community system			
		ergy Primary h/year factor	Emissions kWh/year
CO2 from other sources of space and water Efficiency of heat source 1 (%)		s repeat (363) to (366) for the se	econd fuel 329 (367a)
Energy associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x 3.07	= 1637.89 (367)
Electrical energy for heat distribution	[(313) x	2.92	= 51.25 (372)
Total Energy associated with community syst	ems (363)(3	66) + (368)(372)	= 286 (373)
Electricity for pumps, fans and electric keep-h	not (231) x	3.07	= 303.8 (267)

Electricity for lighting	(232) x	0 =	465.09	(268)
Energy saving/generation technologies				_
Item 1		3.07	-1981.57	(269)
'Total Primary Energy		sum of (265)(271) =	2290.42	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =	91.62	(273)

		l lsor-F	Details:						
Accesser Name:	Adam Ritchie	– USEFL	Strom	o Nives	hor:		QTD (	019516	
Assessor Name: Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.4.25	
		Property	Address			SHP + F			
Address :									
Overall dwelling dime	ensions:	•	4 0						<b>.</b> .
Ground floor		Are	<b>a(m²)</b> 25	(1a) x		ight(m) :.09	(2a) =	<b>Volume(m</b> <sup>2</sup>	<b>3)</b> (3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)		(4)			(24)	17.25	(00)
	a)+(1b)+(16)+(1a)+(16)+(1	'''	25	J	) . (20) . (20	d)+(3e)+	(3n) -		<b>7</b>
Dwelling volume				(3a) <del>+</del> (3b	)+(30)+(30	J)+(3e)+	(311) =	77.25	(5)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating  0 + 0	, 	0	<b>7</b> = F	0	x	40 =	0	(6a)
Number of open flues	0 + 0		0	」	0	x	20 =	0	(6b)
Number of intermittent fa				┙┟			10 =		╡`′
				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0			0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(	7a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			<u> </u>
Number of storeys in the	he dwelling (ns)					[(0)	41.04	0	(9)
Additional infiltration	.25 for steel or timber frame o	r 0 35 fo	r masoni	rv consti	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	dollori			0	(11)
deducting areas of opening	· .	) <b>1</b> (===1:	ماد الم						<b></b>
If no draught lobby, en	floor, enter 0.2 (unsealed) or (	). i (seale	ea), eise	enter 0				0	(12)
	s and doors draught stripped							0	(14)
Window infiltration	o ana accio araagin emippea		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	our per s	quare m	etre of e	envelope	area	2.5	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed		_	7(40)
Number of sides sheltere Shelter factor	eu		(20) = 1 -	[0.075 x ( <sup>2</sup>	19)] =			0	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed							-	
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.	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
	1 1 1 1 1 1 1 1 1 1	1	1					J	

Adjusted infiltr	ration rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	= (21a) x	(22a)m					
0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15	]	
Calculate effe		_	rate for t	he appli	cable ca	ise	•			!	•	• -	<del></del>
If mechanic			and the NI (O	10l-) (00·	-) <b>- -</b> (	C (	NEW - de-		) (00-)			0.5	(238
If exhaust air h									)) = (23a)			0.5	(23)
If balanced wit		-	-	_								75.65	(230
a) If balance	1	i	1	i —	1		<del>-                                    </del>	<del></del>	<del> </del>	<del> </del>	<del> </del>	) ÷ 100] 1	(0.4)
(24a)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(24
b) If balance	1	1		ı —	1	<del>,                                    </del>	<del>1 ^ `                                  </del>	<del>í `</del>	<del>r ´       `</del>	<del>– ´ –</del>	1 .	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole h									E (22k	.)			
(24c)m = 0	0.57	0	0	0 = (231)	0	0	$\frac{\text{lc}) = (22)}{1}$	0	0	0	0	1	(24
` '												J	(2.1
d) If natural if (22b)r							on from 0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	change	rate - er	nter (24a	) or (24	o) or (24	c) or (24	1d) in bo	x (25)				1	
(25)m= 0.28	0.28	0.27	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.26	0.27	]	(25)
0 11								1				7	
3. Heat losse	es and ne Gro				Net Ar		U-val		AXU		k-value	•	ΑΧk
ELEMENT		(m²)	Openin m		A,r		W/m2		(W/	K)	kJ/m².		kJ/K
Doors Type 1					2.13	X	1	=	2.13				(26)
Doors Type 2					0.35	x	1	<del>-</del>	0.35	=			(26)
Doors Type 3					0.99	X	1	<u> </u>	0.99				(26)
Windows Type	e 1				0.7	x1	  /[1/( 1.2 )+	0.04] =	0.8	一			(27)
Windows Type					1.96	x1	I/[1/( 1.2 )+	0.04] =	2.24	$\dashv$			(27)
Windows Type					0.32	=	·  /[1/( 1.2 )+		0.37	=			(27)
Walls Type1	10.0	77	3.5	$\neg$	6.57		0.13		0.85	╡ ,			(29)
Walls Type1				<u> </u>				=				_	==
	12.9		2.95		10.03	=	0.13	=	1.3	믁 ¦			(29)
Walls Type3	1.8		0	<b>=</b>	1.87		0.13	=	0.24	닠 ¦		$\exists$ $\vdash$	(29)
Walls Type4	2.9	9	0	_	2.9	×	0.13	=	0.38	ᆜ !			(29)
Roof	25		0		25	X	0.1	=	2.5				(30)
Total area of e					52.82								(31)
* for windows and ** include the are						lated usin	g formula 1	!/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	
Fabric heat los				io aria par			(26)(30	) + (32) =				12.16	(33)
Heat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	225	(34)
Thermal mass		` ,	⊃ = Cm ÷	: TFA) ir	n kJ/m²K				itive Value			100	(35)
For design asses can be used inste	sments wh	nere the de	tails of the	,			recisely the	e indicative	e values of	TMP in T	able 1f		\```
Thermal bridg	es : S (L	x Y) cal	culated i	using Ap	pendix l	K						7.92	(36)

Total fabric he	at loss							(33) +	(36) =		ı	20.08	(37)
Ventilation hea		alculated	d monthl	V					, ,	25)m x (5)		20.00	(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 7.17	7.09	7.01	6.61	6.53	6.13	6.13	6.05	6.29	6.53	6.69	6.85		(38)
Heat transfer of	coefficier	nt, W/K	<u>I</u>	l .	<u>I</u>			(39)m	= (37) + (37)	38)m	ı	l	
(39)m= 27.25	27.17	27.09	26.69	26.61	26.22	26.22	26.14	26.37	26.61	26.77	26.93		
Heat loss para	meter (H	HLP), W	/m²K	•	•	•			Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	26.67	(39)
(40)m= 1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.08		
Number of day	ys in mor	nth (Tab	le 1a)	•	•	•		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.07	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
			ı		ı				<u> </u>			l	
4. Water hea	ting ener	rgy requi	irement:								kWh/ye	ear:	
												ı	
Assumed occu if TFA > 13.5			[1 - exp	(-0 0003	849 x (TF	FA -13 9	1211 + 0 (	0013 x (	ΓFA -13		.09		(42)
if TFA £ 13.		11.70 %	i OAP	( 0.0000	) 10 X (11	71 10.0	<i>/</i> 2/] · O.(	) 10 10 11 (		.0)			
Annual averag											0.05		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	t			
				·	<del> </del>	•	A	Can	0-4	Nav	Dag		
Jan Hot water usage i	Feb in litres per	Mar dav for ea	Apr ach month	May   Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06		
(11)	00.00	01.20	00.00	00.10	01.00	0 1.00	00.10			m(44) <sub>112</sub> =		720.62	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600					. 20.02	` ′
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
	•	•		•		•	•		Total = Su	m(45) <sub>112</sub> =	=	944.85	(45)
If instantaneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)	) to (61)				•	
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage Storage volum		includir	na anv e	olar or M	WHDC	etorago	within so	me vec	col			1	(47)
If community h	, ,		•			_		airie ves	361		0		(47)
Otherwise if no	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			(					,		,			
a) If manufact	turer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/y	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-									! !	
Hot water stor	-			ie 2 (KVV	n/litre/da	ay)				0.	.02		(51)
Volume factor	_		011 4.3							1	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro				ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				, , ,	. , ,	•		03		(55)
												•	

Water	storage	loss cal	culated t	or each	month			((56)m = (	(55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Append	ı ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	m Table	3			•				0		(58)
	•	•				59)m = (	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	a cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	: 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		(62)
Solar DF		calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	vwhrs	applies	, see Ap	pendix (	<b>3</b> )					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•	•	•	•	•	•	•	•	
(64)m=	153.24	135.6	143.69	130.57	129.24	117.31	114.42	123.14	122.17	135.31	140.86	150.15		
-								Outp	out from w	ater heate	r (annual) <sub>1</sub>	l12	1595.69	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	า] + 0.8 ว	x [(46)m	+ (57)m	+ (59)m	1	
(65)m=	76.79	68.43	73.62	68.42	68.81	64.02	63.89	66.79	65.63	70.83	71.84	75.77	_	(65)
inclu	ude (57)	m in cal	culation (	of (65)m	only if c	vlinder i	s in the	dwellina	or hot w	ater is f	rom com	munity h	ı ıeatina	
			e Table 5		•	,		J				,	<u> </u>	
	Ĭ	,			, <b>.</b>									
Metabl	Jan	Feb	5), Wat Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43	54.43		(66)
` ′			ļ			ion L9 o		<u> </u>						, ,
(67)m=	8.58	7.62	6.2	4.69	3.51	2.96	3.2	4.16	5.58	7.09	8.27	8.82		(67)
						uation L		<u> </u>		ļ.	1 3.2.	1 0.02	l	(- )
(68)m=	86.3	87.2	84.94	80.14	74.07	68.37	64.56	63.67	65.93	70.73	76.8	82.5	1	(68)
			<u> </u>			ļ.	ļ.	<u>!</u>	ļ.	Į	70.0	02.5		(00)
(69)m=	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44		(69)
` '			(Table 5		20.44	20.44	20.44	20.44	20.44	20.44	20.44	20.44		(00)
(70)m=	0	o gairis	0	0 0	0	0	0	0	0	0	0	0	I	(70)
														(10)
1	<del>_</del>		n (nega			<del>-                                    </del>	12.54	40.54	10.54	10.54	10.54	12.54	1	(71)
(71)m=	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54	-43.54		(71)
1		gains (T	· ·						l	l		l .c.		(70)
(72)m=	103.22	101.83	98.95	95.03	92.49	88.91	85.87	89.77	91.15	95.2	99.78	101.84		(72)
1		gains =	r								'1)m + (72)	1	I	
(73)m=	237.43	235.98	229.42	219.19	209.4	199.57	192.96	196.92	201.99	212.35	224.18	232.48		(73)
	lar gains	S. 1												

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientat	ion:	Access Facto Table 6d	r	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	1.96		X	19.64	x	0.4	x	0.7	=	7.47	(76)
East	0.9x	0.77	x	1.96		X	38.42	x	0.4	x	0.7	=	14.61	(76)
East	0.9x	0.77	х	1.96		X	63.27	X	0.4	×	0.7	=	24.06	(76)
East	0.9x	0.77	x	1.96		X	92.28	X	0.4	x	0.7		35.1	(76)
East	0.9x	0.77	х	1.96		X	113.09	X	0.4	x	0.7	=	43.01	(76)
East	0.9x	0.77	x	1.96		X	115.77	X	0.4	X	0.7	=	44.03	(76)
East	0.9x	0.77	x	1.96		X	110.22	X	0.4	X	0.7	=	41.92	(76)
East	0.9x	0.77	x	1.96		X	94.68	X	0.4	X	0.7	=	36.01	(76)
East	0.9x	0.77	x	1.96		X	73.59	X	0.4	X	0.7	=	27.99	(76)
East	0.9x	0.77	x	1.96		x	45.59	X	0.4	X	0.7	=	17.34	(76)
East	0.9x	0.77	x	1.96		x	24.49	X	0.4	X	0.7	=	9.31	(76)
East	0.9x	0.77	x	1.96		x	16.15	X	0.4	x	0.7	=	6.14	(76)
West	0.9x	0.77	x	0.7		X	19.64	X	0.4	X	0.7	=	2.67	(80)
West	0.9x	0.77	x	0.32		X	19.64	X	0.4	x	0.7	=	1.22	(80)
West	0.9x	0.77	x	0.7		X	38.42	X	0.4	x	0.7	=	5.22	(80)
West	0.9x	0.77	x	0.32		x	38.42	X	0.4	X	0.7	=	2.39	(80)
West	0.9x	0.77	x	0.7		X	63.27	X	0.4	X	0.7	=	8.59	(80)
West	0.9x	0.77	x	0.32		X	63.27	X	0.4	X	0.7	=	3.93	(80)
West	0.9x	0.77	x	0.7		X	92.28	X	0.4	X	0.7	=	12.53	(80)
West	0.9x	0.77	x	0.32		X	92.28	X	0.4	X	0.7	=	5.73	(80)
West	0.9x	0.77	x	0.7		X	113.09	X	0.4	x	0.7	=	15.36	(80)
West	0.9x	0.77	x	0.32		X	113.09	X	0.4	X	0.7	=	7.02	(80)
West	0.9x	0.77	x	0.7		X	115.77	X	0.4	X	0.7	=	15.72	(80)
West	0.9x	0.77	x	0.32		X	115.77	X	0.4	x	0.7	=	7.19	(80)
West	0.9x	0.77	x	0.7		X	110.22	X	0.4	X	0.7	=	14.97	(80)
West	0.9x	0.77	x	0.32		X	110.22	X	0.4	X	0.7	=	6.84	(80)
West	0.9x	0.77	x	0.7		X	94.68	X	0.4	X	0.7	=	12.86	(80)
West	0.9x	0.77	x	0.32		X	94.68	X	0.4	X	0.7	=	5.88	(80)
West	0.9x	0.77	x	0.7		X	73.59	X	0.4	X	0.7	=	10	(80)
West	0.9x	0.77	X	0.32		X	73.59	X	0.4	X	0.7	=	4.57	(80)
West	0.9x	0.77	x	0.7		X	45.59	X	0.4	X	0.7	=	6.19	(80)
West	0.9x	0.77	x	0.32		X	45.59	X	0.4	X	0.7	=	2.83	(80)
West	0.9x	0.77	x	0.7		X	24.49	X	0.4	X	0.7	=	3.33	(80)
West	0.9x	0.77	x	0.32		X	24.49	X	0.4	X	0.7	=	1.52	(80)
West	0.9x	0.77	x	0.7		x	16.15	X	0.4	x	0.7	=	2.19	(80)
West	0.9x	0.77	x	0.32		X	16.15	X	0.4	X	0.7	=	1	(80)
<b>—</b>		watts, calcula	$\overline{}$			$\overline{}$		<del></del>	n = Sum(74)m.			i	7	
` '	11.36				55.39		66.94 63.73	54.	75 42.55	26.36	14.16	9.34	]	(83)
Ţ.		internal and s		<u>`                                    </u>		Ť		T	07 044 7	000 =		044.51	1	(0.4)
(84)m=	248.78	3 258.19 26	6	272.55 2	74.79	1 20	66.51 256.69	251	.67 244.54	238.7	238.34	241.81	J	(84)

7 Me	an inter	nal temr	perature	(heating	season	)								
			neating p			•	from Tal	ole 9. Th	1 (°C)				21	(85)
•		_	ains for			•		c,	( - /					`
•	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.9	0.89	0.85	0.79	0.69	0.55	0.42	0.44	0.62	0.78	0.87	0.91		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)		-	-		
(87)m=	19.31	19.47	19.79	20.21	20.58	20.84	20.95	20.94	20.77	20.34	19.79	19.29		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.89	0.88	0.84	0.78	0.67	0.52	0.38	0.4	0.59	0.77	0.86	0.9		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.87	19.02	19.33	19.75	20.11	20.35	20.44	20.43	20.29	19.88	19.34	18.85		(90)
		-				-	-	-	f	fLA = Livin	g area ÷ (	4) =	0.84	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.24	19.4	19.72	20.14	20.51	20.77	20.87	20.86	20.7	20.27	19.72	19.22		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			'	
(93)m=	19.24	19.4	19.72	20.14	20.51	20.77	20.87	20.86	20.7	20.27	19.72	19.22		(93)
8. Sp	ace hea	ting requ	uirement											
			ternal ter or gains	•		ned at sto	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:									'	
(94)m=	0.88	0.86	0.83	0.77	0.67	0.54	0.41	0.43	0.6	0.76	0.84	0.88		(94)
			, W = (94		4)m								ı	
(95)m=	218.25	222.32	220.22	208.85	184.65	142.87	105.23	108.67	146.76	181.29	201.1	213.65		(95)
	<del></del>	r	rnal tem	·		l								(00)
(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)
(97)m=	407.24	394.09	an intern	299.99	234.37	Lm , vv =	=[(39)m 111.86	x [(93)m 116.5	- (96)m 174	257.32	337.79	404.53		(97)
			ement fo							<u> </u>		404.55		(31)
(98)m=	140.61	115.42	102.54	65.62	36.99	0	0.02	0	0	56.57	98.41	142.02		
(00)						<u> </u>		<u> </u>		l	) = Sum(9		758.17	(98)
Space	e heatin	a require	ement in	kWh/m²	?/vear					` •			30.33	(99)
·		•	nts – Indi			vstems i	ncludino	micro-C	:HP)					`
Spac	e heatir	ng:			<u> </u>									
			at from s			mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								100	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	າ, %						0	(208)

		1										
	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating r	equirement ( 15.42   102.54	calculate	d above) 36.99	0	0	0	0	56.57	98.41	142.02		
			<u> </u>				0	30.37	30.41	142.02		(244)
$(211)m = \{[(98)m \\ 140.61 \ 1$	X (204)] } X 15.42 102.54	65.62	36.99	0	0	0	0	56.57	98.41	142.02		(211)
			<u> </u>			Tota	l I (kWh/yea	ar) =Sum(2	L 211) <sub>15,1012</sub>	=	758.17	(211)
Space heating f	uel (seconda	ry), kWh/	month							L		
= {[(98)m x (201)	] } x 100 ÷ (20	08)			•		•					
(215)m= 0	0 0	0	0	0	0	0	0	0	0	0		_
						lota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	-	0	(215)
Water heating Water heating from	om senarate d	communi	tv system	n·								
Annual water he	•		iy oyolon								1595.69	(64)
Fraction of heat	from commu	nity CHP	•							[	1	(303a)
Factor for charg	ing method fo	or commi	unity wat	er heati	ng					[	1	(305)
Distribution loss	factor (Table	e 12c) for	commur	nity heat	ing syst	em					1.1	(306)
Water heat from	CHP						(64) x (30	03a) x (30	5) x (306) :	= [	1755.26	(310a)
Electricity used	for heat distri	bution				0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	17.55	(313)
Annual totals								k'	Wh/year		kWh/yea	<u>r_</u>
Space heating fu	el used, mair	n system	1								758.17	
Electricity for pun	nps, fans and	l electric	keep-hot	t								
mechanical ven	tilation - bala	nced, ext	ract or p	ositive ii	nput fror	n outside	Э			98.96		(230a)
Total electricity for	or the above,	kWh/yea	ır			sum	of (230a).	(230g) =			98.96	(231)
											151.5	(232)
Electricity for ligh	ting											
Electricity for ligh	•									L	-645.46	(233)
	ited by PVs	dual heat	ing syste	ms inclu	uding mi	cro-CHP	)			Ĺ	-645.46	(233)
Electricity genera	ited by PVs	dual heat	ing syste		uding mi <b>ergy</b>	cro-CHP	)	Emiss	ion fac	tor	-645.46	
Electricity genera	ited by PVs	dual heat	ing syste	En		cro-CHF	)	<b>Emiss</b> kg CO		tor		<u> </u>
Electricity genera	ated by PVs sions – Individ		ing syste	<b>En</b> kW	ergy	cro-CHP	)		2/kWh	tor = [	Emissions	<u> </u>
Electricity general	ated by PVs sions – Individual main system 1		ing syste	<b>En</b> kW (21	<b>ergy</b> /h/year	cro-CHP	)	kg CO	2/kWh	-	Emissions kg CO2/ye	s ear
Electricity general 12a. CO2 emiss  Space heating (n	nain system 1	1)		<b>En</b> kW (21	ergy /h/year	cro-CHP		kg CO	2/kWh	= [	Emissions kg CO2/ye	s ar (261)
Electricity general 12a. CO2 emiss  Space heating (no	nain system 1	1)		<b>En</b> kW (21	ergy /h/year	Ene	ergy	0.5	2/kWh	= [	Emissions kg CO2/ye	s ar (261)
Electricity general 12a. CO2 emiss  Space heating (no	nain system 1	1)		<b>En</b> kW (21	ergy /h/year	Ene		0.5 0.5	2/kWh	= [ = [	Emissions kg CO2/ye	s ar (261)
Electricity general 12a. CO2 emiss  Space heating (no	nain system 1 econdary) om community	y system	water he	En kW (21) (21)	ergy /h/year 1) x 5) x	Ene kW	ergy h/year	0.5 0.5	2/kWh  19  19  mission g CO2/k	= [ = [	Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year	s ar (261)
Electricity general  12a. CO2 emiss  Space heating (no space heating (so water heating from the co2 from other	nain system 1 econdary) om community sources of special source 1 (%	y system pace and	water he	En kW (21) (21)	ergy /h/year 1) x 5) x not CHP CHP usin	Ene kW	ergy h/year s repeat (3	kg CO:  0.5  0.5  E kg	2/kWh  19  19  mission g CO2/k	= [ = [ factor I Wh I	Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year	(261) (263)
Space heating (no Space heating from the color of heating from the color of heating of heating from the color of heating f	nain system 1 econdary) om community sources of special source 1 (%	y system pace and ) urce 1	water he	En kW (21) (21)	ergy /h/year 1) x 5) x not CHP CHP usin [(307b)+	Ene kW ) g two fuels	ergy h/year s repeat (3	kg CO:  0.5  0.5  E kg	2/kWh 19 19 mission g CO2/k 6) for the s	= [ = [ n factor I Wh I	Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year	(367a)
Space heating (no Space heating from the strength of the stren	nain system 1 econdary) om community sources of special source 1 (% I with heat so	y system  pace and ) urce 1 tribution	water he	En kW (21) (21)	ergy /h/year 1) x 5) x not CHP CHP usin [(307b)+	<b>Ene kW</b> ) g two fuels	ergy h/year s repeat (3 100 ÷ (367	kg CO:  0.5  0.5  E kg  63) to (366  b) x	2/kWh  19  19  mission g CO2/k  6) for the s  0.52	= [ = [ wh factor   Wh   econd fuel	Emissions kg CO2/ye  393.49  0  Emissions kg CO2/year  329  276.89	(367a) (367)
Electricity general  12a. CO2 emiss  Space heating (note the space heating from the space h	nain system 1 econdary) om community sources of sp source 1 (% I with heat so y for heat dist iated with cor	y system  pace and ) urce 1 tribution mmunity	water he	En kW (21) (21) eating (r	ergy /h/year 1) x 5) x not CHP CHP usin [(307b)+	Ene kW ) g two fuels -(310b)] x 2 [(313) x	ergy h/year s repeat (3 100 ÷ (367	kg CO:  0.5  0.5  E kg  63) to (366  b) x	2/kWh 19 19 mission g CO2/k 6) for the s 0.52 0.52	= [ = [ what is a second fuel = = = = =	Emissions kg CO2/year  393.49  0  Emissions kg CO2/year  329  276.89  9.11	(367a) (367) (372)

Electricity for lighting	(232) x	0.519 =	78.63	(268)
Energy saving/generation technologies Item 1		0.519 =	-335	(269)
Total CO2, kg/year		sum of (265)(271) =	474.48	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	18.98	(273)
El rating (section 14)			91	(274)

		llsor-F	Details:						
Access	Adam Ditable	– USEFL		_ 11	I		OTDO	040540	
Assessor Name: Software Name:	Adam Ritchie Stroma FSAP 2012		Strom Softwa					019516 on: 1.0.4.25	
Software Name.		Property	Address			SHP + F		71. 1.0.4.20	
Address :				,					
1. Overall dwelling dime	ensions:								
Ground floor		Are	a(m²)	l(10) ×		eight(m)	] <sub>(20</sub> )	Volume(m	<u> </u>
	a) . (4 la) . (4 a) . (4 a) (4	>		(1a) x	3	3.09	(2a) =	77.25	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	25	(4)					_
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	77.25	(5)
2. Ventilation rate:	main seconda	rv	other		total			m³ per hou	ır
N. sala and A. Parana	heating heating	<u> </u>					40	-	_
Number of chimneys	0 + 0	╛╵┢	0	_	0		40 =	0	(6a)
Number of open flues	0 + 0	+	0	_ = <u>[</u>	0		20 =	0	(6b)
Number of intermittent fa	ins				2	X	10 =	20	(7a)
Number of passive vents	3				0	X	10 =	0	(7b)
Number of flueless gas f	ires				0	X e	40 =	0	(7c)
							Air ch	nanges per h	our
Infiltration due to chimne	ve flues and fans (62) (6b) u	75\1(7b\1)	(70) –	Г					_
	ys, flues and fans = (6a)+(6b)+( been carried out or is intended, proce			continue fr	20 rom (9) to		÷ (5) =	0.26	(8)
Number of storeys in t		ou to ( ),			o (o) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding and specifical results (specifical results) results (see the second results) results (see the se	to the grea	ter wall are	ea (after					
If suspended wooden	floor, enter 0.2 (unsealed) or (	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	(4-)		0	(15)
Infiltration rate			(8) + (10)					0	(16)
,	q50, expressed in cubic metr lity value, then $(18) = [(17) \div 20] +$			•	etre of e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is beina u	sed		0.51	(18)
Number of sides sheltere		·	,	Í	J			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.51	(21)
Infiltration rate modified f	for monthly wind speed			1			1	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				1			1	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
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		
<del>_</del>								_	

Adjusted infiltr	ation rate (allo	wing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.65	0.64 0.62	0.56	0.55	0.48	0.48	0.47	0.51	0.55	0.57	0.6	]	
	ctive air change	e rate for t	he appli	cable ca	ise					!		
	al ventilation:	manadir N. (C	ah) (00.	· \ / ·		\  <b> </b>		(00-)			0	(23a)
	eat pump using Ap n heat recovery: ef							i) = (23a)			0	(23b)
	•	•	ŭ		`		,	Ola ) (	001-) [	4 (00)	0	(23c)
	ed mechanical o	ventilation	with he	at recov	ery (MV)	HR) (248	$\frac{a)m = (2)}{0}$	2b)m + (	23b) × [	$\frac{1 - (23c)}{0}$	) ÷ 100] ]	(24a)
			_							"	]	(244)
(24b)m= 0	ed mechanical o	ventilation 0	without	neat red		0 (240 0	)m = (22   0	20)m + (.   0	230)	0	1	(24b)
	<u> </u>										J	(240)
	$n < 0.5 \times (23b)$		-	-				.5 × (23h	o)			
(24c)m = 0	0 0	0	0	0	0	0	0	0	0	0	1	(24c)
	ventilation or w	hole hous	e positiv	ve input	ventilati	on from	loft	<u> </u>	<u> </u>		1	
,	n = 1, then (24		•	•				0.5]				
(24d)m= 0.71	0.7 0.69	0.66	0.65	0.62	0.62	0.61	0.63	0.65	0.66	0.68		(24d)
Effective air	change rate -	enter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.71	0.7 0.69	0.66	0.65	0.62	0.62	0.61	0.63	0.65	0.66	0.68	]	(25)
3. Heat losse	s and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doors Type 1				2.13	x	1	=	2.13				(26)
Doors Type 2				0.35	X	1	<del>-</del>	0.35	$\equiv$			(26)
Doors Type 3				0.99	X	1	<u> </u>	0.99	$\equiv$			(26)
Windows Type	e 1			0.65	x1	/[1/( 1.4 )+	0.04] =	0.86	$\equiv$			(27)
Windows Type	e 2			1.83	x1	/[1/( 1.4 )+	0.04] =	2.43				(27)
Windows Type	e 3			0.3	x1	/[1/( 1.4 )+	0.04] =	0.4	=			(27)
Walls Type1	10.07	3.43		6.64	. x	0.18	i	1.2			$\neg$	(29)
Walls Type2	12.98	2.82		10.16	5 x	0.18	<del>-</del>	1.83	F i			(29)
Walls Type3	1.87	0		1.87	. x	0.18	= :	0.34	<b>=</b>			(29)
Walls Type4	2.9	0	=	2.9	x	0.18	<b>=</b>	0.52	<b>=</b>		<b>-</b>	(29)
Roof	25	0	_	25	x	0.13	= :	3.25	<b>=</b>		╡┝	(30)
Total area of e				52.82	=	0.10		0.20				(31)
	roof windows, use	e effective wi	ndow U-va			n formula 1	/[(1/U-valu	ue)+0.041 a	as aiven in	n paragrapl	h 3.2	(01)
	as on both sides of					,		., , .	3	7		
Fabric heat los	ss, $W/K = S (A)$	x U)				(26)(30	) + (32) =				14.29	(33)
Heat capacity	$Cm = S(A \times k)$						((28).	(30) + (32	2) + (32a)	(32e) =	225	(34)
Thermal mass	parameter (TN	/IP = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
· ·	sments where the o		construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in T	able 1f		
	es : S (L x Y) c		usina Ar	pendix I	K						2.64	(36)
-	al bridging are not		•	-	•						2.04	(30)
		(55)		,								

											ı		_
Total fabric he								. ,	(36) =	,		16.93	(37)
Ventilation hea	1	1	· ·	í	Ι.	l	١,		I	25)m x (5)	1		
Jan	Feb 17.9	Mar 17.7	Apr 16.74	May 16.56	Jun 15.73	Jul 15.73	Aug 15.57	Sep 16.05	Oct 16.56	Nov 16.92	Dec 17.3		(38)
(38)m= 18.11	L	<u> </u>	10.74	10.50	15.75	15.75	15.57		<u> </u>	<u> </u>	17.3		(30)
Heat transfer		· ·	00.07	00.40	00.00	00.00	00.5	· , ,	= (37) + (3	·	04.00		
(39)m= 35.04	34.83	34.63	33.67	33.49	32.66	32.66	32.5	32.98	33.49	33.85 Sum(39) <sub>1</sub>	34.23	33.67	(39)
Heat loss para	ameter (I	HLP), W	/m²K						= (39)m ÷		12 / 12=	33.07	(00)
(40)m= 1.4	1.39	1.39	1.35	1.34	1.31	1.31	1.3	1.32	1.34	1.35	1.37		
								,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.35	(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 requ	irement:								kWh/ye	ear:	
Assumed occu											.09		(42)
if TFA > 13.	•	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
if TFA £ 13.  Annual average	•	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		60	0.05		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	lwelling is	designed i			se target o		.03		(10)
not more that 125	litres per	person pei	r 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	· ·	· ·					· <i>′</i>						
(44)m= 66.06	63.66	61.25	58.85	56.45	54.05	54.05	56.45	58.85	61.25	63.66	66.06	700.00	7(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		720.62	(44)
(45)m= 97.96	85.68	88.41	77.08	73.96	63.82	59.14	67.86	68.67	80.03	87.36	94.87		
	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ	ļ	<b>!</b>		rotal = Su	l m(45) <sub>112</sub> =	<u> </u>	944.85	(45)
If instantaneous v	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46 <sub>)</sub>	) to (61)					
(46)m= 14.69	12.85	13.26	11.56	11.09	9.57	8.87	10.18	10.3	12	13.1	14.23		(46)
Water storage Storage volum		\ includir	a any c	olar or M	WHDC	ctorogo	within co	mo voc	col		150		(47)
If community h	` '		•			ŭ		anie ves	9 <b>C</b> I		150		(47)
Otherwise if no	•			_			• •	ers) ente	er '0' in (	47)			
Water storage			`					,	`	,			
a) If manufact	turer's d	eclared I	oss fact	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)	) =		0.	75		(50)
b) If manufact Hot water stor			-								0		(51)
If community h	-			IC 2 (KVV)	11/11110/00	, y <i>)</i>					0		(31)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or	(54) in (	55)								0.	75		(55)

Water stor	age loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m= 23	3.33 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
` '	ntains dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (	<u>I</u> H11)] ÷ (5	0), else (5	<u>I</u> 7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23	3.33 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary ci	rcuit loss (ar	nnual) fro	m Table	3							0		(58)
•	rcuit loss cal	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modifie	d by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi los	s calculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat	required for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 144	4.56 127.76	135.01	122.17	120.55	108.91	105.73	114.46	113.77	126.63	132.45	141.46		(62)
Solar DHW i	nput calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add addit	ional lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (	3)					
(63)m=	0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output fro	m water hea	ter			-	-	-	-	-	-	-		
(64)m= 144	4.56 127.76	135.01	122.17	120.55	108.91	105.73	114.46	113.77	126.63	132.45	141.46		
	•						Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	1493.47	(64)
Heat gains	s from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	]	
(65)m= 69	.85 62.16	66.67	61.7	61.87	57.29	50.04	50.04			i			(05)
		00.07	01.7	01.07	57.29	56.94	59.84	58.91	63.89	65.12	68.82		(65)
include	(57)m in cal	ļ			ļ	<u> </u>	ļ	ļ	ļ	<u> </u>		eating	(65)
	` '	culation o	of (65)m	only if c	ļ	<u> </u>	ļ	ļ	ļ	<u> </u>		eating	(65)
5. Interna	al gains (see	culation of Table 5	of (65)m and 5a	only if c	ļ	<u> </u>	ļ	ļ	ļ	<u> </u>		eating	(65)
5. Internation	` '	culation of Table 5	of (65)m and 5a	only if c	ļ	<u> </u>	dwelling	or hot w	ļ	<u> </u>		eating	(65)
5. International Metabolic	al gains (see	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the o	ļ	ļ	ater is fr	om com	munity h	eating	(66)
5. International Metabolic  Metabolic  J  (66)m= 54	gains (Table an Feb	e Table 5 e 5), Wat Mar 54.43	of (65)m 5 and 5a ts Apr 54.43	only if constant of the consta	ylinder i: Jun 54.43	Jul	Aug 54.43	or hot w	ater is fr	om com	munity h	eating	
5. International Metabolic  Metabolic  J  (66)m= 54  Lighting ga	al gains (see gains (Table an Feb	e Table 5 e 5), Wat Mar 54.43	of (65)m 5 and 5a ts Apr 54.43	only if constant of the consta	ylinder i: Jun 54.43	Jul	Aug 54.43	or hot w	ater is fr	om com	munity h	eating	
5. International Metabolic  Metabolic  J  (66)m= 54  Lighting ga  (67)m= 8.	gains (Table an Feb .43 54.43 ains (calcula 68 7.71	E Table 5 E 5), Wat Mar 54.43 ted in Ap 6.27	of (65)m and 5a ts Apr 54.43 ppendix 4.75	May 54.43 L, equat 3.55	Jun 54.43 ion L9 o	Jul 54.43 r L9a), a 3.24	Aug 54.43 Iso see	Sep 54.43 Table 5 5.65	Oct 54.43	Nov 54.43	Dec 54.43	eating	(66)
5. International Metabolic  Metabolic  J  (66)m= 54  Lighting ga  (67)m= 8.  Appliances	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula	culation of Table 5 2 5), Wat Mar 54.43 ted in Ap 6.27	of (65)m s and 5a ts Apr 54.43 opendix 4.75 Append	May 54.43 L, equat 3.55 dix L, eq	Jun 54.43 ion L9 of 3 uation L	Jul 54.43 r L9a), a 3.24 13 or L1	Aug 54.43 Iso see 4.21 3a), also	Sep 54.43 Table 5 5.65 see Ta	Oct 54.43 7.17 ble 5	Nov 54.43	Dec 54.43	eating	(66)
5. International Metabolic  (66)m= 54  Lighting gates (67)m= 8.  Appliances (68)m= 86	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 63.3 87.2	culation of Table 5 (a) Wat Mar 54.43 (b) 6.27 (c) culated in 84.94	ts Apr 54.43 Appendix 4.75 Appendix 80.14	May 54.43 L, equat 3.55 dix L, eq 74.07	Jun 54.43 ion L9 of 3 uation L 68.37	Jul 54.43 r L9a), a 3.24 13 or L1 64.56	Aug 54.43 lso see 4.21 3a), also 63.67	Sep 54.43 Table 5 5.65 see Ta 65.93	Oct 54.43  7.17 ble 5 70.73	Nov 54.43	Dec 54.43	eating	(66) (67)
5. International Metabolic  (66)m= 54  Lighting ga (67)m= 8.  Appliances (68)m= 86  Cooking g	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula	culation of Table 5 (a) Wat Mar 54.43 (b) 6.27 (c) culated in 84.94	ts Apr 54.43 Appendix 4.75 Appendix 80.14	May 54.43 L, equat 3.55 dix L, eq 74.07	Jun 54.43 ion L9 of 3 uation L 68.37	Jul 54.43 r L9a), a 3.24 13 or L1 64.56	Aug 54.43 lso see 4.21 3a), also 63.67	Sep 54.43 Table 5 5.65 see Ta 65.93	Oct 54.43  7.17 ble 5 70.73	Nov 54.43	Dec 54.43	eating	(66) (67)
5. International Metabolic  (66)m= 54  Lighting gate (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28	gains (Table an Feb .43 54.43 ains (calcula s gains gains (calcula s gains gains gains gains (calcula s gain	culation of Earlie Solution of Earlie Earlie Solution of Earlie Ear	of (65)m ts Apr 54.43 ppendix 4.75 Append 80.14 ppendix 28.44	May 54.43 L, equat 3.55 dix L, eq 74.07 L, equat	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a)	Aug 54.43 lso see 4.21 3a), also se 63.67	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table	Oct 54.43 7.17 ble 5 70.73 5	Nov 54.43 8.37	Dec 54.43	eating	(66) (67) (68)
5. International Metabolic  (66)m= 54  Lighting gate (67)m= 8.  Appliances (68)m= 86  Cooking gate (69)m= 28  Pumps an	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 6.3 87.2 ains (calcula	culation of Earlie Solution of Earlie Earlie Solution of Earlie Ear	of (65)m ts Apr 54.43 ppendix 4.75 Append 80.14 ppendix 28.44	May 54.43 L, equat 3.55 dix L, eq 74.07 L, equat	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a)	Aug 54.43 lso see 4.21 3a), also se 63.67	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table	Oct 54.43 7.17 ble 5 70.73 5	Nov 54.43 8.37	Dec 54.43	eating	(66) (67) (68)
Metabolic  J  (66)m= 54  Lighting ga  (67)m= 8.  Appliances  (68)m= 86  Cooking g  (69)m= 28  Pumps an  (70)m=	gains (Table an Feb43 54.43 ains (calcula 68 7.71 s gains (calcula 6.3 87.2 ains (calcula 6.44 28.44 d fans gains 3 3	culation of the culation of th	of (65)m ts Apr 54.43 ppendix 4.75 Appendix 80.14 ppendix 28.44 5a) 3	only if controls:  May 54.43  L, equat 3.55  dix L, eq 74.07  L, equat 28.44	Jun 54.43 ion L9 of 3 uation L 68.37 cion L15 28.44	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 o, also se 28.44	Sep 54.43 Table 5 5.65 see Ta 65.93 ee Table 28.44	Oct 54.43  7.17 ble 5  70.73  5  28.44	Nov 54.43 8.37 76.8	Dec 54.43 8.93 82.5	eating	(66) (67) (68) (69)
5. International Metabolic  (66)m= 54  Lighting gate (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28  Pumps an (70)m= Losses e.c.	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 3.3 87.2 ains (calcula 44 28.44 d fans gains	culation of the culation of th	of (65)m ts Apr 54.43 ppendix 4.75 Appendix 80.14 ppendix 28.44 5a) 3	only if controls:  May 54.43  L, equat 3.55  dix L, eq 74.07  L, equat 28.44	Jun 54.43 ion L9 of 3 uation L 68.37 cion L15 28.44	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 o, also se 28.44	Sep 54.43 Table 5 5.65 see Ta 65.93 ee Table 28.44	Oct 54.43  7.17 ble 5  70.73  5  28.44	Nov 54.43 8.37 76.8	Dec 54.43 8.93 82.5	eating	(66) (67) (68) (69)
Metabolic  J (66)m= 54  Lighting ga (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28  Pumps an (70)m= Losses e.g (71)m= -43	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 6.3 87.2 ains (calcula 6.44 28.44 d fans gains 3 3 g. evaporatio 3.54 -43.54	culation of the Europe Solution of the Europe	of (65)m ts Apr 54.43 ppendix 4.75 Appendix 80.14 ppendix 28.44 5a) 3 tive value	May 54.43 L, equat 3.55 dix L, eq 74.07 L, equat 28.44  3 es) (Tab	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15 28.44 3	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 , also se 28.44	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table 28.44	Oct 54.43  7.17 ble 5 70.73 5 28.44	Nov 54.43 8.37 76.8 28.44	Dec 54.43 8.93 82.5 28.44	eating	(66) (67) (68) (69)
Metabolic  (66)m= 54  Lighting ga (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28  Pumps an (70)m= Losses e.ç (71)m= -43  Water hea	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 68.3 87.2 ains (calcula 64.4 28.44 d fans gains 3 3 g. evaporatio	culation of the Europe Solution of the Europe	of (65)m ts Apr 54.43 ppendix 4.75 Appendix 80.14 ppendix 28.44 5a) 3 tive value	May 54.43 L, equat 3.55 dix L, eq 74.07 L, equat 28.44  3 es) (Tab	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15 28.44 3	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 , also se 28.44	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table 28.44	Oct 54.43  7.17 ble 5 70.73 5 28.44	Nov 54.43 8.37 76.8 28.44	Dec 54.43 8.93 82.5 28.44	eating	(66) (67) (68) (69)
Metabolic  (66)m= 54  Lighting ga (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28  Pumps an (70)m=    Losses e.g (71)m= -43  Water hea (72)m= 93	gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 6.3 87.2 ains (calcula 6.44 28.44 d fans gains 3 3 g. evaporatio 3.54 -43.54 tting gains (T	culation of the Europe Solution of the Europe	of (65)m s and 5a ts Apr 54.43 opendix 4.75 n Appendix 28.44 opendix 28.44 state of the state of	only if constructions only if constructions only if constructions on the construction of the construction	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15 28.44 3 le 5) -43.54	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 , also se 28.44 3	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table 28.44  3 -43.54	Oct 54.43  7.17 ble 5 70.73 5 28.44  3 -43.54	Nov 54.43 8.37 76.8 28.44 3 90.45	Dec 54.43 8.93 82.5 28.44 3 -43.54	eating	(66) (67) (68) (69) (70) (71)
Metabolic  (66)m= 54  Lighting ga (67)m= 8.  Appliances (68)m= 86  Cooking g (69)m= 28  Pumps an (70)m= Losses e.ç (71)m= -43  Water hea (72)m= 93  Total inter	al gains (see gains (Table an Feb .43 54.43 ains (calcula 68 7.71 s gains (calcula 63.3 87.2 ains (calcula 644 28.44 d fans gains 3 3 g. evaporatio 3.54 -43.54 ating gains (7.88 92.49	culation of the Europe Solution of the Europe	of (65)m s and 5a ts Apr 54.43 opendix 4.75 n Appendix 28.44 opendix 28.44 state of the state of	only if constructions only if constructions only if constructions on the construction of the construction	Jun 54.43 ion L9 of 3 uation L 68.37 ion L15 28.44 3 le 5) -43.54	Jul 54.43 r L9a), a 3.24 13 or L1 64.56 or L15a) 28.44	Aug 54.43 lso see 4.21 3a), also 63.67 , also se 28.44 3	Sep 54.43 Table 5 5.65 See Ta 65.93 ee Table 28.44  3 -43.54	Oct 54.43  7.17 ble 5 70.73 5 28.44  3 -43.54	Nov 54.43 8.37 76.8 28.44 3 90.45	Dec 54.43 8.93 82.5 28.44 3 -43.54	eating	(66) (67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientatio		Access Factor Table 6d	or	Area m²		Flux Table 6a				g_ Table 6b			FF Table 6c			Gains (W)		
East	0.9x	0.77	X	1.8	3	x	1:	9.64	x	(	0.63	X	0.	7	] =	1	0.98	(76)
East (	0.9x	0.77	X	1.8	3	x	3	8.42	x	(	0.63	x	0.	7	] =	2	1.49	(76)
East (	0.9x	0.77	X	1.8	3	x	6	3.27	х	(	0.63	x	0.	7	] =	3:	5.39	(76)
East (	0.9x	0.77	X	1.8	3	x	9:	2.28	x	(	0.63	×	0.	7	] =	5	1.61	(76)
East	0.9x	0.77	X	1.8	3	x	11	3.09	х	(	0.63	x	0.	7	Ī =	6:	3.25	(76)
East	0.9x	0.77	X	1.8	3	x	11	5.77	x	(	0.63	×	0.	7	] =	6-	4.75	(76)
East	0.9x	0.77	X	1.8	3	x	11	0.22	х	(	0.63	x	0.	7	Ī =	6	1.64	(76)
East	0.9x	0.77	X	1.8	3	x	9.	4.68	x	(	0.63	×	0.	7	] =	5	2.95	(76)
East	0.9x	0.77	X	1.8	3	x	7:	3.59	x	(	0.63	X	0.	7	] =	4	1.16	(76)
East	0.9x	0.77	X	1.8	3	x	4	5.59	x	(	0.63	X	0.	7	] =	2	25.5	(76)
East	0.9x	0.77	X	1.8	3	x	2	4.49	x	(	0.63	X	0.	7	] =	1	3.7	(76)
East	0.9x	0.77	X	1.8	3	x	1	6.15	x	(	0.63	X	0.	7	] =	9	0.03	(76)
West	0.9x	0.77	X	0.6	5	x	1	9.64	x	(	0.63	X	0.	7	] =	(	3.9	(80)
West	0.9x	0.77	X	0.0	3	x	1:	9.64	X	(	0.63	X	0.	7	] =		1.8	(80)
West	0.9x	0.77	X	0.6	5	x	3	8.42	х	(	0.63	X	0.	7	] =	7	'.63	(80)
West	0.9x	0.77	X	0.3	3	x	3	8.42	x	(	0.63	X	0.	7	] =	3	3.52	(80)
West	0.9x	0.77	X	0.6	5	x	6	3.27	x	(	0.63	X	0.	7	] =	1:	2.57	(80)
West	0.9x	0.77	X	0.3	3	x	6	3.27	x	(	0.63	X	0.	7	] =		5.8	(80)
West	0.9x	0.77	X	0.6	5	x	9:	2.28	x	(	0.63	X	0.	7	] =	18	8.33	(80)
West	0.9x	0.77	X	0.0	3	x	9:	2.28	x	(	0.63	X	0.	7	] =	8	3.46	(80)
West	0.9x	0.77	X	0.6	5	x	11	3.09	x	(	0.63	X	0.	7	] =	2:	2.47	(80)
West	0.9x	0.77	X	0.0	3	x	11	3.09	x	(	0.63	X	0.	7	] =	10	0.37	(80)
West	0.9x	0.77	X	0.6	5	x	11	5.77	x	(	0.63	X	0.	7	=		23	(80)
West	0.9x	0.77	X	0.3	3	x	11	5.77	x	(	0.63	X	0.	7	=	10	0.61	(80)
West	0.9x	0.77	X	0.6	5	x	11	0.22	X	(	0.63	X	0.	7	] =	2	1.89	(80)
West	0.9x	0.77	X	0.3	3	x	11	0.22	x	(	0.63	X	0.	7	] =	10	0.11	(80)
West	0.9x	0.77	X	0.6	5	x	9.	4.68	x	(	0.63	X	0.	7	] =	18	8.81	(80)
West	0.9x	0.77	X	0.3	3	x	9.	4.68	X	(	0.63	X	0.	7	] =	8	3.68	(80)
West	0.9x	0.77	X	0.6	5	x	7	3.59	x	(	0.63	X	0.	7	] =	1-	4.62	(80)
West	0.9x	0.77	X	0.3	3	x	7	3.59	x	(	0.63	X	0.	7	] =	6	6.75	(80)
West	0.9x	0.77	X	0.6	5	x	4:	5.59	X	(	0.63	X	0.	7	] =	9	0.06	(80)
West	0.9x	0.77	X	0.3	3	x	4:	5.59	X	(	0.63	X	0.	7	] =	4	.18	(80)
West	0.9x	0.77	X	0.6	5	x	2	4.49	x	(	0.63	X	0.	7	] =	4	1.86	(80)
West	0.9x	0.77	X	0.0	3	x	2	4.49	X	(	0.63	X	0.	7	] =	2	2.25	(80)
West	0.9x	0.77	X	0.6	5	x	1	6.15	x	(	0.63	X	0.	7	] =	3	3.21	(80)
West	0.9x	0.77	X	0.3	3	x	1	6.15	x	(	0.63	X	0.	7	=	1	.48	(80)
<b>—</b>		watts, calcu	$\overline{}$			$\overline{}$			<del> </del>		n(74)m			-		1		
` '	5.69		3.76	78.4	96.08		8.36	93.64	80.4	44	62.52	38.73	20.8	1 1	3.72			(83)
		internal and		<u> </u>		<u> </u>	<del>_</del>			<u> I</u>	T	041.5		<del>,,</del>		1		(0.4)
(84)m= 24	7.88	262.38 27	6.91	291.31	299.19	2	91.63	280.3	271	.07   2	258.24	244.8	3 238.	/5   23	39.97	J		(84)

7. IVIE	an interi	nal temp	erature	(heating	season	)								
			eating p			•	from Tab	ole 9. Th	1 (°C)				21	(85)
-		•	ains for I			•								(\cdot \cdot)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.92	0.83	0.66	0.5	0.53	0.76	0.93	0.97	0.99		(86)
Mean i		temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.78	19.91	20.15	20.5	20.77	20.94	20.99	20.98	20.89	20.56	20.14	19.78		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
=m(88)	20.3	20.3	20.31	20.33	20.33	20.35	20.35	20.35	20.34	20.33	20.32	20.32		(88)
Utilisat	tion fac	tor for g	ains for ı	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.98	0.98	0.96	0.91	0.8	0.61	0.43	0.47	0.72	0.91	0.97	0.99		(89)
Mean i	internal	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19.16	19.29	19.54	19.89	20.15	20.31	20.34	20.34	20.26	19.96	19.54	19.18		(90)
									f	LA = Livin	g area ÷ (4	<b>1</b> ) =	0.84	(91)
Mean i	internal	temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.68	19.81	20.06	20.4	20.68	20.84	20.89	20.88	20.79	20.47	20.05	19.68		(92)
· · · · -					<u> </u>	ĭ			ere appro					(22)
`	19.68	19.81	20.06	20.4	20.68	20.84	20.89	20.88	20.79	20.47	20.05	19.68		(93)
			uirement		ra abtain	ad at at	on 11 of	Table O	h oo tho	+ Ti /'	76\m an	d ro oolo	uloto	
			emanter or gains	•		ieu ai si	ерттог	rable 9	b, so tha	t 11,111=(	rojili ali	u re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat	tion fac	tor for g	ains, hm	•	ı	ı	1	ı	ı					
(94)m=	0.98	0.97	0.96	0.91	0.82	0.65	0.49	0.52	0.75	0.92	0.97	0.98		(94)
	gains, 243.07	255.41	, W = (9 <sup>2</sup> 264.71	4)m x (8- 265.41	4)m 244.94	189.93	136.93	141.6	193.4	224.12	231.04	235.83		(95)
` ′ L			rnal tem				130.93	141.0	193.4	224.12	231.04	233.63		(90)
(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 Id	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	538.94	519.44	469.51	387.33	300.64	203.93	139.98	145.7	220.67	330.43	438.25	530.09		(97)
· -		g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	220.13	177.43	152.37	87.78	41.44	0	0	0	0	79.09	149.19	218.93		_
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1126.36	(98)
Space	heating	g require	ement in	kWh/m²	<sup>2</sup> /year								45.05	(99)
			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	heating on of sp	_	nt from se	econdar	y/supple	mentary	system						0	(201)
	•		nt from m			·	-	(202) = 1	- (201) =				1	(202)
	•		ng from i	-	, ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heati	-									93.5	(206)
	ncy of s	-	ry/supple			g systen	ո, %						0	(208)

		_				_			_		_	_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heatir	ng requir	ement (c	alculate	d above)	0	0	0	0	79.09	149.19	218.93	7	
$(211)$ m = {[(98)									75.05	143.13	210.00		(211)
235.43	<del>i                                    </del>	162.96	93.88	44.32	0	0	0	0	84.59	159.57	234.15	7	(211)
				!			Tota	l (kWh/yea	ar) =Sum(2	211)	=	1204.66	(211)
Space heating	•		• •	month									
$= \{[(98)m \times (2)] $ $(215)m = 0$	01)] } x 1 T 0	00 ÷ (20	8) 0	0	0	0	0	0	0	0	0	7	
(210)	<u> </u>		Ů						_	215) <sub>15,1012</sub>		0	(215)
Water heating	g												
Water heating Annual wate		•		y system	n:							1493.47	(64)
Annual totals	_	requirei	ПСП						F.	Wh/year		kWh/yea	
Space heating		ed, main	system	1					K.	vvii/yeai		1204.66	a1
Water heating	fuel use	ed										1794.5	7
Electricity for	pumps, f	ans and	electric	keep-hot	t								
central heati	ng pump	:									30	7	(230c)
boiler with a	fan-assis	sted flue									45	Ī	(230e)
Total electricit	y for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for	lighting											153.37	(232)
Electricity for 12a. CO2 en		– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHP	)				153.37	(232)
		– Individ	ual heati	ing syste			cro-CHP	)	Emiss	ion fac	tor	153.37	
		– Individ	ual heati	ing syste	En	uding mi <b>ergy</b> /h/year	cro-CHP		Emiss kg CO		tor		ns
	nissions			ing syste	En kW	ergy	cro-CHP			2/kWh	tor =	Emission	ns
12a. CO2 en	nissions	system 1		ing syste	<b>En</b> kW (21	<b>ergy</b> /h/year	cro-CHP	,	kg CO	2/kWh		Emission kg CO2/y	ns ear
12a. CO2 en	missions of the second of the	system 1		ing syste	En kW (21	ergy /h/year	cro-CHP		kg CO:	2/kWh	=	Emission kg CO2/yo	ear (261)
Space heating	g (main s	ystem 1 dary)		ing syste	En kW (21) (21)	ergy /h/year i) x 5) x	cro-CHP + (263) + (		0.2 0.5	2/kWh	=	Emission kg CO2/ye	ear (261) (263)
Space heating Space heating Water heating	g (main s g (second	ystem 1 dary) ing	)	ing syste	En kW (21) (21)	ergy /h/year i) x 5) x			0.2 0.5	2/kWh	=	Emission kg CO2/ye 260.21 0	(261) (263) (264)
Space heating Space heating Water heating Space and wa	g (main s g (second	ystem 1 dary) ing	)	ing syste	En kW (21) (21)	ergy /h/year i) x 5) x	+ (263) + ( <b>Ene</b>	264) = ergy	0.2 0.5 0.2	2/kWh 16 19 16 mission	= = =	Emission kg CO2/yo 260.21 0 387.61 647.82 Emissions	(261) (263) (264) (265)
Space heating Water heating Space and wa Water heating	missions of the missions of the main series of the missions of	ystem 1 dary) ing mmunity	) system	ing syste	En kW (21) (21)	ergy /h/year 1) x 5) x 9) x	+ (263) + ( Ene kWl	264) =	0.2 0.5 0.2	2/kWh 16 19 16 mission g CO2/k	= = = factor Wh	Emission kg CO2/yd 260.21 0 387.61 647.82 Emissions kg CO2/year	(261) (263) (264) (265)
Space heating Space heating Water heating Space and wa Water heating	g (main s g (second ater heati g from co	eystem 1 dary) ing mmunity	system		En kW (21 (21) (21) (26)	ergy /h/year 1) x 5) x 9) x	+ (263) + ( Ene kWl	264) = ergy h/year	0.2 0.5 0.2	2/kWh 16 19 16 mission	= = = factor Wh	Emission kg CO2/yd 260.21 0 387.61 647.82 Emissions kg CO2/year 0	(261) (263) (264) (265) (372)
Space heating Space heating Water heating Space and wa Water heating Total CO2 ass	g (main s g (second ater heati g from co	dary)  ing  mmunity  neat distriction	system ribution nmunity :	systems	En kW (21) (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year	0.2 0.5 0.2 E kg	2/kWh 16 19 16 mission g CO2/k	= = factor Wh	Emission kg CO2/yd 260.21 0 387.61 647.82 Emissions kg CO2/year 0 0	(261) (263) (264) (265) (372) (373)
Space heating Space heating Water heating Space and wa Water heating Electrical end Total CO2 ass Electricity for	missions  g (main s g (second ater heati g from co ergy for h sociated pumps, f	dary)  ing  mmunity  neat distriction	system ribution nmunity :	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year	kg CO2  0.2  0.5  0.2  E kg (372)	2/kWh  16  19  16  mission g CO2/k  0	= = factor Wh	Emission kg CO2/yd 260.21  0 387.61  647.82  Emissions kg CO2/year 0  0 38.93	(261) (263) (264) (265) (372) (373) (267)
Space heating Space heating Water heating Space and wa Water heating Electrical end Total CO2 ass Electricity for	missions  g (main s g (second ater heati g from co ergy for h sociated pumps, f lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity :	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg  (372)  0.5  0.5	2/kWh  16  19  16  mission g CO2/k  0	= = factor Wh	Emission kg CO2/year 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(261) (263) (264) (265) (372) (373) (267) (268)
Space heating Space heating Water heating Space and wa Water heating Electrical end Total CO2 ass Electricity for	missions  g (main s g (second ater heati g from co ergy for h sociated pumps, f lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity :	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg (372)	2/kWh  16  19  16  mission g CO2/k  0	= = factor Wh	Emission kg CO2/yd 260.21  0 387.61  647.82  Emissions kg CO2/year 0  0 38.93	(261) (263) (264) (265) (372) (373) (267)
Space heating Space heating Water heating Space and wa Water heating Electrical end Total CO2 ass Electricity for	missions  g (main s g (second ater heati g from co ergy for h sociated pumps, f lighting	dary)  ing  mmunity  neat distriction	system ribution nmunity :	systems	En kW (21) (21) (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + ( Ene kWl	264) = ergy h/year 66) + (368)	kg CO2  0.2  0.5  0.2  E kg  (372)  0.5  0.5	2/kWh  16  19  16  mission g CO2/k  0	= = factor Wh	Emission kg CO2/year 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(261) (263) (264) (265) (372) (373) (267) (268)

## **SAP Input**

#### Property Details: Flat Type E - ASHP + PV

Address:

Located in: Wales

Region: Thames valley

UPRN:

Date of assessment: 07 November 2019
Date of certificate: 12 May 2020

Assessment type: 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: 460

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 49.68 m<sup>2</sup> 3.09 m

Living area: 24.05 m<sup>2</sup> (fraction 0.484)

Front of dwelling faces: South

	$n \cap n$	ing	tvin	00.
-	uen	II IU	$\mathbf{I} \mathbf{V} \mathbf{U}$	ES.

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D9_01	Manufacturer	Solid			
Vent_09_01	Manufacturer	Solid			
Vent_09_09	Manufacturer	Solid			
Vent_09_04	Manufacturer	Solid			
Vent_09_10	Manufacturer	Solid			
Window_09_02	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_03	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_05	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_11	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_07	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Window_09_08	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	Yes	
Fanlight	Manufacturer	Windows	low-E, $En = 0.05$ , soft coat	No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
D9_01	mm	0	0	1	2.13	1
Vent_09_01	mm	0	0	1	0.7	1
Vent_09_09	mm	0	0	1	0.96	1
Vent_09_04	mm	0	0	1	0.7	1
Vent_09_10	mm	0	0	1	0.7	1
Window_09_02	6mm	0.7	0.4	1.2	1.1	1
Window_09_03	6mm	0.7	0.4	1.2	0.19	1
Window_09_05	6mm	0.7	0.4	1.2	2.01	1
Window_09_11	6mm	0.7	0.4	1.2	1.46	1
Window_09_07	6mm	0.7	0.4	1.2	1.46	1
Window_09_08	6mm	0.7	0.4	1.2	0.99	1
Fanlight	6mm	0.7	0.4	1.2	0.32	1

Name: Type-Name: Location: Orient: Width: Height: D9\_01 9\_01 South 0 n 9\_01 0.58 Vent\_09\_01 South 1.2

## **SAP Input**

Vent_09_09	9_09	East	0.58	1.65
Vent_09_04	9_06	North	1.2	0.58
Vent_09_10	9_07	North	0.58	1.2
Window_09_02	9_01	South	0.92	1.2
Window_09_03	9_01	South	0	0
Window_09_05	9_06	North	1.22	1.65
Window_09_11	9_07	North	1.22	1.2
Window_09_07	9_08	North	1.22	1.2
Window_09_08	9_09	East	0.6	1.65
Fanlight	9_01	South	1.01	0.315

Overshading: Average or unknown

and the second second second							
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>ts</u>						
9_01	12.36	4.44	7.92	0.13	0	False	N/A
9_02	5.871	0	5.87	0.13	0	False	N/A
9_03	5.84	0	5.84	0.13	0	False	N/A
9_04	2.812	0	2.81	0.13	0	False	N/A
9_06	8.498	2.71	5.79	0.13	0	False	N/A
9_07	8.019	2.16	5.86	0.13	0	False	N/A
9_08	10.521	1.46	9.06	0.13	0	False	N/A
9_09	19.467	1.95	17.52	0.13	0	False	N/A
R9_01	49.68	0	49.68	0.1	0		N/A
Internal Flament							

Internal Elements
Party Elements

Thermal	hridaes.

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

#### Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

Approved Installation Scheme: False

### Main heating system

Main heating system: Electric underfloor heating

Standard tariff Fuel: Electricity

Info Source: SAP Tables

SAP Table: 425

In timber floor, or immediately below floor covering Underfloor heating, pipes in insulated timber floor

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Room-sealed Boiler interlock: Yes

### Main heating Control:

## **SAP Input**

Main heating Control: Programmer and room thermostat

Control code: 2704

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: 952 From DHW-only community scheme

Heat source: From hot-water only community scheme - heat pump heat from electric heat pump, heat fraction 1, efficiency 329

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

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: 0.868

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Photovoltaic 2

Installed Peak power: 0.347

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Photovoltaic 3

Installed Peak power: 0.326

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property /	Address	Flat Ty	pe E - A	SHP + F	Pγ		
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\			(1a) x	3	.09	(2a) =	153.51	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)4	9.68	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	153.51	(5)
2. Ventilation rate:	main accorde	•	04lb 0 m		40401				-
	main seconda heating heating	ry 	other		total		i	m³ per hou	r 
Number of chimneys	0 + 0	+	0	_ = _	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	Х	10 =	0	(7a)
Number of passive vents				Ē	0	X	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)
				<u>L</u>			!		
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in the	peen carried out or is intended, proced he dwelling (ns)	ed to (17), o	otherwise (	continue fr	om (9) to	(16)		0	(9)
Additional infiltration	ne awening (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	r 0.35 for	r masoni	y constr	uction	,	•	0	(11)
	resent, use the value corresponding	to the great	er wall are	a (after			!		
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	,	7.1 (OOGIO	,a), 0.00	ontor o				0	(13)
• •	s and doors draught stripped							0	(14)
Window infiltration	<b>C</b>		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 cubic metr	es per ho	ur per s	quare m	etre of e	envelope	area	2.5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a deg	gree air pe	rmeability	is being u	sed	ĺ		7,,0
Number of sides sheltere Shelter factor	ea each		(20) = 1 -	0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18		,.			0.12	(21)
Infiltration rate modified f	_		, , ,					0.12	(=./
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 Easter (22a)m (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(,	1	1	L	•	L	L		I	

Adjusted infiltration rate (allowing for shelter ar	nd wind speed) :	= (21a) x (22a)m					
0.16 0.16 0.15 0.14 0.13	0.12 0.12	0.12 0.12	0.13	0.14	0.15		
Calculate effective air change rate for the appli	cable case	ļ ļ					_
If mechanical ventilation:	-) Fa (a aatia.a.	(NIC)\ _athamiia = (22	h) (22-)		[	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a			b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing			201.) (6	201 ) [4	(00.)	73.95	(23c)
a) If balanced mechanical ventilation with he	<del> </del>	<del>1 ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '</del>	<del> </del>		<del>`</del>	÷ 100]	(24a)
(24a)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(24a)
b) If balanced mechanical ventilation without	<del> </del>	<del></del>	<del>T ` `</del>				(24b)
` '	<u> </u>	0 0	0	0	0		(240)
c) If whole house extract ventilation or positive if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•		) 5 × (23h)	١			
(24c)m= 0 0 0 0 0 0	0 0		0	0	0		(24c)
d) If natural ventilation or whole house positi	ve input ventilat	ion from loft	_				
if (22b)m = 1, then (24d)m = (22b)m other	•		( 0.5]				
(24d)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	o) or (24c) or (2	4d) in box (25)					
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25	0.25 0.26	0.26	0.27	0.28		(25)
3. Heat losses and heat loss parameter:							
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-value W/m2K	A X U (W/k	()	k-value kJ/m²-k		X k /K
Doors Type 1	2.13 ×	1 =	2.13				(26)
Doors Type 1 Doors Type 2	2.13 x		2.13				(26) (26)
• •		1 =					
Doors Type 2	0.7 ×	1 =	0.7				(26)
Doors Type 2 Doors Type 3	0.7 × 0.96 ×	1 =	0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 x 0.96 x 0.7 x 0.7 x	1 =	0.7 0.96 0.7 0.7				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x	1 = 1 = 1 = 1 = 1	0.7 0.96 0.7 0.7 1.26				(26) (26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 x 0.96 x 0.7 x 0.7 x 1.1 x 0.19 x	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04]	0.7 0.96 0.7 0.7 1.26 0.22				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x 0.19 x 2.01 x	1 = 1	0.7 0.96 0.7 0.7 1.26 0.22 2.3				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7 x 0.96 x 0.7 x 0.7 x 0.7 x 1.1 x 0.19 x 2.01 x 1.46 x	1 = 1 = 1/[1/(1.2)+0.04] = 1/[1/	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	1 = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 1/[1/(1.2)+0.04] = 0.13 = 0.13 = 0.13	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81 0 Walls Type5 8.5 2.71	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.03 0.76 0.76 0.76				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7	1 = 1   1   1   1   1   1   1   1   1	0.7 0.96 0.7 0.7 1.26 0.22 2.3 1.67 1.67 1.13 0.37 1.03 0.76 0.76 0.37				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Aug Sep Oct Nov Dec Apr May Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:	
a) If manufacturer's declared loss factor is known (kWh/day):	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year (48) x (49) = 110	(50)
b) If manufacturer's declared cylinder loss factor is not known:	
Hot water storage loss factor from Table 2 (kWh/litre/day)  0.02	(51)
If community heating see section 4.3  Volume factor from Table 2a	(50)
Volume factor from Table 2a 1.03  Temperature factor from Table 2b 0.6	(52) (53)
(47) × (54) × (50) × (50)	(54)
Energy lost from water storage, kwn/year $(47) \times (51) \times (52) \times (53) = 1.03$ Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	()
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(56)
If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50)$ – $(H11)]$ ÷ $(50)$ , else $(57)$ m = $(56)$ m where $(H11)$ is from Appendix H	()
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (50)m +$	61)m
(62)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25 154.05 161.32 172.37	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25 154.05 161.32 172.37	
Output from water heater (annual) <sub>112</sub> 1816.9	8 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m + (57)m + (59)m]	
(65)m= 84.42 75.1 80.5 74.43 74.57 68.99 68.49 72.07 70.98 77.06 78.65 83.15	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84 100.84	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 34.46 30.6 24.89 18.84 14.08 11.89 12.85 16.7 22.42 28.46 33.22 35.41	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 218.51 220.78 215.07 202.9 187.55 173.11 163.47 161.21 166.92 179.08 194.44 208.87	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76 46.76	
	(69)
Pumps and fans gains (Table 5a)	(69)
	(69) (70)

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)	1
Water	heating	gains (T	able 5)										-	
(72)m=	113.47	111.76	108.2	103.37	100.23	95.81	92.06	96.87	98.58	103.58	109.23	111.77	(72)	1
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	446.82	443.52	428.54	405.49	382.24	361.2	348.76	355.15	368.29	391.51	417.27	436.43	(73)	1
6. Sol	ar gains	S:												

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

		Access Facto Table 6d		Area m²	a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	=	4.15	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	X	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	X	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	=	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	=	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	X	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	X	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	X	2.01	X	24.19	x	0.4	X	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	x	24.19	x	0.4	X	0.7	=	6.85	(74)

North			7		1		1		ı		ı		7
North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	= 	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East -	0.9x	0.77	X	0.99	X	38.42	X	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	X	63.27	X	0.4	X	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	X	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	X	113.09	Х	0.4	X	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	X	115.77	X	0.4	X	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	X	110.22	X	0.4	X	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	X	94.68	X	0.4	X	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	X	73.59	X	0.4	X	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	X	45.59	X	0.4	X	0.7	=	8.76	(76)
East	0.9x	0.77	X	0.99	X	24.49	х	0.4	X	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	X	16.15	X	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	X	46.75	x	0.4	X	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	X	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	X	0.32	X	46.75	x	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	X	0.7	=	16.34	(78)
South	0.9x	0.77	X	0.19	X	76.57	X	0.4	X	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	X	76.57	x	0.4	X	0.7	=	4.75	(78)
South	0.9x	0.77	X	1.1	X	97.53	X	0.4	X	0.7	=	20.82	(78)
South	0.9x	0.77	X	0.19	X	97.53	X	0.4	X	0.7	=	3.6	(78)
South	0.9x	0.77	X	0.32	X	97.53	X	0.4	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	X	0.7	=	23.53	(78)
South	0.9x	0.77	X	0.19	X	110.23	x	0.4	X	0.7	=	4.06	(78)
South	0.9x	0.77	X	0.32	X	110.23	X	0.4	X	0.7	=	6.84	(78)
South	0.9x	0.77	X	1.1	X	114.87	X	0.4	X	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	X	114.87	X	0.4	X	0.7	=	4.24	(78)
South	0.9x	0.77	X	0.32	X	114.87	x	0.4	X	0.7	=	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	=	23.6	(78)
South	0.9x	0.77	X	0.19	X	110.55	x	0.4	x	0.7	=	4.08	(78)
South	0.9x	0.77	X	0.32	x	110.55	x	0.4	x	0.7	=	6.86	(78)
South	0.9x	0.77	X	1.1	×	108.01	x	0.4	x	0.7	=	23.05	(78)
South	0.9x	0.77	X	0.19	x	108.01	x	0.4	x	0.7	=	3.98	(78)
South	0.9x	0.77	X	0.32	x	108.01	x	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	×	1.1	x	104.89	x	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	x	0.19	x	104.89	x	0.4	x	0.7	=	3.87	(78)

South	0.9x	0.77	X	0.3	32	X	1	04.89	X		0.4	x [	0.7	=	6.51	(78)
South	0.9x	0.77	X	1.	1	X	1	01.89	X		0.4	x [	0.7	=	21.75	(78)
South	0.9x	0.77	X	0.1	19	X	1	01.89	x		0.4	x [	0.7	=	3.76	(78)
South	0.9x	0.77	X	0.3	32	X	1	01.89	X		0.4	x [	0.7	=	6.33	(78)
South	0.9x	0.77	X	1.	1	X	8	32.59	x		0.4	x [	0.7	=	17.63	(78)
South	0.9x	0.77	X	0.1	19	X	8	32.59	x		0.4	x [	0.7	=	3.04	(78)
South	0.9x	0.77	X	0.3	32	X	8	32.59	x		0.4	x [	0.7	=	5.13	(78)
South	0.9x	0.77	X	1.	1	X	5	55.42	X		0.4	x [	0.7	=	11.83	(78)
South	0.9x	0.77	X	0.1	19	X	5	55.42	x		0.4	x [	0.7	=	2.04	(78)
South	0.9x	0.77	X	0.3	32	X	5	5.42	X		0.4	x [	0.7	=	3.44	(78)
South	0.9x	0.77	X	1.	1	X		40.4	x		0.4	x [	0.7	=	8.62	(78)
South	0.9x	0.77	X	0.1	19	X		40.4	X		0.4	x [	0.7	=	1.49	(78)
South	0.9x	0.77	X	0.3	32	X		40.4	x		0.4	x [	0.7	=	2.51	(78)
Solar g	í –		alculated	1	r	$\overline{}$			r <del>`</del>		ım(74)m .	(82)m	_		7	
(83)m=	28.55	50.74	75.66	105.22	129.09		33.29	126.35	107	.63	85.68	57.7	34.57	24.2		(83)
Ĭ			and solar	<u> </u>	<u> </u>	<del>-</del>							1		1	(0.4)
(84)m=	475.37	494.26	504.19	510.71	511.33	4	94.49	475.11	462	.79	453.97	449.2	451.83	460.63		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	า)										_
Temp	erature	during h	neating p	eriods ir	n the liv	ing	area	from Tal	ole 9,	Th1	1 (°C)				21	(85)
Utilisa			ains for		ı —	Ť							_		1	
	Jan	Feb	Mar	Apr	May	+	Jun	Jul	<del>                                     </del>	ug	Sep	Oct	Nov	Dec		(0.0)
(86)m=	0.91	0.9	0.88	0.83	0.74		0.61	0.48	0.5	51	0.67	0.82	0.89	0.92	]	(86)
Mean		· ·	ature in	living ar	r `	$\overline{}$		ps 3 to 7	7 in T	able	9c)			1	7	
(87)m=	19.01	19.18	19.51	19.97	20.41	2	20.76	20.91	20.	89	20.66	20.14	19.52	18.98		(87)
Temp	erature	during h	neating p	eriods ir	rest of	fdw	elling	from Ta	able 9	9, Th	n2 (°C)		_	_	-	
(88)m=	20.4	20.4	20.4	20.41	20.41	2	20.42	20.42	20.4	42	20.42	20.41	20.41	20.4		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	ee Table	9a)							
(89)m=	0.91	0.89	0.87	0.81	0.72	(	0.57	0.43	0.4	16	0.64	0.8	0.88	0.91		(89)
Mean	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m=	18.52	18.69	19.02	19.48	19.9	Ť	20.23	20.36	20.		20.14	19.65	19.04	18.5	]	(90)
•		•	•	•	•			•	•		f	LA = Liv	ng area ÷ (	4) =	0.48	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	a) = fl	LA × T1	+ (1	– fL	A) x T2					
(92)m=	18.76	18.93	19.26	19.72	20.15	_	20.49	20.62	20.0	_	20.4	19.89	19.27	18.73	]	(92)
ا Apply	adjustn	nent to t	he mear	interna	l tempe	ratu	re fro	m Table	4e,	whe	re appro	priate	1		1	
(93)m=	18.76	18.93	19.26	19.72	20.15	2	20.49	20.62	20.0	61	20.4	19.89	19.27	18.73		(93)
8. Spa	ace hea	ting requ	uirement													
			ternal ter or gains			ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	): 		_		_		,				_	1	
(94)m=	0.89	0.87	0.85	0.79	0.71	(	0.58	0.45	0.4	17	0.64	0.78	0.86	0.89	]	(94)
I		r	W = (94)	ŕ	<del></del>	T -	05.5-	0.5-			000 5 . 1	0=0=	000		1	(05)
(95)m=	422.07	431.48	426.16	404.95	362.01	2	85.55	212.2	218	.54	290.21	352.53	388.33	411.91	j	(95)

Mont	hly aver	age exte	rnal tem	nerature	from Ta	able 8								
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature, l	_m , W =	=[(39)m :	x [(93)m	– (96)m	]	ļ			
(97)m=	864.59	836.71	758.87	635.01	494.63	339.85	232.3	242.37	365.5	543.62	716.26	859.67		(97)
Spac		<del></del>			nonth, kV	Vh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	1824.81	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year							l	36.73	(99)
			nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
-	e heating	_	it from se	econdar	v/sunnle	mentarv	svstem					[	0	(201)
	•		it from m	-		montary	•	(202) = 1 -	- (201) =			l I	1	(202)
			ng from i	•	` '			(204) = (20	02) × [1 –	(203)] =		 	1	(204)
			ace heati	•								l [	100	(206)
	•		ry/supple			g system	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ar
Spac	e heatin	g require	ement (c						•		l .		,	
	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		
(211)n	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	329.24	272.31	247.54	165.64	98.67	0	0	0	0	142.17	236.11	333.13		_
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	1824.81	(211)
•		• ,	econdar		month									
$= \{[(98)$ (215)m=		01)] } X 1	00 ÷ (20 0	8) 0	0	0	0	0	0	0	0	0		
(210)111-			Ů	U		U	Ů				215) <sub>15.1012</sub>		0	(215)
Water	heating	1									710,1012			
	•	•	parate co	ommunit	y systen	า:						_		
Annu	ıal water	heating	requirer	nent										_
Fract	ion of he	_											1816.98	(64)
		eat from	commur	nity CHP								[	1816.98	(64) (303a)
Facto			commur ethod fo	•		er heatii	ng					[ [		=
	or for cha	arging m		r commu	unity wat		•	em				[ [ [	1	(303a)
Distri	or for cha	arging m	ethod fo r (Table	r commu	unity wat		•	em	(64) x (30	03a) x (305	5) x (306) =	    -  -	1	(303a) (305)
Distri Wate	or for charbution lo	arging m oss facto om CHP	ethod fo r (Table	r commu	unity wat		•				5) x (306) = · (310a)(	l r	1 1 1.05	(303a) (305) (306)
Distri Wate Elect	or for charbution lo	arging moss factoom CHP	ethod fo r (Table	r commu	unity wat		•			(307e) +		[310e)] =	1 1 1.05 1907.83	(303a) (305) (306) (310a) (313)
Distri Wate Elect	or for charbution lo r heat fr ricity use al totals	arging moss factoom CHP	ethod fo r (Table	r commu 12c) for	unity wat		•			(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space	br for char bution lover heat from ricity use al totals theating	arging moss factoom CHP ed for he	ethod fo r (Table at distrib	r commu 12c) for oution system	unity wat commur	nity heat	•			(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri	br for char bution lover heat from ricity use al totals heating licity for p	arging moss factors om CHP ed for he fuel use pumps, fa	ethod for (Table at distributed, main ans and	r community of the comm	unity wat commur 1 keep-hot	nity heat	ing syste		× [(307a).	(307e) +	(310a)(	[310e)] =	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri mech	or for char bution lover heat from ricity used al totals to heating licity for pananical v	arging moss factorom CHP ed for he fuel use bumps, facentilation	ethod for (Table at distributed, main ans and	r community of the comm	unity wat commur  1 keep-hot ract or p	nity heat	ing syste	0.01 n outside	× [(307a).	(307e) +	(310a)( <b>Wh/year</b>	[310e)] = [	1 1 1.05 1907.83 19.08 kWh/year	(303a) (305) (306) (310a) (313)
Distri Wate Elect Annua Space Electri mech	or for char bution lover heat from ricity used al totals to heating licity for pananical v	arging moss factorom CHP ed for he fuel use bumps, facentilation of the formal entilation of the formal entitle entilation of the formal entitle	ethod for (Table at distributed, main ans and notated)	r community of the comm	unity wat commur  1 keep-hot ract or p	nity heat	ing syste	0.01 n outside	× [(307a).	(307e) +	(310a)( <b>Wh/year</b>	[310e)] = [	1 1.05 1907.83 19.08 <b>kWh/year</b> 1824.81	(303a) (305) (306) (310a) (313) (230a)

Electricity generated by PVs			-1251.11	(233)
10a. Fuel costs - individual heating systems:				
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19 × 0.01 =	240.69	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	= 0	(241)
Space heating - secondary	(215) x	13.19 × 0.01 =	= 0	(242)
Water heating from CHP	(310a) x	4.24 x 0.01 =	80.89	(342
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	28.36	(249)
(if off-peak tariff, list each of (230a) to (230g) separately for lighting	arately as applicable and ap	oply fuel price according to		(250)
Additional standing charges (Table 12)			60	(251)
	one of (233) to (235) x)	13.19 × 0.01 =	-165.02	(252)
Appendix Q items: repeat lines (253) and (254) as	s needed			
Total energy cost (245)(24	7) + (250)(254) =		277.03	(255)
11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(255) x (2	56)] ÷ [(4) + 45.0] =		1.23	(257)
SAP rating (Section 12)			82.86	(258)
12a. CO2 emissions – Individual heating system	ns including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year	
Space heating (main system 1)				
	(211) x	0.519 =	947.08	(261)
Space heating (secondary)	(211) x (215) x	0.519 =		(261) (263)
Space heating (secondary) Water heating from community system		0.519		
		0.519 = Emission facto	0 (	
Water heating from community system  CO2 from other sources of space and water hea	(215) x Energy kWh/yea	0.519 =  Emission facto kg CO2/kWh	r Emissions kg CO2/year	
Water heating from community system  CO2 from other sources of space and water heating from community system	(215) x  Energy kWh/yea	Emission facto kg CO2/kWh	r Emissions kg CO2/year	(263)
Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	Energy kWh/yea ating (not CHP) there is CHP using two fuels repea	Emission facto kg CO2/kWh	0  r Emissions kg CO2/year  uel 329 ( = 300.96 (	(263)
Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/yea ating (not CHP) there is CHP using two fuels repeat [(307b)+(310b)] x 100 ÷ (	0.519 =  Emission facto kg CO2/kWh  at (363) to (366) for the second for the seco	0  r Emissions kg CO2/year  uel 329 ( = 300.96 ( = 9.9 (	(367)
Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/yea ating (not CHP) there is CHP using two fuels repeat [(307b)+(310b)] x 100 ÷ ([(313) x	0.519 =  Emission facto kg CO2/kWh  at (363) to (366) for the second for the seco	0  r Emissions kg CO2/year  uel 329 ( = 300.96 ( = 9.9 ( = 310.86 (	(367) (367) (372)
Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/yea ating (not CHP) there is CHP using two fuels repeat [(307b)+(310b)] x 100 ÷ ([(313) x (363)(366) + (363)(	0.519 =  Emission facto kg CO2/kWh  at (363) to (366) for the second for (367b) x	0  r Emissions kg CO2/year  uel 329 = 300.96 = 9.9 = 310.86 (111.59)	(367) (367) (372) (373)
Water heating from community system  CO2 from other sources of space and water heat Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  Electricity for pumps, fans and electric keep-hot	Energy kWh/yea ating (not CHP) there is CHP using two fuels repeat [(307b)+(310b)] x 100 ÷ ( [(313) x (363)(366) + (300) x	0.519 =  Emission facto kg CO2/kWh  at (363) to (366) for the second for (367b) x	0  r Emissions kg CO2/year  uel 329 = 300.96 = 9.9 = 310.86 (111.59) (126.33)	(367) (367) (372) (373) (267)

CO2 emissions per m²		(272) ÷ (4)	=		17.04	(273)
EI rating (section 14)					88	(274)
13a. Primary Energy						
	<b>Energy</b> kWh/year	<b>Pri</b> fac	<b>mary</b> etor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x		3.07	=	5602.18	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Water heating from community system						
		Energy kWh/year	Primary factor		missions Wh/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	- '	wo fuels repeat (363) to	o (366) for the sec	cond fuel	329	(367a)
Energy associated with heat source 1	[(307b)+(3 <sup>2</sup>	10b)] x 100 ÷ (367b) x	3.07	=	1780.25	(367)
Electrical energy for heat distribution	[(3	13) x	2.92	=	55.71	(372)
Total Energy associated with community systems	(36	63)(366) + (368)(37	72)	=	310.86	(373)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	660.06	(267)
Electricity for lighting	(232) x		0	=	747.25	(268)
Energy saving/generation technologies Item 1			3.07	=	-3840.91	(269)
'Total Primary Energy		sum of (26	5)(271) =		5004.53	(272)
Primary energy kWh/m²/year			=	_		_

		User D	etails:						
Assessor Name:	Adam Ritchie		Strom	a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.25	
		Property /	Address	Flat Ty	pe E - A	SHP + F	Pγ		
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\			(1a) x	3	.09	(2a) =	153.51	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)4	9.68	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	153.51	(5)
2. Ventilation rate:	main accorde	<b>.</b>	04lb 0 m		40401				-
	main seconda heating heating	ry 	other		total		i	m³ per hou	r 
Number of chimneys	0 + 0	+	0	_ = _	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	Х	10 =	0	(7a)
Number of passive vents				Ē	0	X	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)
				<u>L</u>			!		
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in the	peen carried out or is intended, proced he dwelling (ns)	ed to (17), o	otherwise (	continue fr	om (9) to	(16)		0	(9)
Additional infiltration	ne awening (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	r 0.35 for	r masoni	y constr	uction	,	•	0	(11)
	resent, use the value corresponding	to the great	er wall are	a (after			!		
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	,	7.1 (OOGIO	,a), 0.00	ontor o				0	(13)
• •	s and doors draught stripped							0	(14)
Window infiltration	<b>C</b>		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 cubic metr	es per ho	ur per s	quare m	etre of e	envelope	area	2.5	(17)
	lity value, then $(18) = [(17) \div 20] +$							0.12	(18)
	es if a pressurisation test has been do	ne or a deg	gree air pe	rmeability	is being u	sed	ĺ		7,,0
Number of sides sheltere Shelter factor	ea each		(20) = 1 -	0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18		,.			0.12	(21)
Infiltration rate modified f	_		, , ,					0.12	(=./
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 Easter (22a)m (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(,	1	1	L	•	L	L		I	

Adjusted infiltration rate (allowing for shelter ar	nd wind speed) = (21a) :	( (22a)m		
0.16 0.16 0.15 0.14 0.13	0.12 0.12 0.12	0.12 0.13	0.14 0.15	
Calculate effective air change rate for the appl	icable case			· · · · · · · · · · · · · · · · · · ·
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23)	a) × Emy (aguation (NE)) ath	orwico (23h) – (23a)		0.5 (23a)
If balanced with heat recovery: efficiency in % allowing				0.5 (23b)
a) If balanced mechanical ventilation with he			22b) + [1 (22b)	73.95 (23c)
(24a)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	$0.26 \qquad 0.26$	$\frac{230) \times [1 - (230)}{0.27}$	(24a)
b) If balanced mechanical ventilation without	<del>                                     </del>			1
(24b)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24b)
c) If whole house extract ventilation or positi	ve input ventilation from	outside	I	I
if (22b)m < 0.5 x (23b), then (24c) = (23	•		)	
(24c)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other				
(24d)m= 0 0 0 0 0	0 0 0	0 0	0 0	(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (24d) in be	ox (25)	!	1
(25)m= 0.29 0.29 0.28 0.27 0.26	0.25 0.25 0.25	0.26 0.26	0.27 0.28	(25)
3. Heat losses and heat loss parameter:			·	
<b>ELEMENT</b> Gross Openings area (m²) m²	Net Area U-va A ,m² W/m		k-value () kJ/m²-l	
• • •			<u>^</u>	
Doors Type 1	2.13 X 1	= 2.13		(26)
Doors Type 2	2.13 X 1	= 2.13		(26) (26)
• •				
Doors Type 2	0.7 × 1	= 0.7		(26)
Doors Type 2 Doors Type 3	0.7 x 1 0.96 x 1	= 0.7		(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 x 1 0.96 x 1 0.7 x 1	= 0.7 = 0.96 = 0.7 = 0.7		(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7	$ \begin{array}{cccc}  & = & 0.7 \\  & = & 0.96 \\  & = & 0.7 \\  & = & 0.7 \\  & + 0.04 & = & 1.26 \end{array} $		(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$		(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $+ 0.04] = 1.26$ $+ 0.04] = 0.22$ $+ 0.04] = 2.3$		(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 5	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0	0.7	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.44 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7			(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type1 12.36 4.44 Walls Type2 5.87 0 Walls Type3 5.84 0 Walls Type4 2.81	0.7     x     1       0.96     x     1       0.7     x     1       0.7     x     1       1.1     x1/[1/(1.2)       0.19     x1/[1/(1.2)       2.01     x1/[1/(1.2)       1.46     x1/[1/(1.2)       0.99     x1/[1/(1.2)       0.32     x1/[1/(1.2)       7.92     x     0.1       5.87     x     0.1       2.81     x     0.1	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 2.3 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.75		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5	0.7       x       1         0.96       x       1         0.7       x       1         0.7       x       1         1.1       x1/[1/(1.2)         0.19       x1/[1/(1.2)         2.01       x1/[1/(1.2)         1.46       x1/[1/(1.2)         0.99       x1/[1/(1.2)         0.32       x1/[1/(1.2)         7.92       x         0.1       5.87         5.84       x         0.1       5.79	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 + 0.04] = 1.26 + 0.04] = 2.3 + 0.04] = 1.67 + 0.04] = 1.67 + 0.04] = 1.13 + 0.04] = 0.37 3 = 0.76 3 = 0.76 3 = 0.76		(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 1.95 17.52 0.13 2.28 Roof (30)49.68 0 49.68 0.1 4.97 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ 26.67 (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low 100 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)18.46 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)45.13 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =14.67 14.51 14.36 13.56 13.41 12.61 12.61 12.46 12.93 13.41 13.72 14.04 (38)Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =59.8 59.64 59.48 58.69 58.53 57.74 57.74 57.58 58.06 58.53 58.85 59.17 (39)Average =  $Sum(39)_{1...12}/12=$ 58.65 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.2 1.18 1.18 1.16 1.16 1.16 (40)m =1.2 1.2 1.17 1.18 1.18 1.19 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				(15)
a) If manufacturer's declared loss factor is known (kWh/day):		0		(48)
Temperature factor from Table 2b		0		(49)
Energy lost from water storage, kWh/year (48) x (49) = b) If manufacturer's declared cylinder loss factor is not known:	11	10		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0	02		(51)
If community heating see section 4.3				
Volume factor from Table 2a  Temperature factor from Table 2b		03		(52)
·	0.			(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times ($	1	03 03		(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)r)$		00		(00)
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98	32.01 30.98	32.01		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)ii			x H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98	32.01 30.98	32.01		(57)
Primary circuit loss (annual) from Table 3		0		(58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m				,
(modified by factor from Table H5 if there is solar water heating and a cylinder	thermostat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51	23.26		(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$				
(61)m= 0 0 0 0 0 0 0 0 0	0 0	0		(61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (	45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25	154.05 161.32	172.37		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar	contribution to wate	er heating)		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)				
(63)m= 0 0 0 0 0 0 0 0	0 0	0		(63)
Output from water heater				
(64)m= 176.18 155.67 164.39 148.62 146.56 132.26 128.27 139.03 138.25	154.05 161.32	172.37	4040.00	1(64)
	ater heater (annual) <sub>1.</sub>	L	1816.98	(64)
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times (65)m = 84.42                                  $	77.06 78.65	+ (59)m 83.15	J	(65)
				(00)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot w	ater is from comi	munity n	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov	Dec		
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep	84.03 84.03	84.03		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	000	000		()
(67)m= 13.78 12.24 9.96 7.54 5.63 4.76 5.14 6.68 8.97	11.39 13.29	14.17		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Tal				, ,
(68)m= 146.4 147.92 144.09 135.94 125.66 115.99 109.53 108.01 111.84	119.99 130.27	139.94		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table				
(69)m= 31.4 31.4 31.4 31.4 31.4 31.4 31.4 31.4	31.4 31.4	31.4		(69)
Pumps and fans gains (Table 5a)				
(70)m= 0 0 0 0 0 0 0 0 0	0 0	0		(70)

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23		(71)
Water heating gains (Table 5)														
(72)m=	113.47	111.76	108.2	103.37	100.23	95.81	92.06	96.87	98.58	103.58	109.23	111.77		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	321.87	320.13	310.46	295.06	279.73	264.77	254.93	259.77	267.59	283.16	301	314.08		(73)
6. Sol	ar gains	S:												
Solar a	aine ara a	salculated i	ucina colo	r flux from	Table 6a	and accor	intod ogun	tions to co	nyort to th	o applicab	lo orientat	ion		

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

		Access Facto Table 6d		Area m²	a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.7	=	4.15	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	x	0.7	=	3.01	(74)
North	0.9x	0.77	X	1.46	X	10.63	x	0.4	X	0.7	=	3.01	(74)
North	0.9x	0.77	X	2.01	x	20.32	x	0.4	x	0.7	=	7.93	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	X	0.7	=	5.76	(74)
North	0.9x	0.77	x	1.46	x	20.32	x	0.4	x	0.7	=	5.76	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.7	=	13.47	(74)
North	0.9x	0.77	x	1.46	x	34.53	X	0.4	x	0.7	=	9.78	(74)
North	0.9x	0.77	X	1.46	X	34.53	X	0.4	X	0.7	=	9.78	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.7	=	21.63	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	1.46	X	55.46	X	0.4	X	0.7	=	15.71	(74)
North	0.9x	0.77	X	2.01	X	74.72	X	0.4	X	0.7	=	29.14	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	1.46	X	74.72	X	0.4	X	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.01	X	79.99	X	0.4	X	0.7	=	31.2	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	1.46	X	79.99	X	0.4	X	0.7	=	22.66	(74)
North	0.9x	0.77	X	2.01	X	74.68	X	0.4	X	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	x	1.46	x	74.68	x	0.4	X	0.7	=	21.16	(74)
North	0.9x	0.77	X	2.01	X	59.25	X	0.4	X	0.7	=	23.11	(74)
North	0.9x	0.77	x	1.46	x	59.25	x	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	x	1.46	x	59.25	X	0.4	x	0.7	=	16.78	(74)
North	0.9x	0.77	X	2.01	X	41.52	X	0.4	X	0.7	=	16.19	(74)
North	0.9x	0.77	X	1.46	X	41.52	X	0.4	X	0.7	=	11.76	(74)
North	0.9x	0.77	X	1.46	x	41.52	x	0.4	x	0.7	=	11.76	(74)
North	0.9x	0.77	X	2.01	X	24.19	x	0.4	X	0.7	=	9.43	(74)
North	0.9x	0.77	x	1.46	x	24.19	x	0.4	x	0.7	=	6.85	(74)
North	0.9x	0.77	X	1.46	x	24.19	x	0.4	X	0.7	=	6.85	(74)

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North	0.9x	0.77	X	2.01	X	13.12	X	0.4	X	0.7	=	5.12	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	1.46	X	13.12	X	0.4	X	0.7	=	3.72	(74)
North	0.9x	0.77	X	2.01	X	8.86	X	0.4	X	0.7	=	3.46	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
North	0.9x	0.77	X	1.46	X	8.86	X	0.4	X	0.7	=	2.51	(74)
East	0.9x	0.77	X	0.99	X	19.64	X	0.4	X	0.7	=	3.77	(76)
East	0.9x	0.77	X	0.99	x	38.42	x	0.4	X	0.7	=	7.38	(76)
East	0.9x	0.77	X	0.99	x	63.27	x	0.4	x	0.7	=	12.15	(76)
East	0.9x	0.77	X	0.99	x	92.28	X	0.4	X	0.7	=	17.73	(76)
East	0.9x	0.77	X	0.99	x	113.09	x	0.4	x	0.7	=	21.73	(76)
East	0.9x	0.77	X	0.99	x	115.77	X	0.4	x	0.7	=	22.24	(76)
East	0.9x	0.77	X	0.99	x	110.22	x	0.4	x	0.7	=	21.17	(76)
East	0.9x	0.77	X	0.99	x	94.68	x	0.4	x	0.7	=	18.19	(76)
East	0.9x	0.77	X	0.99	x	73.59	x	0.4	x	0.7	=	14.14	(76)
East	0.9x	0.77	X	0.99	x	45.59	X	0.4	x	0.7	=	8.76	(76)
East	0.9x	0.77	x	0.99	x	24.49	X	0.4	x	0.7	=	4.7	(76)
East	0.9x	0.77	X	0.99	x	16.15	x	0.4	x	0.7	=	3.1	(76)
South	0.9x	0.77	X	1.1	x	46.75	X	0.4	x	0.7	=	9.98	(78)
South	0.9x	0.77	X	0.19	x	46.75	X	0.4	X	0.7	=	1.72	(78)
South	0.9x	0.77	x	0.32	x	46.75	X	0.4	X	0.7	=	2.9	(78)
South	0.9x	0.77	X	1.1	x	76.57	x	0.4	x	0.7	] =	16.34	(78)
South	0.9x	0.77	x	0.19	x	76.57	x	0.4	x	0.7	=	2.82	(78)
South	0.9x	0.77	X	0.32	x	76.57	x	0.4	x	0.7	] =	4.75	(78)
South	0.9x	0.77	х	1.1	x	97.53	x	0.4	x	0.7	=	20.82	(78)
South	0.9x	0.77	х	0.19	x	97.53	x	0.4	x	0.7	] =	3.6	(78)
South	0.9x	0.77	X	0.32	x	97.53	x	0.4	x	0.7	] =	6.06	(78)
South	0.9x	0.77	X	1.1	x	110.23	x	0.4	x	0.7	] =	23.53	(78)
South	0.9x	0.77	X	0.19	×	110.23	x	0.4	x	0.7	] =	4.06	(78)
South	0.9x	0.77	X	0.32	x	110.23	x	0.4	x	0.7	j =	6.84	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.4	x	0.7	=	24.52	(78)
South	0.9x	0.77	X	0.19	x	114.87	X	0.4	x	0.7	j =	4.24	(78)
South	0.9x	0.77	x	0.32	x	114.87	x	0.4	x	0.7	j =	7.13	(78)
South	0.9x	0.77	X	1.1	x	110.55	x	0.4	x	0.7	j =	23.6	(78)
South	0.9x	0.77	j x	0.19	x	110.55	x	0.4	x	0.7	j =	4.08	(78)
South	0.9x	0.77	j x	0.32	×	110.55	x	0.4	x	0.7	j =	6.86	(78)
South	0.9x	0.77	×	1.1	x	108.01	x	0.4	x	0.7	j =	23.05	(78)
South	0.9x	0.77	×	0.19	x	108.01	x	0.4	x	0.7	i =	3.98	(78)
South	0.9x	0.77	i x	0.32	x	108.01	X	0.4	x	0.7	=	6.71	(78)
South	0.9x	0.77	X	1.1	x	104.89	X	0.4	x	0.7	=	22.39	(78)
South	0.9x	0.77	i x	0.19	x	104.89	X	0.4	X	0.7	=	3.87	(78)
	L		_		1				ı				

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South	0.9x	0.77	X	0.3	32	X	10	04.89	X		0.4	X	0.7		=	6.51	(78)
South	0.9x	0.77	X	1.	1	X	10	01.89	X		0.4	X	0.7		=	21.75	(78)
South	0.9x	0.77	X	0.1	9	X	10	01.89	X		0.4	X	0.7		=	3.76	(78)
South	0.9x	0.77	X	0.3	32	X	10	01.89	X		0.4	X	0.7		=	6.33	(78)
South	0.9x	0.77	X	1.	1	X	8	2.59	x		0.4	x	0.7		=	17.63	(78)
South	0.9x	0.77	X	0.1	9	X	8	2.59	X		0.4	×	0.7		=	3.04	(78)
South	0.9x	0.77	X	0.3	32	X	8	2.59	x		0.4	X	0.7		=	5.13	(78)
South	0.9x	0.77	X	1.	1	X	5	5.42	X		0.4	X	0.7		=	11.83	(78)
South	0.9x	0.77	X	0.1	9	X	5	5.42	X		0.4	x	0.7		=	2.04	(78)
South	0.9x	0.77	X	0.3	32	X	5	5.42	X		0.4	X	0.7		=	3.44	(78)
South	0.9x	0.77	X	1.	1	X		40.4	X		0.4	X	0.7		=	8.62	(78)
South	0.9x	0.77	X	0.1	9	X		40.4	X		0.4	x	0.7		=	1.49	(78)
South	0.9x	0.77	X	0.3	32	X		40.4	X		0.4	X	0.7		=	2.51	(78)
Ť		watts, ca				1			<del>` ´</del>		um(74)m .	<del>`</del>	1			1	(00)
(83)m=	28.55	50.74	75.66	105.22	129.09		33.29	126.35	107	.63	85.68	57.7	34.57	24	.2		(83)
r	1	nternal a				<del>-</del>	-			1	050.07					1	(0.4)
(84)m=	350.42	370.87	386.12	400.28	408.82	3	98.06	381.29	367	7.4	353.27	340.8	6 335.57	338	.29		(84)
		nal temp															_
Temp	erature	during h	neating p	eriods ir	n the liv	ing	area 1	from Tal	ole 9	, Th′	1 (°C)					21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,n	า (s	ee Ta	ble 9a)	_			1		1		1	
	Jan	Feb	Mar	Apr	May	+	Jun	Jul	<del>                                     </del>	ug	Sep	Ос	+	+-	ec		<i>(</i> )
(86)m=	0.95	0.94	0.92	0.89	0.81	(	0.69	0.57	0.0	6	0.76	0.89	0.94	9.0	96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)	ı		1		1	
(87)m=	18.65	18.84	19.21	19.73	20.25	2	0.67	20.86	20.	84	20.53	19.9	1 19.21	18.	62		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Th	n2 (°C)					_	
(88)m=	20.4	20.4	20.4	20.41	20.41	2	0.42	20.42	20.	42	20.42	20.4	1 20.41	20	.4		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)								
(89)m=	0.95	0.94	0.92	0.87	0.79	(	0.66	0.51	0.5	54	0.73	0.87	0.93	0.9	95		(89)
Mean	interna	l temper	ature in	the rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	' in Tabl	e 9c)	-	-		-	
(90)m=	18.17	18.36	18.73	19.25	19.75	Ť	0.15	20.33	20.		20.03	19.4	3 18.74	18.	15		(90)
		l		l		-					f	LA = Li	ving area ÷	(4) =		0.48	(91)
Mean	interna	l temper	atura (fo	r the wh	ole dwe	llin	a) – fl	Δ <b>~</b> T1	<b></b> /1	_ fl	Δ) <b>~</b> T2						
(92)m=	18.41	18.6	18.96	19.48	19.99	$\overline{}$	9) – 11 20.4	20.59	20.	$\neg$	20.28	19.6	18.97	18.	38	1	(92)
L		nent to t		l				<u> </u>	L							]	
(93)m=	18.41	18.6	18.96	19.48	19.99	1	20.4	20.59	20.		20.28	19.6	1	18.	38	]	(93)
8. Spa	ace hea	ting requ	uirement											·			
		mean int				ned	at ste	ep 11 of	Tabl	le 9b	, so tha	t Ti,m	=(76)m a	nd re-	cal	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oc	t Nov	D	ес	]	
Utilisa	tion fac	tor for g	ains, hm	1:													
(94)m=	0.93	0.92	0.9	0.85	0.78	(	0.66	0.53	0.5	56	0.73	0.86	0.91	0.9	94		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (8	4)m											1	
(95)m=	327.36	341.91	347.12	342.1	318.32	20	61.55	200.69	204	1.7	256.59	291.6	3 306.82	317	.64		(95)

Monthly average external temperature from Table 8			
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]			
(97)m= 843.55 816.81 741.31 621.24 485.29 335.02 230.11 239.71 358.52 530.31 698.2	9 838.89		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	<u> </u>		
(98)m= 384.05 319.13 293.27 200.98 124.23 0 0 0 0 177.57 281.8		0400.04	7(00)
Total per year (kWh/year) = Sun	(98) <sub>15,912</sub> =	2168.91	(98)
Space heating requirement in kWh/m²/year		43.66	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)			
Space heating: Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$		1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		1	(204)
Efficiency of main space heating system 1		100	(206)
Efficiency of secondary/supplementary heating system, %	·	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	/ Dec	kWh/ye	 ear
Space heating requirement (calculated above)			
384.05         319.13         293.27         200.98         124.23         0         0         0         0         177.57         281.8	387.81		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	1		(211)
384.05 319.13 293.27 200.98 124.23 0 0 0 0 177.57 281.8			7(0.4)
Total (kWh/year) =Sum(211) <sub>15,10</sub>	12	2168.91	(211)
Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)]\} \times 100 \div (208)$			
(215)m =	0		
Total (kWh/year) =Sum(215) <sub>15,10</sub>	12=	0	(215)
Water heating	•		_
Water heating from separate community system:  Annual water heating requirement		1816.98	(64)
Fraction of heat from community CHP			(303a)
·		1	(305)
Factor for charging method for community water heating  Distribution loss factor (Table 13c) for community heating system		1 .05	╡`
Distribution loss factor (Table 12c) for community heating system  Water heat from CLID. (2022) v (2025) v (2027)		1.05	(306)
Water heat from CHP (64) x (303a) x (305) x (30	<i>'</i>	1907.83	(310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)		19.08	(313)
Annual totals  Space heating fuel used, main system 1	ar 	2168.91	<u>r</u>
Electricity for pumps, fans and electric keep-hot		2100.01	
mechanical ventilation - balanced, extract or positive input from outside	215		(230a)
Total electricity for the above, kWh/year sum of (230a)(230g) =	215		(200a)
TOTAL ETECHTICATOR THE ADDIVE KVVII/VEAL SUIT OF (2504)(2504) =		045	(224)
Electricity for lighting		215  243.4	(231)

Electricity generated by PVs			-1251.11 (233)
12a. CO2 emissions – Individual heating system	ns including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	1125.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating from community system			
	Energ kWh/y	•	Emissions kg CO2/year
CO2 from other sources of space and water hea Efficiency of heat source 1 (%)		peat (363) to (366) for the second fu	el 329 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100	÷ (367b) x 0.52	= 300.96 (367)
Electrical energy for heat distribution	[(313) x	0.52	9.9 (372)
Total CO2 associated with community systems	(363)(366)	+ (368)(372)	= 310.86 (373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	111.59 (267)
Electricity for lighting	(232) x	0.519 =	126.33 (268)
Energy saving/generation technologies Item 1		0.519 =	-649.33 (269)
Total CO2, kg/year		sum of (265)(271) =	1025.11 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	20.63 (273)

El rating (section 14)

		User De	etails:						
Assessor Name:	Adam Ritchie			a Num	her:		STRO	019516	
Software Name:	Stroma FSAP 2012			are Vei				n: 1.0.4.25	
		Property A	Address	Flat Ty	pe E - A	SHP + F	Pγ		
Address :									
1. Overall dwelling dime	ensions:	-							
Ground floor		Area	<del>`                                    </del>	(10) v		ight(m)	(2a) =	Volume(m³	<u>^</u>
	\			(1a) x	3	.09	(2a) =	153.51	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 49	9.68	(4)					_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	153.51	(5)
2. Ventilation rate:	main accorde		-4h-au		40401			m3 man hav	-
	main seconda heating heating	iry (	other		total		•	m³ per hou	r 
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0	X :	20 =	0	(6b)
Number of intermittent fa	ns				2	X	10 =	20	(7a)
Number of passive vents				Ē	0	×	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x -	40 =	0	(7c)
				_				_	
							Air ch	anges per ho	our
·	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$				20		÷ (5) =	0.13	(8)
If a pressurisation test has be Number of storeys in the	peen carried out or is intended, proce	ed to (17), o	therwise o	continue fr	om (9) to	(16)	İ		(9)
Additional infiltration	ne awening (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 for	masonr	y constr	uction	• ( )	•	0	(11)
	resent, use the value corresponding	to the greate	er wall are	a (after			!		
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or (	) 1 (seale	d) else	enter 0			1	0	(12)
If no draught lobby, en	,	7.1 (OOGIO	a), 0.00	ontor o				0	(13)
• ,	s and doors draught stripped							0	(14)
Window infiltration	<b>.</b>	(	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate		(	(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	ur per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] +$	(8), otherwis	se (18) = (	16)				0.38	(18)
	es if a pressurisation test has been do	one or a degi	ree air pe	rmeability	is being u	sed	Ī		_
Number of sides sheltere Shelter factor	<b>2</b> d	(	(20) = 1 -	[0.0 <b>75</b> x (1	9) <u> </u>  =			0	(19) (20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)		-/1			0.38	(21)
Infiltration rate modified f	_	`	( ) ( -,	( - /				0.36	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 (00-) (01	2) m · 4	· •				-		•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	]	
(ΔΔα)ΠΙ- 1.Δ1 1.Δ0	1.20 1.1 1.00 0.95	0.90	0.32	'	1.00	1.12	1.10	I	

Adjusted infiltration rate (allowing for s	helter and wind s	speed) = (21a) x	(22a)m				
0.48 0.48 0.47 0.42	0.41 0.36	0.36 0.35	0.38 0.41	0.43	0.45		
Calculate effective air change rate for If mechanical ventilation:	the applicable ca	ise				•	(23a)
If exhaust air heat pump using Appendix N, (	23h) = (23a) x Fmy (6	equation (N5)) othe	nwise (23h) = (23a)			0	
If balanced with heat recovery: efficiency in 9						0	(23b)
a) If balanced mechanical ventilation	-			(23h) <b>v</b> [1	   _ (23c)	0 ÷ 1001	(23c)
(24a)m= 0 0 0 0	0 0		0 0	0	0	- 100]	(24a)
b) If balanced mechanical ventilation	without heat red	covery (MV) (24h	$\frac{1}{1} = \frac{1}{(22b)m} + \frac{1}{(22b)m}$	(23b)			, ,
(24b)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24b)
c) If whole house extract ventilation	or positive input	ventilation from (	outside	1	<u> </u>		
if (22b)m < 0.5 x (23b), then (24	•			b)			
(24c)m= 0 0 0 0	0 0	0 0	0 0	0	0		(24c)
d) If natural ventilation or whole hou if (22b)m = 1, then (24d)m = (22							
(24d)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(24d)
Effective air change rate - enter (24a	a) or (24b) or (24	c) or (24d) in box	x (25)	•			
(25)m= 0.62 0.61 0.61 0.59	0.58 0.57	0.57 0.56	0.57 0.58	0.59	0.6		(25)
3. Heat losses and heat loss parameter	ter:						
ELEMENT Gross Openii		rea U-val	ue AXL	J	k-value	)	ΑΧk
area (m²) r	n <sup>2</sup> A ,r	m² W/m²	2K (W	/K)	kJ/m²-ł	<	kJ/K
Doors Type 1	2.13	x 1	= 2.13				(26)
Doors Type 1 Doors Type 2	0.7	x 1 x 1	= 2.13				(26) (26)
• •		x 1					. ,
Doors Type 2	0.7	x 1	= 0.7				(26)
Doors Type 2 Doors Type 3	0.7	x 1 x 1	= 0.7				(26) (26)
Doors Type 2 Doors Type 3 Doors Type 4	0.7 0.96 0.7	x 1 x 1 x 1 x 1	= 0.7 = 0.96 = 0.7 = 0.7				(26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1	0.7 0.96 0.7 0.7	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	= 0.7 $= 0.96$ $= 0.7$ $= 0.7$ $-0.04] = 1.41$ $-0.04] = 0.24$				(26) (26) (26) (26) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2	0.7 0.96 0.7 0.7 1.06	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3	0.7 0.96 0.7 0.7 1.06 0.18	x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	0.7 0.96 0.7 0.7 1.06 0.18 1.93	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	0.7 0.96 0.7 1.06 0.18 1.93 1.4	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 5 Windows Type 6 Windows Type 7	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0	0.7 0.96 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/(1.4)+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81	x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ = 0.7 = 0.96 = 0.7 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 1.05				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)	
Doors Type 2 Doors Type 3 Doors Type 4 Doors Type 5 Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Walls Type 1 12.36 4.3 Walls Type 2 5.87 0 Walls Type 3 5.84 0 Walls Type 4 2.81 0	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 0.41 = 1.44 = 1.06 = 0.51				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Type 2         Doors Type 3         Doors Type 4         Doors Type 5         Windows Type 1         Windows Type 2         Windows Type 3         Windows Type 4         Windows Type 5         Windows Type 6         Windows Type 7         Walls Type1       12.36         Walls Type2       5.87         Walls Type3       5.84         Walls Type4       2.81         Walls Type5       8.5	0.7 0.96 0.7 0.7 1.06 0.18 1.93 1.4 1.4 0.95 0.31 8 7.98 5.87 5.84 2.81 3 5.87	x 1 x 1 x 1 x 1 x 1 x 1 x 1/[1/(1.4)+ x1/[1/(1.4)+ x1/[1/	= 0.7 = 0.96 = 0.7 = 0.7 = 0.7 - 0.04] = 1.41 - 0.04] = 2.56 - 0.04] = 1.86 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.26 - 0.04] = 1.44 = 1.06 = 1.05 = 0.51 = 1.06				(26) (26) (26) (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

Walls Type8 (29)19.47 17.56 1.91 0.18 3.16 Roof (30)49.68 0 49.68 0.13 6.46 Total area of elements, m<sup>2</sup> 123.07 (31)\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ (33)Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)447.12 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium 250 (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)6.15 if details of thermal bridging are not known (36) =  $0.05 \times (31)$ Total fabric heat loss (33) + (36) =(37)38.36 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar May Jul Sep Oct Nov Dec Apr Jun Aug (38)m =31.28 31.05 30.83 29.76 29.56 28.64 28.64 28.46 28.99 29.56 29.97 30.39 (38)(39)m = (37) + (38)m Heat transfer coefficient, W/K (39)m =69.65 69.41 69.19 68.12 67.92 67 67 66.82 67.35 67.92 68.33 68.75 (39)Average =  $Sum(39)_{1...12}/12=$ 68.12 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.35 1.37 1.35 1.35 (40)m =1.4 1.39 1.37 1.36 1.37 1.38 1.38 (40)Average =  $Sum(40)_{1...12}/12=$ 1.37 Number of days in month (Table 1a) Feb Oct Jan Mar Sep Apr May Jun Jul Aug Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement: kWh/year: Assumed occupancy, N (42)1.68 if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 (43)74.12 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar May Aug Sep Oct Nov Dec Apr Jun Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =81.53 78.56 75.6 72.63 69.67 66.7 69.67 72.63 75.6 78.56 81.53 (44)889.39 Total =  $Sum(44)_{1/12}$  = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 120.9 105.74 109.12 95.13 91.28 78.77 72.99 83.76 84.76 107.82 (45)m =98.78 117.09 1166.14 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 18.14 15.86 16.37 14.27 13.69 11.82 10.95 12.56 12.71 14.82 16.17 17.56 (46)(46)m =Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:				
a) If manufacturer's declared loss factor is known (kWh/day):		1.39		(48)
Temperature factor from Table 2b		0.54		(49)
Energy lost from water storage, kWh/year	$(48) \times (49) =$	0.75		(50)
b) If manufacturer's declared cylinder loss factor is not known	1:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0		(51)
If community heating see section 4.3  Volume factor from Table 2a		0		(52)
Temperature factor from Table 2b		0		(52)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0		(54)
Enter (50) or (54) in (55)	(11)11(01)11(02)11(00)	0.75		(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$			, ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where	H11) is from Append	l ix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33	23.33 22.58 23.33	22.58 23.33		(57)
Primary circuit loss (annual) from Table 3	•	0		(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div$	365 × (41)m		l	
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder thermo	ostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26		(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4	1)m			
(61)m= 0 0 0 0 0 0	0 0 0	0 0		(61)
Total heat required for water heating calculated for each mon	$h (62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m	
(62)m= 167.5 147.83 155.71 140.22 137.88 123.86 119.5	9 130.35 129.85 145.37	152.91 163.68		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar contribut	ion to water heating)	•	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)			
(63)m= 0 0 0 0 0 0	0 0 0	0 0		(63)
Output from water heater				
(64)m= 167.5 147.83 155.71 140.22 137.88 123.86 119.5	9 130.35 129.85 145.37	152.91 163.68		
	Output from water heate	r (annual) <sub>112</sub>	1714.75	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	]	
(65)m= 77.48 68.83 73.56 67.7 67.63 62.26 61.55	65.13 64.26 70.12	71.92 76.21		(65)
include (57)m in calculation of (65)m only if cylinder is in the	e dwelling or hot water is f	rom community h	eating	
5. Internal gains (see Table 5 and 5a):				
Metabolic gains (Table 5), Watts				
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
(66)m= 84.03 84.03 84.03 84.03 84.03 84.03 84.03	84.03 84.03 84.03	84.03 84.03		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5			
(67)m= 13.89 12.33 10.03 7.59 5.68 4.79 5.18	6.73 9.03 11.47	13.39 14.27		(67)
Appliances gains (calculated in Appendix L, equation L13 or L	.13a), also see Table 5		1	
(68)m= 146.4 147.92 144.09 135.94 125.66 115.99 109.5	3 108.01 111.84 119.99	130.27 139.94		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5		ı	
(00) -   044   044   044   044   044   044				
(69)m= 31.4 31.4 31.4 31.4 31.4 31.4 31.4 31.4	31.4 31.4 31.4	31.4 31.4		(69)
Pumps and fans gains (Table 5a)  (70)m= 3 3 3 3 3 3 3 3 3 3	31.4 31.4 31.4	31.4 31.4		(69)

Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)							
(71)m=	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	-67.23	(71)
Water	heating	gains (T	able 5)										
(72)m=	104.13	102.42	98.87	94.03	90.9	86.48	82.72	87.53	89.24	94.25	99.9	102.43	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m	
(73)m=	315.63	313.89	304.2	288.78	273.44	258.47	248.64	253.48	261.32	276.91	294.77	307.86	(73)
6. Sol	ar gains	S:											
0-1					T-11-0-			C					

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation

_		calculated using Access Facto Table 6d		Area m²	a and	Flux Table 6a	illoris	g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.93	x	10.63	x	0.63	x	0.7	=	6.27	(74)
North	0.9x	0.77	х	1.4	x	10.63	x	0.63	x	0.7	] =	4.55	(74)
North	0.9x	0.77	х	1.4	x	10.63	x	0.63	x	0.7	] =	4.55	(74)
North	0.9x	0.77	х	1.93	x	20.32	x	0.63	x	0.7	] =	11.99	(74)
North	0.9x	0.77	x	1.4	x	20.32	х	0.63	x	0.7	] <b>=</b>	8.69	(74)
North	0.9x	0.77	X	1.4	X	20.32	x	0.63	x	0.7	=	8.69	(74)
North	0.9x	0.77	X	1.93	X	34.53	x	0.63	x	0.7	=	20.37	(74)
North	0.9x	0.77	x	1.4	x	34.53	x	0.63	x	0.7	=	14.77	(74)
North	0.9x	0.77	x	1.4	x	34.53	x	0.63	x	0.7	=	14.77	(74)
North	0.9x	0.77	x	1.93	x	55.46	x	0.63	x	0.7	=	32.71	(74)
North	0.9x	0.77	x	1.4	x	55.46	x	0.63	x	0.7	=	23.73	(74)
North	0.9x	0.77	x	1.4	x	55.46	x	0.63	x	0.7	=	23.73	(74)
North	0.9x	0.77	x	1.93	x	74.72	x	0.63	x	0.7	] =	44.07	(74)
North	0.9x	0.77	X	1.4	X	74.72	x	0.63	X	0.7	=	31.97	(74)
North	0.9x	0.77	X	1.4	X	74.72	x	0.63	X	0.7	=	31.97	(74)
North	0.9x	0.77	X	1.93	X	79.99	x	0.63	X	0.7	=	47.18	(74)
North	0.9x	0.77	X	1.4	X	79.99	X	0.63	X	0.7	=	34.22	(74)
North	0.9x	0.77	X	1.4	X	79.99	x	0.63	x	0.7	=	34.22	(74)
North	0.9x	0.77	X	1.93	X	74.68	X	0.63	X	0.7	=	44.05	(74)
North	0.9x	0.77	X	1.4	X	74.68	X	0.63	X	0.7	=	31.95	(74)
North	0.9x	0.77	x	1.4	x	74.68	x	0.63	x	0.7	=	31.95	(74)
North	0.9x	0.77	X	1.93	X	59.25	x	0.63	X	0.7	=	34.95	(74)
North	0.9x	0.77	x	1.4	x	59.25	X	0.63	x	0.7	=	25.35	(74)
North	0.9x	0.77	x	1.4	x	59.25	X	0.63	X	0.7	=	25.35	(74)
North	0.9x	0.77	X	1.93	X	41.52	X	0.63	X	0.7	=	24.49	(74)
North	0.9x	0.77	X	1.4	X	41.52	X	0.63	x	0.7	=	17.76	(74)
North	0.9x	0.77	X	1.4	X	41.52	x	0.63	x	0.7	=	17.76	(74)
North	0.9x	0.77	X	1.93	X	24.19	x	0.63	x	0.7	=	14.27	(74)
North	0.9x	0.77	x	1.4	x	24.19	x	0.63	x	0.7	=	10.35	(74)
North	0.9x	0.77	X	1.4	X	24.19	x	0.63	x	0.7	=	10.35	(74)

North	0.9x	0.77	1 ,	1.00	l .,	40.40	1 ,	0.00	١ ,,	0.7	1 _	774	(74)
North	-	0.77	] X ]	1.93	X I	13.12	X	0.63	X	0.7	] = ]	7.74	╡゛
North	0.9x	0.77	] X ]	1.4	l X	13.12	X	0.63	X	0.7	] = ]	5.61	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	]	1.4	l x	13.12	l x	0.63	X	0.7	] = 1 _	5.61	
North	<u> </u>	0.77	] X ]	1.93	l x l	8.86	X	0.63	X	0.7	] = ]	5.23	$= \frac{1}{74}$
North	0.9x 0.9x	0.77	] X ] ,,	1.4	l x	8.86	X	0.63	X	0.7	] = ] _	3.79	$= \frac{1}{1} \frac{(74)}{(74)}$
East	0.9x	0.77	] X ] <sub>v</sub>	1.4	l x	8.86	X	0.63	X	0.7	] = ] <sub>=</sub>	3.79	$\frac{1}{2}$ (74) (76)
East	0.9x	0.77	]	0.95	X	19.64	l x	0.63	X	0.7	] 1	5.7	(76) (76)
East	0.9x C	0.77	]	0.95	x x	38.42	x x	0.63	X	0.7	=	11.15	(76) (76)
East	0.9x	0.77	] x ] x	0.95	^   x	63.27 92.28	] ^   ] <sub>x</sub>	0.63	x	0.7	]	26.79	] <sub>(76)</sub>
East	0.9x	0.77	」^ ] ×	0.95	^   x	113.09	] ^ ] <sub>x</sub>	0.63	X	0.7	] =	32.83	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	115.77	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	33.61	(76)
East	0.9x	0.77	」^ ] ×	0.95	^   x	110.22	] ^ ] <sub>x</sub>	0.63	X	0.7	]	32	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	94.68	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	27.49	(76)
East	0.9x	0.77	] ^ ] x	0.95	^   x	73.59	] ^ ] <sub>x</sub>	0.63	X	0.7	] - ] =	21.37	(76)
East	0.9x	0.77	」 ^ ] <sub>×</sub>	0.95	l ^ l x	45.59	] ^ ] <sub>x</sub>	0.63	X	0.7	]	13.24	(76)
East	0.9x	0.77	] ^ ] <sub>x</sub>	0.95	l ^	24.49	] ^ ] <sub>x</sub>	0.63	X	0.7	]	7.11	(76)
East	0.9x	0.77	」 ^ ] x	0.95	l ^ l x	16.15	] ^ ] <sub>x</sub>	0.63	X	0.7	]	4.69	(76)
South	0.9x	0.77	]	1.06	l ^	46.75	]	0.63	X	0.7	]	15.15	(78)
South	0.9x	0.77	]	0.18	l ^	46.75	]	0.63	X	0.7	]	2.57	(78)
South	0.9x	0.77	]	0.31	l x	46.75	)	0.63	x	0.7	] ] =	4.43	(78)
South	0.9x	0.77	] x	1.06	x	76.57	) x	0.63	x	0.7	] ] <sub>=</sub>	24.8	(78)
South	0.9x	0.77	] x	0.18	X	76.57	X	0.63	x	0.7	] ] <sub>=</sub>	4.21	(78)
South	0.9x	0.77	] ]	0.31	l X	76.57	] ]	0.63	X	0.7	] ]	7.25	(78)
South	0.9x	0.77	] ]	1.06	X	97.53	)   X	0.63	X	0.7	] ] =	31.6	(78)
South	0.9x	0.77	X	0.18	X	97.53	X	0.63	X	0.7	]   =	5.37	(78)
South	0.9x	0.77	X	0.31	X	97.53	X	0.63	x	0.7	j   =	9.24	(78)
South	0.9x	0.77	X	1.06	х	110.23	X	0.63	X	0.7	=	35.71	(78)
South	0.9x	0.77	X	0.18	x	110.23	X	0.63	X	0.7	=	6.06	(78)
South	0.9x	0.77	X	0.31	x	110.23	x	0.63	x	0.7	j =	10.44	(78)
South	0.9x	0.77	j×	1.06	x	114.87	x	0.63	x	0.7	j =	37.21	(78)
South	0.9x	0.77	x	0.18	x	114.87	X	0.63	x	0.7	=	6.32	(78)
South	0.9x	0.77	x	0.31	x	114.87	x	0.63	x	0.7	] =	10.88	(78)
South	0.9x	0.77	X	1.06	x	110.55	x	0.63	x	0.7	j =	35.81	(78)
South	0.9x	0.77	x	0.18	x	110.55	x	0.63	x	0.7	] =	6.08	(78)
South	0.9x	0.77	x	0.31	x	110.55	x	0.63	x	0.7	] =	10.47	(78)
South	0.9x	0.77	x	1.06	x	108.01	x	0.63	x	0.7	] =	34.99	(78)
South	0.9x	0.77	×	0.18	x	108.01	x	0.63	x	0.7	] =	5.94	(78)
South	0.9x	0.77	x	0.31	x	108.01	x	0.63	x	0.7	] =	10.23	(78)
South	0.9x	0.77	X	1.06	x	104.89	x	0.63	x	0.7	<b>=</b>	33.98	(78)
South	0.9x	0.77	×	0.18	x	104.89	x	0.63	X	0.7	] =	5.77	(78)

South	0.9x	0.77	×	0.3	31	x	10	04.89	x	0.63		x	0.7	=	9.94	(78)
South	0.9x	0.77	X	1.0	)6	X	10	01.89	x	0.63		x	0.7	=	33.01	(78)
South	0.9x	0.77	X	0.1	18	X	10	01.89	x	0.63		x	0.7	=	5.6	(78)
South	0.9x	0.77	X	0.3	31	X	10	01.89	x	0.63		x	0.7	=	9.65	(78)
South	0.9x	0.77	X	1.0	)6	X	8	2.59	x	0.63		x	0.7	=	26.75	(78)
South	0.9x	0.77	X	0.1	18	х	8	2.59	x	0.63		x	0.7	=	4.54	(78)
South	0.9x	0.77	X	0.3	31	x	8	2.59	x	0.63		x	0.7	=	7.82	(78)
South	0.9x	0.77	X	1.0	06	х	5	5.42	x	0.63		x	0.7	=	17.95	(78)
South	0.9x	0.77	X	0.1	18	x	5	5.42	x	0.63		x	0.7	=	3.05	(78)
South	0.9x	0.77	X	0.3	31	X	5	5.42	x	0.63		x	0.7	=	5.25	(78)
South	0.9x	0.77	X	1.0	)6	X	4	10.4	x	0.63		x	0.7	=	13.09	(78)
South	0.9x	0.77	X	0.1	18	x	4	40.4	x	0.63		x	0.7	=	2.22	(78)
South	0.9x	0.77	X	0.3	31	x	4	40.4	x	0.63		x	0.7	=	3.83	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	= Sum(74)	)m(8	32)m			-	
(83)m=	43.22	76.8	114.49	159.19	195.25	2	01.6	191.11	162.8	32 129.	64 8	37.32	52.32	36.64		(83)
Total g				r (84)m =	<del>`</del>	Ť							1	·	1	
(84)m=	358.85	390.69	418.69	447.97	468.69	46	60.07	439.75	416.	3 390.	97 3	64.24	347.09	344.49		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	n)										
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	area 1	from Tal	ole 9,	Th1 (°C	)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	ı (se	ee Ta	ble 9a)					,		•	
	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	ig Se	р	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.97	0.91	C	).79	0.63	0.68	3 0.88	В (	0.97	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	in Ta	able 9c)					_	
(87)m=	19.54	19.68	19.93	20.29	20.63	2	0.88	20.97	20.9	5 20.7	'8 2	20.36	19.9	19.53		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9	, Th2 (°0	C)					
(88)m=	19.76	19.77	19.77	19.79	19.79	1	19.8	19.8	19.8	1 19.8	B 1	9.79	19.78	19.78	]	(88)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina.	h2.	m (se	e Table	9a)						-	
(89)m=	0.99	0.99	0.98	0.95	0.87	T	0.69	0.48	0.53	3 0.8	1 (	0.96	0.99	1		(89)
Mean	interna	l temner	ature in	the rest	of dwell	ina	T2 (f	allow ste	ns 3	to 7 in T	ahle (	3c)		ı		
(90)m=	17.86	18.06	18.42	18.95	19.41	Ť	9.72	19.79	19.7		$\neg$	9.06	18.39	17.84	]	(90)
` ´ I			<u> </u>	<u> </u>	<u> </u>				<u> </u>		fLA	= Livir	ng area ÷ (₄	1 4) =	0.48	(91)
Maaa	:	1 40 000 0 0 0	otivo /fo	ماند مماند	مريدام مام	، ما:ال	~\ fI	ΛΤ4	. /4	£I ^\	TO					
(92)m=	18.67	18.84	19.15	r the wh	20	<del> </del>	g) = 11 0.28	20.36	20.3	<del></del>	1	9.69	19.12	18.66	1	(92)
			l	interna		1							10.12	10.00		(02)
(93)m=	18.67	18.84	19.15	19.6	20	1	0.28	20.36	20.3		<del>i i</del>	9.69	19.12	18.66	]	(93)
	ace hea	ting requ	uirement													
					re obtaii	ned	at ste	ep 11 of	Table	9b, so	that T	ï,m=(	76)m an	d re-cal	culate	
the ut		1		using Ta						-			1	1	1	
,	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	ig Se	p	Oct	Nov	Dec	]	
I			ains, hm	ı —	0.00	T -	. 70	0.55		1 000	<u>, I .</u>	0.00	0.00	0.00	1	(04)
(94)m=	0.99	0.99	0.98	0.95	0.88	Γ.	).73	0.55	0.6	0.83	3 (	0.96	0.99	0.99	J	(94)
usetu	ıl gains,	HILLIGAM)	vv = 194	4 IIII X (X	41111											
(95)m=	356.05	385.99	409.51	425.83	412.95	33	36.44	242.32	250.0	07 325.	92 3	48.55	342.38	342.24	1	(95)

Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]
(97)m= 1000.99 967.82 875.5 728.75 563.95 380.5 251.88 264.02 409.44 617.23 821.39 993.99 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
(98)m= 479.83 390.99 346.69 218.1 112.34 0 0 0 199.9 344.89 484.91
Total per year (kWh/year) = Sum(98) <sub>15912</sub> = $2577.65$ (98) Space heating requirement in kWh/m²/year $51.89$ (99)
9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:
Fraction of space heat from secondary/supplementary system 0 (201
Fraction of space heat from main system(s) $ (202) = 1 - (201) =                                   $
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 $(204)$
Efficiency of main space heating system 1
Efficiency of secondary/supplementary heating system, %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
479.83 390.99 346.69 218.1 112.34 0 0 0 199.9 344.89 484.91
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (212) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (213) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (214) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (215) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (216) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (217) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 $ $ ($
Total (kWh/year) = Sum(211) <sub>15,1012</sub> 2756.84 (211
Space heating fuel (secondary), kWh/month
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0
Total (kWh/year) =Sum(215) <sub>15,1012</sub> = 0 (215)
Water heating
Water heating from separate community system:  Annual water heating requirement  1714.75 (64)
Annual totals kWh/year kWh/year
Space heating fuel used, main system 1 2756.84
Water heating fuel used 2030.49
Electricity for pumps, fans and electric keep-hot
central heating pump: 30 (230
boiler with a fan-assisted flue
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231
Electricity for lighting
12a. CO2 emissions – Individual heating systems including micro-CHP
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year
Space heating (main system 1) (211) x 0.216 = 595.48 (261

Space heating (secondary)	(215) x	0.519	= [	0	(263)
Water heating	(219) x	0.216	= [	438.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1034.06	(265)
Water heating from community system					
	Energy kWh/year	Emission fa kg CO2/kW		Emissions kg CO2/year	
Electrical energy for heat distribution	[(313) x	0	=	0	(372)
Total CO2 associated with community systems	(363)(366) + (368	3)(372)	=	0	(373)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	= [	127.27	(268)
Total CO2, kg/year	sum o	of (265)(271) =		1200.26	(272)

TER =

(273)

35.61

# **BRUKL** Output Document



Compliance with England Building Regulations Part L 2013

### Project name

CR As designed

Date: Mon May 11 17:19:28 2020

### Administrative information

### **Building Details**

Address: ,

### Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.0 Interface to calculation engine: iSBEM

Interface to calculation engine version: v5.6.a

BRUKL compliance check version: v5.6.a.0

#### Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user Address: Information not provided by the user, Information not provided by the user, Information not provided

by the user

### Certifier details

Name: Ritche+Daffin

Telephone number: +44 (0)20 70433417

Address: 49-50 Eagle Wharf Road, London, N1 7ED

### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.2
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.2
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	27.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

### Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.13	0.13	Z1 Office/e
Floor	0.25	0.09	0.1	Z4 Garden Room/f
Roof	0.25	0.1	0.1	Z4 Garden Room/c.1
Windows***, roof windows, and rooflights	2.2	1.2	1.2	Z1 Office/e/g
Personnel doors	2.2	0.61	1	Bin Store Door
Vehicle access & similar large doors	1.5	9 <b>4</b> 5	: ::=:	"No external vehicle access doors"
High usage entrance doors	3.5	-		"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m²K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	2.5

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

### 1- Elec Htg & Nat vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	1	-	-	-	(III)
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	n YES

### 1- Default HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.56	0.015
Standard value	2*	N/A

### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]						UD.	UD efficiency				
	ID of system type	Α	В	С	C D	D E	E F	F G	G H	H I	пке	HR efficiency	
8	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
Z2 WC		1.5	-	-	Joseph Company			30	1.50	( <del>15</del> )		N/A	
Z6L Staff WC		3)	-	-	1.5	-		3)			0.75	0.5	

General lighting and display lighting	Lumino	ous effic	acy [lm/W]	Ī
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Z7L Furniture Store	90	521	<b>22</b> ((	20
Z8L Plantrooms	90	221 221	<b>=</b> 0	84
Z9L Cleaners	r=:	90	<b>=</b> 3	23
Z1 Office	90	-	:=3	136
Z2 WC	); <del>-</del>	90	-0	9
Z3 Entrance	p=:	90	15	71
Z4 Garden Room	, s. <del>-</del> 1	90	15	60
Z5L Staff Room	90	, 15 <del>5</del> 11	=3	186
Z6L Staff WC	(A <del>7</del> 4)	90	=0	27

General lighting and display lighting	Lumino	us effic	acy [lm/W]	2
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Z10L Corridor	8570	90	<b></b>	65

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Z1 Office	NO (-69.6%)	NO
Z3 Entrance	NO (-80.9%)	NO
Z4 Garden Room	YES (+15.7%)	NO
Z5L Staff Room	NO (-83%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

## EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

## Technical Data Sheet (Actual vs. Notional Building)

### **Building Global Parameters**

	Actual	Notional
Area [m²]	194.3	194.3
External area [m²]	519	519
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	111.66	238.06
Average U-value [W/m²K]	0.22	0.46
Alpha value* [%]	44.17	19.02

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

### **Building Use**

### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

#### 100 **B1 Offices and Workshop businesses**

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

## Energy Consumption by End Use [kWh/m²]

	Actual	Notional 35.16	
Heating	17.98		
Cooling	0	0	
Auxiliary	2.12	0.95	
Lighting	16.24	12.47	
Hot water	18.03	24.15	
Equipment*	41.16	41.16	
TOTAL**	54.36	72.72	

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

## Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

## Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	163.29	207.03
Primary energy* [kWh/m²]	162.73	151.11
Total emissions [kg/m²]	27.5	30.2

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[S	T] No Heatin	g or Coolin	g				W-		7-	
	Actual	40.8	1.8	0	0	0	0	0	0	0
	Notional	65.2	1.1	0	0	0	0	0		
[S	T] Central h	eating using	water: flo	or heating,	[HS] Direct	or storage	electric he	eater, [HFT]	Electricity,	[CFT] Elect
	Actual	88.8	130.2	26.3	0	3.1	0.94	0	1	0
	Notional	151.5	120.4	51.4	0	1.4	0.82	0		

### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

# **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

### **Building fabric**

Element	<b>U</b> i₋Typ	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.12	Z10L Corridor/su
Floor	0.2	0.09	Z1 Office/f
Roof	0.15	0.1	Z4 Garden Room/c.1
Windows, roof windows, and rooflights	1.5	1.2	Z1 Office/e/g
Personnel doors	1.5	0.4	Lobby Door to Courtyard
Vehicle access & similar large doors	1.5	J.	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m²h	()]		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m²K)]

<sup>\*</sup> There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	2.5

# **BRUKL** Output Document



Compliance with England Building Regulations Part L 2013

### Project name

CR As designed

Date: Mon May 11 17:50:56 2020

### Administrative information

### **Building Details**

Address: ,

### **Certification tool**

Calculation engine: SBEM

Calculation engine version: v5.6.a.0 Interface to calculation engine: iSBEM

Interface to calculation engine version: v5.6.a

BRUKL compliance check version: v5.6.a.0

#### Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided

by the user

### Certifier details

Name: Ritche+Daffin

Telephone number: +44 (0)20 70433417

Address: 49-50 Eagle Wharf Road, London, N1 7ED

### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.2
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	30.2
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	22.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

# Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.13	0.13	Z1 Office/e
Floor	0.25	0.09	0.1	Z4 Garden Room/f
Roof	0.25	0.1	0.1	Z4 Garden Room/c.1
Windows***, roof windows, and rooflights	2.2	1.2	1.2	Z1 Office/e/g
Personnel doors	2.2	0.61	1	Bin Store Door
Vehicle access & similar large doors	1.5	9 <b>4</b> 3	3 <del>4</del>	"No external vehicle access doors"
High usage entrance doors	3.5	::	10 <del>-1</del> 1	"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m²K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	2.5

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

### 1- Elec Htg & Nat vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	1	-	-	-	(III)
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	n YES

### 1- Default HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.56	0.015
Standard value	2*	N/A

### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name			SFP [W/(I/s)]								UD.	HR efficiency	
	ID of system type	Α	В	С	D	E	F	G	Н	l.	пке	riiciency	
8	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
Z2 WC		1.5	-	-	Joseph Company			30	1 <del>5</del> 5	( <del>15</del> )		N/A	
Z6L Staff WC		3)	-	-	1.5	-		3)			0.75	0.5	

General lighting and display lighting	Lumino	ous effic	acy [lm/W]	Ī	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]	
Standard value	60	60	22		
Z7L Furniture Store	90	521	<b>22</b> ((	20	
Z8L Plantrooms	90	221 221	<b>=</b> 0	84	
Z9L Cleaners	r=:	90	<b>=</b> 3	23	
Z1 Office	90	-	:=3	136	
Z2 WC	); <del>-</del>	90	-0	9	
Z3 Entrance	p=:	90	15	71	
Z4 Garden Room	, s. <del>-</del> 1	90	15	60	
Z5L Staff Room	90	, 15 <del>5</del> 11	=3	186	
Z6L Staff WC	(A <del>7</del> 4)	90	=0	27	

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Z10L Corridor	B <del>-7</del> 3	90	E.	65

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Z1 Office	NO (-69.6%)	NO
Z3 Entrance	NO (-80.9%)	NO
Z4 Garden Room	NO (-30.8%)	YES
Z5L Staff Room	NO (-83%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

## EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

## Technical Data Sheet (Actual vs. Notional Building)

### **Building Global Parameters**

	Actual	Notional
Area [m²]	194.3	194.3
External area [m²]	519	519
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	111.66	238.06
Average U-value [W/m²K]	0.22	0.46
Alpha value* [%]	44.17	19.02

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

### **Building Use**

### % Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

### 100 B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

## Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	18.92	35.16
Cooling	0	0
Auxiliary	2.12	0.95
Lighting	16.24	12.47
Hot water	18.03	24.15
Equipment*	41.16	41.16
TOTAL**	55.31	72.72

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

## Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	11.26	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

## **Energy & CO<sub>2</sub> Emissions Summary**

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	144.76	207.03
Primary energy* [kWh/m²]	165.56	151.11
Total emissions [kg/m²]	22.1	30.2

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

<sup>\*\*</sup> Total is net of any electrical energy displaced by CHP generators, if applicable.

Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[S	T] No Heatin	g or Coolin	g				W-			
	Actual	40.8	1.8	0	0	0	0	0	0	0
	Notional	65.2	1.1	0	0	0	0	0	-	
[S	T] Central h	eating using	water: flo	or heating,	[HS] Direct	or storage	electric he	eater, [HFT]	Electricity,	CFT] Elect
	Actual	93.5	98.4	27.7	0	3.1	0.94	0	1	0
	Notional	151.5	120.4	51.4	0	1.4	0.82	0		

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