Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 *Printed on 09 June 2021 at 10:01:41*

Project Information:

Assessed By: Ben Tunningley (STRO027495) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING AS BUILT

Site Reference: Albany Farm

Total Floor Area: 74.1m²

Plot Reference: Plot 032

Address: 15 Buttercup Road, Bishops Waltham, SOUTHAMPTON, SO32 1RF

Client Details:

Name: Bargate Homes

Address: The New Barn, Vicarage Farm Business Par, Winchester Road, Fair Oak, SO50 7HD

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.51 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.59 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 43.6 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 4.56
Maximum 10.0

4 Heating efficiency

Main Heating system: Database: (rev 478, product index 017929):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35

(Combi)

Efficiency 89.6 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

OK

Regulations Compliance Report

Cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls	Programmer, room therm	ostat and TRVs	OK
Hot water controls:	No cylinder thermostat		
Boiler interlock:	No cylinder Yes		ок
Low energy lights	165		<u> </u>
Percentage of fixed lights w	th low-energy fittings	100.0%	
Minimum	ar low energy mangs	75.0%	ок
Mechanical ventilation		. 6.6 /	
Continuous extract system (decentralised)		
Specific fan power:	accontraincea)	0.16 0.18	
Maximum		0.7	ОК
Summertime temperature			
Overheating risk (South Eng	gland):	Slight	ОК
sed on:		-	
Overshading:		Very Little	
Windows facing: North Wes		3.06m²	
Windows facing: South East		6.51m²	
Windows facing: South Wes	t	2.28m²	
Ventilation rate:		4.00	
Blinds/curtains:		None	
Key features			
Roofs U-value		0.11 W/m²K	
Party Walls U-value		0 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

			User D	etails:						
Assessor Name:	Ben Tunningley			Strom	a Num	ber:		STRC	0027495	
Software Name:	Stroma FSAP 2	012		Softwa	are Ve	rsion:		Version	on: 1.0.5.41	
		Pro	perty /	Address	: Plot 03	2				
Address :	15 Buttercup Roa	d , Bishops	Waltha	ım, SOU	THAME	TON, SO	032 1R	F		
1. Overall dwelling dime	nsions:									
Ground floor				a(m²)	44-5	Av. Hei		1,0-1	Volume(m³)	_
			3		(1a) x	2.	4	(2a) =	88.92	(3a)
First floor			3	7.05	(1b) x	2.6	67	(2b) =	98.92	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	7	74.1	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3d)	+(3e)+	.(3n) =	187.84	(5)
2. Ventilation rate:										
	main heating	secondary heating	•	other		total			m³ per hou	٢
Number of chimneys	0 +	0	+	0	= [0	X 4	10 =	0	(6a)
Number of open flues	0 +	0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent far	ns				Ī	0	x ′	10 =	0	(7a)
Number of passive vents					Ī	0	x ^	10 =	0	(7b)
Number of flueless gas fin	res				F	0	X 4	40 =	0	(7c)
					L					
								Air cl	nanges per ho	ur
Infiltration due to chimney	·					0		÷ (5) =	0	(8)
If a pressurisation test has be		nded, proceed	to (17), c	otherwise o	continue fi	rom (9) to (1	(6)			7(0)
Number of storeys in the Additional infiltration	ie dweiling (ris)						[(9)-	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel or timbe	er frame or 0	0.35 for	· masonr	y consti	ruction	1(0)	.,,	0	(11)
if both types of wall are pr	esent, use the value con				•					_ '`
deducting areas of opening If suspended wooden fl	• / .	valad) or 0.1	(coalo	ud) alca	ontor O					7(40)
If no draught lobby, ent	•	,	(Seale	u), eise	enter 0				0	(12)
Percentage of windows									0	(14)
Window infiltration	3			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (12) + (13) +	(15) =		0	(16)
Air permeability value,	q50, expressed in c	ubic metres	per ho	ur per s	quare m	etre of er	rvelope	area	4.5599999427795	54 (17)
If based on air permeabili	•								0.23	(18)
Air permeability value applies		has been done	or a deg	gree air pe	rmeability	is being us	ed			7
Number of sides sheltere Shelter factor	u			(20) = 1 -	[0.075 x ([*]	19)] =			0.85	(19)
Infiltration rate incorporati	ing shelter factor			(21) = (18)					0.83	(21)
Infiltration rate modified for	_	ed							0.10	
	Mar Apr Ma		Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind spe									•	
(00)	1 1					1			1	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(22)m=

Wind Factor (2	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	o (allowi	na for sk	ooltor an	d wind s	rnood) –	(21a) v	(22a)m	•	•		•	
0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23]	
Calculate effe		-	rate for t	he appli	cable ca	ise		!	!]	_
If mechanic			l' N. (0		\ - /		\(\frac{1}{2}\)	. (00)) (00)			0.5	(23a)
If exhaust air h									o) = (23a)			0.5	(23b)
If balanced with		•	-	_					Ol.) /	001.)	4 (00 -)	0	(23c)
a) If balance (24a)m= 0	ea mecha 0	anicai ve	entilation 0	with nea	at recove	ery (MVI	HR) (248	$\frac{1}{100} = \frac{1}{100}$	2b)m + (23b) × [1 – (23c) 1 0	i ÷ 100j]	(24a)
b) If balance	ļ		l		<u> </u>	Į		<u> </u>	<u> </u>		1 0		(244)
(24b)m= 0		o 0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	<u> </u>						<u> </u>						(=)
,	n < 0.5 ×			•	•				.5 × (23b	o)			
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural	ventilatio	on or wh	ole hous	se positiv	e input	ventilatio	on from	loft	•	•	•	•	
<u> </u>	n = 1, th	<u> </u>	<u> </u>	ŕ	· `		 		0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air			<u> </u>	^ `	í `	´`		` 	l	l	1	1	(05)
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. Heat losse	o and he												
J. 1 leat 10336	is and ne	eat loss p	paramete	er:									
ELEMENT	Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		K k K
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				′K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x ¹	W/m2	2K = - 0.04] =	(W/ 2.94				(K) (26)
ELEMENT Doors Windows Type	Gros area e 1	SS	Openin	gs	A ,r 2.1 3.06	m ² x x ¹ x ¹	W/m2 1.4 /[1/(1.4)+	2K = 0.04] =	(W/ 2.94 4.06				(26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1	SS	Openin	gs	A ,r 2.1 3.06 6.51	m ² x x ¹ x ¹ x ¹	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = 0.04] =	(W/ 2.94 4.06 8.63	K) 			(K) (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area e 1	ss (m²)	Openin	gs ¹²	A ,r 2.1 3.06 6.51 2.28	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] =	(W/ 2.94 4.06 8.63 3.02	K) 	kJ/m²-l	K kJ/	(K (26) (27) (27) (27) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] = 0.04] =	(W/ 2.94 4.06 8.63 3.02 4.0755	K) 	kJ/m²-l	K kJ/	(K (26) (27) (27) (27) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls	Gros area 1 2 2 3 3 87.3	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63	K) 	75 60	2778.73 4406.4	(K (26) (27) (27) (27) (5) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof	Gros area 1 2 2 3 3 87.3	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63	K) 	75 60	2778.73 4406.4	(K (26) (27) (27) (27) (5) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area e 1 e 2 e 3 87.3 37.0 elements	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = 0.04] = 0.04] = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K) 	75 60 9	2778.79 4406.4 333.45	(26) (27) (27) (27) (5) (28) (29) (30) (31) (5) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area e 1 e 2 e 3 87.3 37.0 elements	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = 0.04] = 0.04] = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K) 	75 60 9	2778.79 4406.4 333.45	(K (26) (27) (27) (27) (28) (30) (31) (5) (32) (32c)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area e 1 e 2 e 3 87.3 37.0 elements	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = 0.04] = 0.04] = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K) 	75 60 9 45	2778.79 4406.4 333.45 1922.89	(K (26) (27) (27) (27) (28) (30) (31) (5) (32) (32c)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area 1 2 3 37.0 elements	ss (m²)	Openin m	gs ¹²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = 0.04] = 0.04] = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K) 	75 60 9 45 9	2778.73 4406.4 333.45 1922.83 539.130 810.772	(K (26) (27) (27) (27) (5) (28) (30) (31) (5) (32c) (32c) (32d)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor	Gros area 1 2 3 37.0 selements	ss (m²) 39 35 , m²	13.94	indow U-ve	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = 0.04 = 0.04 = 0.04 = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K)	75 60 9 45 9 18	2778.79 4406.4 333.45 1922.89 539.130 810.772 666.9	(K) (26) (27) (27) (27) (5) (28) (30) (31) (5) (32c) (32c) (32d)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor Internal ceiling * for windows and	Gros area e 1 e 2 e 3 87.3 37.0 elements	ows, use e sides of in	Openin m 13.99 offective with aternal wall	indow U-ve	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1 x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = 0.04 = 0.04 = 0.04 = = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K)	75 60 9 45 9 18	2778.79 4406.4 333.45 1922.89 539.130 810.772 666.9	(K) (26) (27) (27) (27) (5) (28) (30) (31) (5) (32c) (32c) (32d)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor Internal ceiling * for windows and ** include the area	Gros area 1 1 2 2 3 37.0 37.0 Elements 1 roof windows on both ss, W/K =	ows, use e sides of in= S (A x	Openin m 13.99 offective with aternal wall	indow U-ve	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1 x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11 0	2K = 0.04 = 0.04 = 0.04 = = = = = = = = = =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K)	75 60 9 45 9 18 9	2778.73 4406.4 333.45 1922.83 539.130 810.772 666.9 333.45	(K (26) (27) (27) (27) (5) (28) (30) (31) (5) (32c) (32c) (32d) (32d) (32e)
ELEMENT Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the area Fabric heat los	Gros area e 1 e 2 e 3 87.3 37.0 elements d roof winder as on both ss, W/K = Cm = S(ows, use esides of interest (A x k)	13.90 0 of the state of the sta	gs 1 ² 5 Sindow U-va Is and pan	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calculatitions	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11 0	2K = 0.04 =	(W/ 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	K)	75 60 9 45 9 18 9	2778.79 4406.4 333.45 1922.89 539.130 810.772 666.9 333.45	(K (26) (27) (27) (27) (5 (28) (30) (31) (5 (32c) (32c) (32d) (32e) (32e) (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 ir	nstead of a de					_							_
Thermal bri	idges : S (L	x Y) cal	culated (using Ap	pendix I	K						7.41	(36)
	ermal bridging	are not kn	own (36) =	= 0.05 x (3	1)				<i>,</i> ,				_
Total fabric									(36) =			51.84	(37
	heat loss c		·			1	ī		= 0.33 × (<u> </u>	1	
Ja	ın Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 30.9	99 30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99		(38
Heat transf	er coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
39)m= 82.8	83 82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83		
Heat loss p	arameter (I	HLP), W/	/m²K						Average = = (39)m ÷		12 /12=	82.83	(39
40)m= 1.1	2 1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
Number of	days in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.12	(40
Ja	ın Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	1 28	31	30	31	30	31	31	30	31	30	31		(41
	•					•	•					•	
4. Water h	neating ene	rav roqui	irement:								kWh/y	ear:	
\	J		iromoni.									1	
if TFA > 1	occupancy, 13.9, N = 1 13.9, N = 1	N + 1.76 x	[1 - exp						ΓFA -13.	9)	34		•
if TFA > 1 if TFA £ 1 Annual ave Reduce the ar	ccupancy, 13.9, N = 1	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)			`
if TFA > 1 if TFA £ 1 Annual ave Reduce the ar	occupancy, 13.9, N = 1 13.9, N = 1 erage hot we nual average 125 litres per	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)	34		,
if TFA > ' if TFA £ ' Annual ave Reduce the ar not more that	occupancy, 13.9, N = 1 13.9, N = 1 erage hot we nual average 125 litres per	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 i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 89	34		•
if TFA > f if TFA £ f Annual ave Reduce the ar not more that Ja Hot water usa	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wa annual average 125 litres per an Feb age in litres per	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 i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 89	34		•
if TFA > 1 if TFA £ 1 Annual ave Reduce the armoot more that Ja Hot water usa	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wa annual average 125 litres per an Feb age in litres per	N + 1.76 x ater usage hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month 88.01	es per da 5% if the d vater use, I May Vd,m = fa 84.42	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 80.83	(25 x N) to achieve Aug (43) 84.42	+ 36 a water us Sep	Oct 91.6 Total = Su	9) Nov 95.2 m(44) ₁₁₂ =	34 0.81 Dec 98.79	1077.7	(43
if TFA > 1 if TFA £ 1 Annual ave Reduce the armoot more that Ja Hot water usa 44)m= 98.7	accupancy, 13.9, N = 1 13.9, N = 1 Trage hot wannual average 125 litres per In Feb Ige in litres per In 95.2 Int of hot water	N + 1.76 x ater usage hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month 88.01	es per da 5% if the d vater use, I May Vd,m = fa 84.42	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 80.83	(25 x N) to achieve Aug (43) 84.42	+ 36 a water us Sep	Oct 91.6 Total = Su	9) Nov 95.2 m(44) ₁₁₂ =	34 0.81 Dec 98.79	1077.7	(43
if TFA > 7 if TFA £ 7 Annual ave Reduce the armot more that Ja Hot water usa; 44)m= 98.7 Energy conter 45)m= 146	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wannual average 125 litres per an Feb ge in litres pe 79 95.2 ant of hot water 5.5 128.13	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 used - calc	ge in litre usage by a day (all which month 88.01 culated month 115.27	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 80.83	erage = designed and designed a	(25 x N) to achieve Aug (43) 84.42 27m / 3600 101.49	+ 36 a water us Sep 88.01 0 kWh/mon 102.7	Oct 91.6 Total = Su th (see Ta	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65	34 Dec 98.79 c, 1d) 141.88	1077.7	(43
if TFA > 7 if TFA £ 7 Annual ave Reduce the armot more that Ja Hot water usa; 44)m= 98.7 Energy conter 45)m= 146	accupancy, 13.9, N = 1 13.9, N = 1 Trage hot wannual average 125 litres per In Feb Ige in litres per In 95.2 Int of hot water	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 used - calc	ge in litre usage by a day (all which month 88.01 culated month 115.27	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 80.83	erage = designed and designed a	(25 x N) to achieve Aug (43) 84.42 27m / 3600 101.49	+ 36 a water us Sep 88.01 0 kWh/mon 102.7	Oct 91.6 Total = Su 119.69	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65	34 Dec 98.79 c, 1d) 141.88		(43
if TFA > f if TFA £ f Annual ave Reduce the armony more that Ja Hot water usa; 44)m= 98.7 Energy conter 45)m= 146 f instantaneous 46)m= 21.9	accupancy, 13.9, $N = 1$ 13.9, $N = 1$ 14.7 Prage hot with the state of the state	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 used - calc	ge in litre usage by a day (all which month 88.01 culated month 115.27	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 80.83	erage = designed and designed a	(25 x N) to achieve Aug (43) 84.42 27m / 3600 101.49	+ 36 a water us Sep 88.01 0 kWh/mon 102.7	Oct 91.6 Total = Su 119.69	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65	34 Dec 98.79 c, 1d) 141.88		(43
if TFA > f if TFA £ f Annual ave Reduce the armot more that Ja Hot water usage 44)m= 98.7 Energy conter 45)m= 146 f instantaneous 46)m= 21.9 Nater stora	accupancy, 13.9, N = 1 13.9, N = 1 13.9, N = 1 13.9, N = 1 14 rage hot water 125 litres per 125 litres per 126 in litres per 13.5 128.13 14 water heating 15.5 128.22 15.6 19.22 16.7 19.22 17.8 19.22 18.9 19.22 19.9 19.22 19.9 19.22	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 ang at point 19.83	[1 - exp ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (no	es per da 5% if the a rater use, I May Vd,m = fa 84.42 onthly = 4. 110.61 o hot water 16.59	ay Vd,av lwelling is not and co Jun ctor from 1 80.83 190 x Vd,r 95.45	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27	(25 x N) to achieve Aug (43) 84.42 DTm / 3600 101.49 boxes (46) 15.22	+ 36 a water us Sep 88.01 0 kWh/mor 102.7) to (61) 15.41	Oct 91.6 Total = Su 119.69 Total = Su 17.95	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ =	34 Dec 98.79 c, 1d) 141.88 21.28		(44)
if TFA > f if TFA £ f Annual ave Reduce the armot more that Ja Hot water usa; 44)m= 98.7 Energy conter 45)m= 146 f instantaneous 46)m= 21.5 Water stora Storage vol	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wannual average 125 litres per an Feb ge in litres pe 79 95.2 at of hot water 128.13 aus water heati 198 19.22 age loss: lume (litres)	N + 1.76 x ater usage hot water person per Mar 91.6 132.22 Ing at point 19.83) including the content of the	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (no	es per da 5% if the of the factor was per da 65% if the of the factor was per da 65% if the of the factor was per da 65% if the of the factor was per da 65% if t	ay Vd,av lwelling is not and co Jun ctor from 1 80.83 190 x Vd,r 95.45 storage), 14.32	erage = designed and ld) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27	(25 x N) to achieve Aug (43) 84.42 77m / 3600 101.49 boxes (46) 15.22 within sa	+ 36 a water us Sep 88.01 0 kWh/mor 102.7) to (61) 15.41	Oct 91.6 Total = Su 119.69 Total = Su 17.95	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ =	34 Dec 98.79 c, 1d) 141.88		(43
if TFA > f if TFA £ f Annual ave Reduce the armot more that Ja Hot water usa 44)m= 98.7 Energy conter 45)m= 146 f instantaneou 46)m= 21.9 Vater stora Storage vol f communit	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wa annual average 125 litres per an Feb age in litres per at of hot water 5.5 128.13 us water heati 98 19.22 age loss: lume (litres ty heating a	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 including and no taken in the calculation in the ca	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (no	es per da 5% if the of rater use, I May Vd,m = fat 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W relling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 80.83 190 x Vd,r 95.45 r storage), 14.32 IWHRS	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage) litres in	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47)	+ 36 a water us Sep 88.01 0 kWh/mor 102.7 15.41 ame vess	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ =	34 Dec 98.79 c, 1d) 141.88 21.28		(44)
if TFA > if TFA £ if IFA Energy conter 44)m= 98.7 Energy conter 45)m= 146 if instantaneous 46)m= 21.9 Vater stora Storage vol f community Otherwise i	accupancy, 13.9, N = 1 125 litres per 125 litres per 13	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 including and no taken in the calculation in the ca	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (no	es per da 5% if the of rater use, I May Vd,m = fat 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W relling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 80.83 190 x Vd,r 95.45 r storage), 14.32 IWHRS	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage) litres in	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47)	+ 36 a water us Sep 88.01 0 kWh/mor 102.7 15.41 ame vess	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ =	34 Dec 98.79 c, 1d) 141.88 21.28		(43
if TFA > if TFA £ if Instantaneous A6)m= 21.5 Water storas Storage vol f community Otherwise if Water storas	accupancy, 13.9, N = 1 125 litres per 125 litres per 13	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 Including and no tall hot water water series and no tall hot water s	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (not) 17.29 ag any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fact 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W welling, e	ay Vd,av lwelling is hot and co Jun ctor from 80.83 190 x Vd,r 95.45 storage), 14.32 /WHRS nter 110 nstantar	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47)	+ 36 a water us Sep 88.01 0 kWh/mor 102.7 15.41 ame vess	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ = 19.6	34 Dec 98.79 c, 1d) 141.88 21.28		(43 (44 (45 (46 (47
if TFA > if TFA £ if	accupancy, 13.9, N = 1 125 litres per 125 litres per 13	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 including and no talk hot water eclared leared	ge in litre usage by day (all w Apr ach month 88.01 culated mo 115.27 for use (no 17.29 and any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fact 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W welling, e	ay Vd,av lwelling is hot and co Jun ctor from 80.83 190 x Vd,r 95.45 storage), 14.32 /WHRS nter 110 nstantar	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47)	+ 36 a water us Sep 88.01 0 kWh/mor 102.7 15.41 ame vess	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ = 19.6	34 Dec 98.79 c, 1d) 141.88 21.28		(43 (44 (45 (46 (47
if TFA > if TFA £ if Instantaneous A6)m= 21.5 Water stora Storage vol f community Otherwise if Water stora a) If manuficancy lost	accupancy, 13.9, N = 1 128 litres per 125 litres per 13	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 Including and no tale hot water eclared learn Table or storage	ge in litre usage by day (all w Apr ach month 88.01 culated me 115.27 for use (no 17.29 ag any so ank in dw er (this in oss facto 2b	es per da 5% if the of water use, I May Vd,m = far 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W velling, e ocludes i or is knowear	ay Vd,av welling is not and co Jun ctor from 5 80.83 190 x Vd,r 95.45 14.32 WHRS nter 110 nstantar	erage = designed (d) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage 0 litres in neous con/day):	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47)	+ 36 a water us Sep 88.01 102.7 105.41 ame vess ers) ente	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ = 19.6	34 Dec 98.79 c, 1d) 141.88 21.28		(43 (44 (45 (46 (47 (48 (49
if TFA > if TFA £ if TFA Energy conter 44)m= 98.7 Energy conter 45)m= 146 If instantaneous 46)m= 21.5 Water storas Storage vol f community Otherwise if Water storas a) If manuficular storas a) If manuficular if Temperatures if Temperatu	accupancy, 13.9, N = 1 125 litres per 125 litres per 135 95.2 138.13 1398 19.22 1398 19.22 1398 19.22 1398 19.22 1398 19.22 1399 19.32 14 19.32 15 19.32 16 19.32 17 19.32 18 19.32 19 19	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 Including and no tale hot water eclared lear storage eclared of a factor fr	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (not 17.29 and any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder le	es per da 5% if the of water use, I May Vd,m = far 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W velling, e ncludes i or is kno	ay Vd,av welling is not and co Jun ctor from 5 80.83 190 x Vd,r 95.45 14.32 /WHRS nter 110 nstantar wn (kWh	erage = designed id) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage 0 litres in neous con/day): known:	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47) ombi boil	+ 36 a water us Sep 88.01 102.7 105.41 ame vess ers) ente	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ = 19.6	34 Dec 98.79 c, 1d) 141.88 21.28 0		(43 (44 (45 (46 (47 (48 (49 (50
if TFA > if TFA £ if Instantaneous A4)m= 98.7 Energy conter 45)m= 146 if instantaneous A46)m= 21.9 Vater stora Storage vol f community Otherwise if Vater stora a) If manuficular Temperature Energy lost b) If manuficular water stora if community Instantaneous A6) if manuficular if Instantaneous A6) if I	accupancy, 13.9, N = 1 13.9, N = 1 arage hot wannual average 125 litres per an Feb age in litres pe 15.5 128.13 as water heating 19.22 age loss: lume (litres age loss: facturer's desertion water facturer's destorage loss acturer's destorage loss age loss	N + 1.76 x ater usage hot water person per Mar r day for ear 91.6 132.22 Ing at point 19.83 Including and no tale hot water eclared lear to a factor free eclared of factor free ecetions.	ge in litre usage by day (all w Apr ach month 88.01 115.27 of use (not 17.29 and any so ank in dw er (this in oss facto 2b c, kWh/ye cylinder le	es per da 5% if the of water use, I May Vd,m = far 84.42 onthly = 4. 110.61 o hot water 16.59 olar or W velling, e ncludes i or is kno	ay Vd,av welling is not and co Jun ctor from 5 80.83 190 x Vd,r 95.45 14.32 /WHRS nter 110 nstantar wn (kWh	erage = designed id) Jul Table 1c x 80.83 m x nm x E 88.44 enter 0 in 13.27 storage 0 litres in neous con/day): known:	(25 x N) to achieve Aug (43) 84.42 07m / 3600 101.49 boxes (46) 15.22 within sa (47) ombi boil	+ 36 a water us Sep 88.01 102.7 105.41 ame vess ers) ente	Oct 91.6 Total = Su 119.69 Total = Su 17.95 sel	9) 89 Nov 95.2 m(44) ₁₁₂ = ables 1b, 1 130.65 m(45) ₁₁₂ = 19.6	34 Dec 98.79 c, 1d) 141.88 21.28 0		(42) (43) (44) (45) (46) (47) (48) (49) (50) (51)

			-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
		(54) in (5	•	, ,				((50) (==> (44)			0		(55)
			culated 1	for each		i		((56)m = (, , ,				•	
(56)m=	0	0	0	0	0 (50)	0	0	0	0	0	0	0	Page 1.1	(56)
-			a solar sto	rage, (57)r				1			-		IX H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	-			om Table								0		(58)
	•			for each	,	,	' '	` '						
,			i	le H5 if t									1	(FO)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m					•	
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		(62)
Solar Di	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0'	if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	//WHRS	applies	, see Ap	pendix C	3)				•	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		_
								Outp	out from wa	ater heater	(annual)	12	1575.01	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	((46)m	+ (57)m	+ (59)m	1	
(65)m=	52.15	45.71	47.4	41.66	40.22	35.06	32.85	37.18	37.48	43.24	46.77	50.61		(65)
inclu	ıde (57)	m in cald	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar											
(66)m=	140.48		Iviai	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lightin		140.48	140.48	Apr 140.48	May 140.48	Jun 140.48	Jul 140.48	Aug 140.48	Sep 140.48	Oct	Nov 140.48	Dec 140.48		(66)
	g gains		140.48		140.48	140.48	140.48	140.48	140.48					(66)
(67)m=	g gains 46.59		140.48	140.48	140.48	140.48	140.48	140.48	140.48					(66) (67)
(67)m=	46.59	(calcula 41.38	140.48 ted in Ap 33.65	140.48	140.48 L, equat	140.48 ion L9 or 16.08	140.48 r L9a), a 17.37	140.48 Iso see 22.58	140.48 Table 5 30.31	140.48 38.48	140.48	140.48		` '
(67)m=	46.59	(calcula 41.38	140.48 ted in Ap 33.65	140.48 opendix 1 25.48	140.48 L, equat	140.48 ion L9 or 16.08	140.48 r L9a), a 17.37	140.48 Iso see 22.58	140.48 Table 5 30.31	140.48 38.48	140.48	140.48		` '
(67)m= Appliar (68)m=	46.59 nces ga 308.46	(calcula 41.38 ins (calc 311.67	140.48 ted in Ap 33.65 ulated in 303.6	140.48 opendix l 25.48 n Append	140.48 L, equat 19.04 dix L, eq 264.75	140.48 ion L9 of 16.08 uation L 244.38	140.48 r L9a), a 17.37 13 or L1 230.77	140.48 Iso see 22.58 3a), also	140.48 Table 5 30.31 see Tal 235.63	38.48 ole 5 252.8	140.48	140.48 47.88		(67)
(67)m= Appliar (68)m=	46.59 nces ga 308.46	(calcula 41.38 ins (calc 311.67	140.48 ted in Ap 33.65 ulated in 303.6	140.48 opendix l 25.48 n Append 286.43	140.48 L, equat 19.04 dix L, eq 264.75	140.48 ion L9 of 16.08 uation L 244.38	140.48 r L9a), a 17.37 13 or L1 230.77	140.48 Iso see 22.58 3a), also	140.48 Table 5 30.31 see Tal 235.63	38.48 ole 5 252.8	140.48	140.48 47.88		(67)
(67)m= Applian (68)m= Cookin (69)m=	46.59 nces ga 308.46 ng gains 51.39	(calcula 41.38 ins (calc 311.67 (calcula 51.39	140.48 ted in Ap 33.65 ulated ir 303.6 ted in A 51.39	140.48 ppendix I 25.48 Append 286.43 ppendix 51.39	140.48 L, equat 19.04 dix L, eq 264.75 L, equat	140.48 ion L9 of 16.08 uation L 244.38 tion L15	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a)	140.48 lso see - 22.58 3a), also 227.57 , also se	140.48 Table 5 30.31 see Tal 235.63 ee Table	38.48 ble 5 252.8	140.48 44.92 274.48	140.48 47.88 294.85		(67) (68)
(67)m= Applian (68)m= Cookin (69)m=	46.59 nces ga 308.46 ng gains 51.39	(calcula 41.38 ins (calc 311.67 (calcula	140.48 ted in Ap 33.65 ulated ir 303.6 ted in A 51.39	140.48 ppendix I 25.48 Append 286.43 ppendix 51.39	140.48 L, equat 19.04 dix L, eq 264.75 L, equat	140.48 ion L9 of 16.08 uation L 244.38 tion L15	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a)	140.48 lso see - 22.58 3a), also 227.57 , also se	140.48 Table 5 30.31 see Tal 235.63 ee Table	38.48 ble 5 252.8	140.48 44.92 274.48	140.48 47.88 294.85		(67) (68)
(67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	46.59 nces ga 308.46 ng gains 51.39 s and fai	(calcula 41.38 ins (calcula 311.67 (calcula 51.39 ns gains 3	140.48 ted in Ap	140.48 ppendix I 25.48 Appendix 286.43 ppendix 51.39 5a) 3	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39	140.48 Iso see - 22.58 3a), also 227.57), also se 51.39	140.48 Fable 5 30.31 see Tal 235.63 ee Table 51.39	38.48 ble 5 252.8 5 51.39	140.48 44.92 274.48 51.39	140.48 47.88 294.85 51.39		(67) (68) (69)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	46.59 nces ga 308.46 ng gains 51.39 s and fai	(calcula 41.38 ins (calc 311.67 (calcula 51.39 ns gains 3	140.48 ted in Ap 33.65 ulated in 303.6 ted in A 51.39 (Table 5	140.48 ppendix I 25.48 Append 286.43 ppendix 51.39 5a) 3 tive value	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39 3 es) (Tab	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39 3 ble 5)	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39	140.48 lso see - 22.58 3a), also 227.57 , also se 51.39	140.48 Table 5 30.31 see Tal 235.63 ee Table 51.39	38.48 ble 5 252.8 5 51.39	140.48 44.92 274.48 51.39	140.48 47.88 294.85 51.39		(67) (68) (69)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	46.59 nces ga 308.46 ng gains 51.39 s and fai 3 s e.g. ev -93.66	(calcula 41.38 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio	140.48 ted in Ap 33.65 ulated in 303.6 tted in A 51.39 (Table 5 3 on (negar	140.48 ppendix I 25.48 Appendix 286.43 ppendix 51.39 5a) 3	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39	140.48 Iso see - 22.58 3a), also 227.57), also se 51.39	140.48 Fable 5 30.31 see Tal 235.63 ee Table 51.39	38.48 ble 5 252.8 5 51.39	140.48 44.92 274.48 51.39	140.48 47.88 294.85 51.39		(67) (68) (69) (70)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	46.59 nces ga 308.46 ng gains 51.39 s and fai 3 s e.g. ev -93.66 heating	(calcula 41.38 ins (calc 311.67 (calcula 51.39 ns gains 3 aporatio -93.66 gains (T	140.48 ted in Ap 33.65 ulated in 303.6 ted in A 51.39 (Table \$ 3 on (nega) -93.66 Table 5)	140.48 ppendix I 25.48 Appendix 286.43 ppendix 51.39 5a) 3 tive value -93.66	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39 3 es) (Tab	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39 3 ole 5) -93.66	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39 3	140.48 Iso see 22.58 3a), also 227.57), also se 51.39 3	140.48 Table 5 30.31 see Tal 235.63 ee Table 51.39 3 -93.66	38.48 ble 5 252.8 5 51.39 3	140.48 44.92 274.48 51.39 3	140.48 47.88 294.85 51.39 3		(67) (68) (69) (70)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	46.59 nces ga 308.46 ng gains 51.39 s and fai 3 s e.g. ev -93.66 heating 70.1	(calcula 41.38 ins (calc 311.67 (calcula 51.39 ns gains 3 aporatic -93.66 gains (T	140.48 ted in Ap 33.65 ulated in 303.6 ted in A 51.39 (Table 5 3 In (negation 193.66 Table 5) 63.71	140.48 ppendix I 25.48 Append 286.43 ppendix 51.39 5a) 3 tive value	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39 3 es) (Tab	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39 3 ble 5) -93.66	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39 3	140.48 lso see - 22.58 3a), also 227.57 , also se 51.39 3 -93.66	140.48 Table 5 30.31 see Tal 235.63 ee Table 51.39 3 -93.66	38.48 ble 5 252.8 5 51.39 3 -93.66	140.48 44.92 274.48 51.39 3 -93.66 64.96	140.48 47.88 294.85 51.39 3 -93.66 68.03		(67) (68) (69) (70) (71)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	46.59 nces ga 308.46 ng gains 51.39 s and fai 3 s e.g. ev -93.66 heating 70.1	(calcula 41.38 ins (calc 311.67 (calcula 51.39 ns gains 3 aporatio -93.66 gains (T	140.48 ted in Ap 33.65 ulated in 303.6 ted in A 51.39 (Table 5 3 In (negation 193.66 Table 5) 63.71	140.48 ppendix I 25.48 Appendix 286.43 ppendix 51.39 5a) 3 tive value -93.66	140.48 L, equat 19.04 dix L, eq 264.75 L, equat 51.39 3 es) (Tab	140.48 ion L9 of 16.08 uation L 244.38 tion L15 51.39 3 ble 5) -93.66	140.48 r L9a), a 17.37 13 or L1 230.77 or L15a) 51.39 3	140.48 Iso see 22.58 3a), also 227.57), also se 51.39 3	140.48 Table 5 30.31 see Tal 235.63 ee Table 51.39 3 -93.66	38.48 ble 5 252.8 5 51.39 3 -93.66	140.48 44.92 274.48 51.39 3 -93.66 64.96	140.48 47.88 294.85 51.39 3 -93.66 68.03		(67) (68) (69) (70) (71)

6. Solar gains:

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

Orientation: Access Fact Table 6d	_	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x 1	X	6.51	x	36.79	x	0.45	x	1.11	=	107.79	(77)
Southeast 0.9x 1	X	6.51	x	62.67	x	0.45	x	1.11	=	183.6	(77)
Southeast 0.9x 1	X	6.51	x	85.75	x	0.45	x	1.11	=	251.21	(77)
Southeast 0.9x 1	X	6.51	x	106.25	x	0.45	x	1.11	=	311.26	(77)
Southeast 0.9x 1	X	6.51	x	119.01	x	0.45	x	1.11	=	348.64	(77)
Southeast 0.9x 1	X	6.51	x	118.15	x	0.45	x	1.11	=	346.12	(77)
Southeast 0.9x 1	×	6.51	x	113.91	x	0.45	x	1.11	=	333.7	(77)
Southeast 0.9x 1	X	6.51	x	104.39	x	0.45	x	1.11	=	305.81	(77)
Southeast 0.9x 1	X	6.51	x	92.85	x	0.45	x	1.11	=	272.01	(77)
Southeast 0.9x 1	×	6.51	x	69.27	x	0.45	x	1.11	=	202.92	(77)
Southeast 0.9x 1	X	6.51	x	44.07	x	0.45	X	1.11	=	129.1	(77)
Southeast 0.9x 1	X	6.51	x	31.49	x	0.45	x	1.11	=	92.24	(77)
Southwest _{0.9x} 1	×	2.28	x	36.79]	0.45	x	1.11	=	37.75	(79)
Southwest _{0.9x} 1	X	2.28	x	62.67]	0.45	x	1.11	=	64.3	(79)
Southwest _{0.9x} 1	X	2.28	x	85.75]	0.45	x	1.11	=	87.98	(79)
Southwest _{0.9x} 1	x	2.28	x	106.25]	0.45	x	1.11	=	109.01	(79)
Southwest _{0.9x} 1	X	2.28	x	119.01]	0.45	X	1.11	=	122.1	(79)
Southwest _{0.9x} 1	x	2.28	x	118.15]	0.45	x	1.11	=	121.22	(79)
Southwest _{0.9x} 1	×	2.28	x	113.91]	0.45	x	1.11	=	116.87	(79)
Southwest _{0.9x} 1	X	2.28	x	104.39]	0.45	X	1.11	=	107.1	(79)
Southwest _{0.9x} 1	x	2.28	x	92.85]	0.45	x	1.11	=	95.27	(79)
Southwest _{0.9x} 1	×	2.28	x	69.27]	0.45	x	1.11	=	71.07	(79)
Southwest _{0.9x} 1	X	2.28	x	44.07]	0.45	x	1.11	=	45.22	(79)
Southwest _{0.9x} 1	×	2.28	x	31.49]	0.45	x	1.11	=	32.31	(79)
Northwest _{0.9x} 1	X	3.06	x	11.28	x	0.45	x	1.11	=	15.54	(81)
Northwest _{0.9x} 1	X	3.06	x	22.97	x	0.45	x	1.11	=	31.63	(81)
Northwest 0.9x 1	X	3.06	x	41.38	x	0.45	X	1.11	=	56.98	(81)
Northwest _{0.9x} 1	X	3.06	x	67.96	x	0.45	x	1.11	= [93.58	(81)
Northwest 0.9x 1	X	3.06	x	91.35	x	0.45	X	1.11	= [125.78	(81)
Northwest 0.9x 1	X	3.06	x	97.38	x	0.45	X	1.11	= [134.1	(81)
Northwest 0.9x 1	X	3.06	x	91.1	x	0.45	x	1.11	=	125.45	(81)
Northwest 0.9x 1	x	3.06	x	72.63	x	0.45	X	1.11	=	100.01	(81)
Northwest _{0.9x} 1	X	3.06	x	50.42	x	0.45	x	1.11	=	69.43	(81)
Northwest _{0.9x} 1	X	3.06	x	28.07	x	0.45	x	1.11	=	38.65	(81)
Northwest _{0.9x} 1	X	3.06	x	14.2	x	0.45	x	1.11	=	19.55	(81)
Northwest _{0.9x} 1	X	3.06	x	9.21	x	0.45	x	1.11	=	12.69	(81)

Solor a	oine in s	watta a	alaulataa	l for oool	h manth			(92)m - C	um/74)m	(92)m				
(83)m=		279.53	alculated	513.85	596.53	601.44	576.01	512.92	436.71	312.64	193.87	137.24	1	(83)
` ′			and solar					312.92	430.71	312.04	193.07	137.24		(00)
(84)m=	687.44	801.81	898.35	984.83	1035.6	1011.81	969.52	914.27	855.92	763.26	679.44	649.22		(84)
7 Me	an interr	nal temr	erature	(heating	season)								
			eating p				from Tal	ole 9. Th	1 (°C)				21	(85)
•		_	ains for l			•		,	(-)					` ′
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.93	0.88	0.79	0.66	0.5	0.37	0.41	0.61	0.83	0.93	0.97		(86)
ا Mean	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ns 3 to 7	in Tabl	e 9c)				l	
(87)m=	19.7	19.95	20.27	20.6	20.84	20.95	20.99	20.98	20.91	20.59	20.07	19.63		(87)
Tomp	oroturo	durina h	ooting n	oriodo ir	root of	dwalling	from To	hla O. T	h2 (°C)				l	
(88)m=	19.99	19.99	eating p	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
` ′ [l i	<u>l</u>		13.33	10.00	10.00	10.00		(00)
r			ains for			- `	i						1	(22)
(89)m=	0.95	0.92	0.86	0.76	0.6	0.43	0.29	0.32	0.54	0.79	0.92	0.96		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.83	19.07	19.37	19.67	19.88	19.96	19.98	19.98	19.93	19.68	19.19	18.76		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.2	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.01	19.25	19.55	19.86	20.07	20.17	20.19	20.19	20.13	19.86	19.37	18.94		(92)
Apply	adjustm	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate			ı	
(93)m=	18.86	19.1	19.4	19.71	19.92	20.02	20.04	20.04	19.98	19.71	19.22	18.79		(93)
8. Spa	ace heat	ting requ	uirement											
						ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-cald	culate	
the ut			or gains							0.1				
ا النال	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.94	0.9	ains, hm _{0.85}	0.75	0.6	0.43	0.29	0.33	0.54	0.78	0.91	0.95]	(94)
			, W = (9 ⁴			0.43	0.29	0.55	0.54	0.70	0.91	0.93		(04)
(95)m=	646.08	725.5	760.64	734.38	621.86	435.33	282.45	297.55	458.1	595.28	615.99	615.96]	(95)
			rnal tem		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)
L	loss rate	for mea	an intern	al tempe	rature.	L Lm , W =		x [(93)m	– (96)m	1			l	
(97)m=	1205.82		1068.79	895.77	681.2	448.61	284.79	301.13	487.31	754.82	1004.19	1208.21		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	 1)m			
(98)m=	416.44	302.67	229.27	116.2	44.15	0	0	0	0	118.69	279.51	440.63		
L						ı	ı	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1947.55	(98)
Space	e heating	a require	ement in	kWh/m²	² /vear								26.28	(99)
			nts – Indi			vstems i	ncluding	micro-C	.HP)					
	e heatin		 111 01	vidual II	canny s	y Sterris I	Heraaing	-moro-C	21 11 /					
-		_	nt from s	econdar	y/supple	mentary	system						0	(201)
														_

Fraction of spa	ice hea	t from m	iain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of tota	al heatir	ng from i	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of m	ain spa	ice heati	ing syste	em 1								90.5	(206)
Efficiency of se	econda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating	require 302.67	ement (c 229.27	alculated	d above)	0		I 0	0	118.69	279.51	440.63	1	
					0	0	0	0	116.69	279.51	440.63]	(044)
$(211)m = \{[(98)r \\ 460.15]$	n x (∠0 334.44	4)] } X 1 253.33	128.39	48.78	0	0	0	0	131.15	308.85	486.89	1	(211)
			12000					l (kWh/yea				2151.99	(211)
Space heating	fuel (se	econdar	y), kWh/	month									_
$= \{[(98)m \times (201)]$	•		• /									_	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating Output from wat	tor hoo	tor (calc	ulated al	hovo)									
· — —	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64]	
Efficiency of war	ter hea	ter									ı	87.3	(216)
(217)m= 89.59	89.46	89.23	88.79	88.12	87.3	87.3	87.3	87.3	88.78	89.39	89.64		(217)
Fuel for water he	-												
(219)m = (64)m (219)m = 178.88	1 X 100 157.12	163.6	m 144.82	141.14	124.58	117.07	132.01	132.89	150.32	161.06	173.62]	
						Į	Tota	I = Sum(2	19a) ₁₁₂ =	l	Į.	1777.11	(219)
Annual totals									k'	Wh/year	•	kWh/year	_ _
Space heating f	uel use	d, main	system	1								2151.99	
Water heating fu	uel use	d										1777.11	
Electricity for pu	ımps, fa	ans and	electric l	keep-ho	t								
mechanical vei	ntilatior	า - balan	ced, ext	ract or p	ositive ii	nput fror	n outside	e			49.6		(230a
central heating	pump:										30]	(2300
boiler with a fa	n-assis	ted flue									45	j	(230
Total electricity	for the	above, k	دWh/yea	r			sum	of (230a).	(230g) =			124.6	(231)
Electricity for lig	htina											329.1	」 【(232)
Electricity gener	•	v PVs										-481.92] (233)
Total delivered	•		sas (211) (221)	+ (231)	± (232)	(237h)	_				3900.87](338)
			•		+ (231)	+ (202).	(2375)	_				3900.07	
10a. Fuel costs	s - inaiv	iduai ne	ating sy	stems:									
						_ 1			Fuel P	rice		Fuel Cost	
					Fu kW	eı /h/year			(Table			£/year	
Space heating -	main s	system 1			kW					12)	x 0.01 =		(240)
Space heating -		•			kW (21	/h/year			(Table	12)	x 0.01 = x 0.01 =	£/year](240)](241)

Water heating cost (other fuel)	(219)	3.48 x 0.01 =	61.84 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	16.43 (249)
(if off-peak tariff, list each of (230a) to (230g			
Energy for lighting	(232)	13.19 X 0.01 =	43.41 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-63.57 (252)
Appendix Q items: repeat lines (253) and (2	,		
	5)(247) + (250)(254) =		253.01 (255)
11a. SAP rating - individual heating syster	ns		
Energy cost deflator (Table 12)			0.42 (256)
9, (/	55) x (256)] ÷ [(4) + 45.0] =		0.89 (257)
SAP rating (Section 12)	contains in alcoling mailtan. OLID		87.55 (258)
12a. CO2 emissions – Individual heating s	ystems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	464.83 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	383.85 (264)
Space and water heating	(261) + (262) + (263) + (264) =		848.68 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	0.519 =	64.67 (267)
Electricity for lighting	(232) x	0.519 =	170.8 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year	sum	n of (265)(271) =	834.04 (272)
CO2 emissions per m²	(272	2) ÷ (4) =	11.26 (273)
EI rating (section 14)			91 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	2625.42 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2168.07 (264)
Space and water heating	(261) + (262) + (263) + (264) =		4793.49 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	3.07	382.52 (267)
Electricity for lighting	(232) x	0 =	1010.34 (268)
Energy saving/generation technologies Item 1		3.07	-1479.49 (269)

 'Total Primary Energy
 sum of (265)...(271) = 4706.86 (272)

 Primary energy kWh/m²/year
 $(272) \div (4) =$ 63.52 (273)

		User Details:				
Access Name	Dan Tunninglay			CTDO	007405	
Assessor Name: Software Name:	Ben Tunningley Stroma FSAP 2012	Stroma Nu Software \			027495 on: 1.0.5.41	
Software Name.		Property Address: Plot		VCISIO	71. 1.0.5. 4 1	
Address :	15 Buttercup Road , Bishor	· · ·		1RF		
Overall dwelling dime	•	oo waanan, ooo ma	Wii 1011, 0002	113		
3		Area(m²)	Av. Height(m)	Volume(m³)	
Ground floor		37.05 (1a)		(2a) =	88.92	(3a)
First floor		37.05 (1b)	x 2.67	(2b) =	98.92	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 74.1 (4)				
Dwelling volume		(3a)+	-(3b)+(3c)+(3d)+(3e)	+(3n) =	187.84	(5)
2. Ventilation rate:						
	main seconda heating heating		total		m³ per houi	•
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			0	x 10 =	0	(7b)
Number of flueless gas fi	res		0	x 40 =	0	(7c)
				اد داد		_
Inditantian due to object	to flues and fame (60) (6b) u	(70)		,	anges per ho	_
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proce		0 ue from (9) to (16)	÷ (5) =	0	(8)
Number of storeys in the	•	<i>\</i>	() ()		0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame of	or 0.35 for masonry cor	nstruction		0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding to	to the greater wall area (afte	r	•		_
=	loor, enter 0.2 (unsealed) or (0.1 (sealed), else enter	. 0		0	(12)
If no draught lobby, ent		,			0	(13)
Percentage of windows	and doors draught stripped				0	(14)
Window infiltration	.	0.25 - [0.2 x (14)	÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15)	=	0	(16)
Air permeability value,	q50, expressed in cubic metr	es per hour per square	metre of envelo	pe area	4.5599999427795	54 (1 7)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] +$	(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applie	s if a pressurisation test has been do	one or a degree air permeab	ility is being used			
Number of sides sheltere	d		44-22		2	(19)
Shelter factor		(20) = 1 - [0.075			0.85	(20)
Infiltration rate incorporat		(21) = (18) x (20) =		0.19	(21)
Infiltration rate modified for		, , , , , , , , , , , , , , , , , , , 	, , , , , , , , , , , , , , , , , , , 		I	
Jan Feb	Mar Apr May Jun	Jul Aug Se	ep Oct No	ov Dec		
Monthly average wind sp	eed from Table 7					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (2	22a)m –	(22)m :	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]	
` '				_								ı	
Adjusted infiltr		r i			ı —	` 	`´	ì	0.04		1 0 00	1	
Calculate effe	0.24 ctive air (0.24 Change i	0.21 rate for t	0.21 he appli	0.18 cable ca	0.18 S e	0.18	0.19	0.21	0.22	0.23		
If mechanic		•										0.5	(23a)
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced wit	h heat reco	very: effici	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	ed mecha	anical ve	ntilation	with hea	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance					i	<u> </u>	ЛV) (24b	í `	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•	•				E (00k	. \			
(24c)m = 0.5	n < 0.5 ×	0.5	nen (240 0.5	(23D) = (23D) 0.5	0.5	0.5	0.5	0.5 m + 0.	0.5 0.5	0.5	0.5	1	(24c)
d) If natural					<u> </u>			ļ	0.5	0.5	0.5	J	(240)
,	n = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effective air	change	rate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (25)	!	!		•	
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. Heat losse	s and he	eat loss r	naramete	ōr.									
ELEMENT	Gros area		Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
ELEMENT Doors			•	gs						K)			
	area		•	gs	A ,r	m² x	W/m2	2K = [(W/	K)			kJ/K
Doors	area e 1		•	gs	A ,r	m ² x x x 1/2	W/m2	2K = [0.04] = [(W/ 2.94	K)			kJ/K (26)
Doors Windows Type	area e 1 e 2		•	gs	A ,r 2.1 3.06	m ² x x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1	W/m2 1.4 /[1/(1.4)+	2K = [· 0.04] = [· 0.04] = [2.94 4.06	K)			kJ/K (26) (27)
Doors Windows Type Windows Type	area e 1 e 2		•	gs	A ,r 2.1 3.06 6.51	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = [· 0.04] = [· 0.04] = [2.94 4.06 8.63			к	(26) (27) (27)
Doors Windows Type Windows Type Windows Type	area e 1 e 2	(m²)	•	gs ²	A ,r 2.1 3.06 6.51 2.28	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	EK = [0.04] = [0.04] = [0.04] = [2.94 4.06 8.63 3.02		kJ/m²-l	к	(26) (27) (27) (27) (27) (8.75) (28)
Doors Windows Type Windows Type Windows Type Floor	area e 1 e 2 e 3	(m²)	· m	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = [0.04] = [0.04] = [0.04] = [= = [(W// 2.94 4.06 8.63 3.02 4.0755		kJ/m²-l	277 440	(26) (27) (27) (27) (27) (8.75) (28)
Doors Windows Type Windows Type Windows Type Floor Walls	area e 1 e 2 e 3 87.3 37.0	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [0.04] = [0.04] = [0.04] = [= = [2.94 4.06 8.63 3.02 4.0755		KJ/m²⋅l 75	277 440	(26) (27) (27) (27) (27) (8.75) (28) (6.4) (29)
Doors Windows Type Windows Type Windows Type Floor Walls Roof	area e 1 e 2 e 3 87.3 37.0	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [0.04] = [0.04] = [0.04] = [= = [2.94 4.06 8.63 3.02 4.0755		KJ/m²⋅l 75	277. 440 333	(26) (27) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	area e 1 e 2 e 3 87.3 37.0 elements	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9	277. 440 333	(26) (27) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	area e 1 e 2 e 3 87.3 37.0 elements	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9	277 440 333 192 539	(26) (27) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (136) (32c)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall **	area e 1 e 2 e 3 87.3 37.0 elements	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9 45 9	277 440 333 192 539	kJ/K (26) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (7722) (32c)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor	area e 1 e 2 e 3 87.3 37.0 elements	(m²)	13.99	gs ²	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.06 37.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9 45 9	277 440 333 192 539 810.:	kJ/K (26) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (.136) (32c) (.7722) (32c) (.3.9) (32d)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	area area area area area area area area	(m²) 9 5 , m²	13.99	gs 2 5	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [0.04] = [(W// 2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9 45 9 9	277 440 333 192 539 810. 660 333	kJ/K (26) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (7722) (32c)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and	area area	(m²) 9 5 , m² ows, use e sides of in	13.99	gs 2 5	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = [0.04] = [0.04] = [0.04] = [(W// 2.94 4.06 8.63 3.02 4.0755 17.63 4.08		75 60 9 45 9 9	277 440 333 192 539 810. 660 333	kJ/K (26) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (.136) (32c) (.7722) (32c) (.3.9) (32d)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor Internal ceiling * for windows and ** include the are	area area area area area area area area	(m²) 9 5 , m² ows, use e sides of in = S (A x	13.99	gs 2 5	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	$\begin{array}{cccc} 2K & & & & & & \\ & & & & & & \\ \hline & & & & &$	(W// 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	as given in	75 60 9 45 9 18 9	277 440 333 192 539 810.: 660 333	(26) (27) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (31) (32c) (7722) (32c) (3.9) (32d) (3.45) (32e)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal floor Internal ceiling * for windows and ** include the are Fabric heat los	area area area area area area area area	ows, use e sides of in = S (A x A x k)	13.99 0	gs 2 5 1 s and part	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calculatitions	x1/2 x1/2 x1/4 x x x x x x x x x x x x x x x x x x x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	$ \begin{array}{cccc} 2K & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & 0.04 & = & \\ & & = & \\ & & = & \\ & & = & \\ & & = & \\ & & & = & \\ & & & & \\ & & & & \\ & & & & \\ & & & &$	(W// 2.94 4.06 8.63 3.02 4.0755 17.63 4.08	as given in	75 60 9 45 9 18 9	277. 440 333 192 539 810.: 666 333	kJ/K (26) (27) (27) (27) (8.75) (28) (6.4) (29) (3.45) (30) (31) (2.85) (32) (32c) (7722) (32c) (3.9) (32d) (3.45) (32e)

and have adjusted		ta:la-la-la-	.datio.a										
can be used instead Thermal bridge				usina An	nendix k	K						7.41	(36)
if details of therma	,	,			•							7.41	(30)
Total fabric hea	0 0		()	(0	-/			(33) +	(36) =			51.84	(37)
Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)	1		_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99		(38)
Heat transfer of	coefficier	nt, W/K		-		-		(39)m	= (37) + (37)	38)m	-	•	
(39)m= 82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83		
Heat loss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷		12 /12=	82.83	(39)
(40)m= 1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
Number of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.12	(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:	
Assumed occu	ipancy I	N								2	.34		(42)
if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)	.54		(42)
Annual averag	e hot wa).81		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	f		•	
	Feb	Mar				Jul	L	Son	Oct	Nov	Dec		
Jan Hot water usage ir			Apr ach month	May Vd,m = fa	Jun ctor from 7		Aug (43)	Sep	Oct	INOV	Dec		
(44)m= 98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42	88.01	91.6	95.2	98.79		
()							<u> </u>		Total = Su	<u> </u>	<u> </u>	1077.7	(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= 146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49	102.7	119.69	130.65	141.88		
If instantaneous w	atar haati	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	havas (16		Total = Su	m(45) ₁₁₂ =	=	1413.04	(45)
If instantaneous w			,				· · ·	. ,	47.05	100	04.00	I	(46)
(46)m= 21.98 Water storage	19.22 loss:	19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage		ا لم معمله م	ft-	معامات	/1.\\/h	- /-l-: ·\·						1	(10)
a) If manufact				JI IS KIIO	WII (KVVI	i/uay).					0		(48)
Temperature fa							(40) (40)				0		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)	· =			0		(50)
Hot water stora			-								0		(51)
If community h	_		on 4.3									· I	
Volume factor Temperature fa			2h							-	0		(52)
romperature to	uotoi IIO	III TADIC	20								0		(53)

Energy lost from Enter (50) or			(47) x (51)	x (52) x (53) =		0	(54	•				
Water storage	, , ,	,	for each	month			((56)m = (55) × (41)ı	m		0	(55	')
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0	(56	3)
If cylinder contain	ns dedicate	d solar sto	rage, (57)	m = (56)m		H11)] ÷ (5	0), else (57	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 (ar	nual) fro	m Table	3							0	(58	3)
Primary circui					59)m = (58) ÷ 36	55 × (41)	m				•	
(modified b	y factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)	•	•	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0	(59))
Combi loss ca	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76	(61)
Total heat red	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64	(62	<u>'</u>)
Solar DHW input									r contributi	on to wate	er heating)		
(add additiona	1	r	r	ı —								l (62	o.\
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	(63	•
FHRS 0	0	0	0	0	0	0	0	0	0	0	0	(63	3) (G2)
Output from v	1	r	400.50	404.00	400.70	400.0	445.05	440.00	400.45	440.00	455.04	1	
(64)m= 160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45 ater heater	143.96	155.64	1575.01 (64	1)
Heat gains fro	m water	hooting	k\\/h/m/	onth 0.2	5 ′ [N 95	v (45)m	·						'
(65)m= 52.15	45.71	47.4	41.66	40.22	35.06	32.85	37.18	37.48	43.24	46.77	50.61] (65	5)
include (57)	ļ	<u> </u>	<u> </u>	ļ	ļ.				ļ.		ļ	`	,
5. Internal g					yiii laci i		weiling	or riot w	ator is in	OIII COIII	indinity i		
Metabolic gai	·)•									
Jan	Feb	Mar											
(66)m= 117.07	+	-	I Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	1	
Lighting going		117.07	Apr 117.07	May 117.07	Jun 117.07	Jul 117.07	Aug 117.07	Sep	Oct	Nov 117.07	Dec 117.07	(66	i)
Lighting gains	(calcula	<u> </u>	117.07	117.07	117.07	117.07	117.07	117.07				(66	i)
(67)m= 19.22	(calcula	<u> </u>	117.07	117.07	117.07	117.07	117.07	117.07				(66	,
· -	17.07	ted in Ap	117.07 opendix 10.51	117.07 L, equat	117.07 ion L9 oi 6.63	117.07 L9a), a	117.07 lso see 9.32	117.07 Table 5	117.07	117.07	117.07	`	,
(67)m= 19.22	17.07 ains (calc	ted in Ap	117.07 opendix 10.51	117.07 L, equat	117.07 ion L9 oi 6.63	117.07 L9a), a	117.07 lso see 9.32	117.07 Table 5	117.07	117.07	117.07	`	7)
(67)m= 19.22 Appliances ga	17.07 ains (calc	13.89 ulated ir 203.41	117.07 opendix 10.51 n Append 191.91	117.07 L, equat 7.86 dix L, eq	117.07 ion L9 or 6.63 uation L 163.73	117.07 L9a), a 7.17 13 or L1 154.61	117.07 Iso see 9.32 3a), also	117.07 Table 5 12.51 see Tal 157.87	117.07 15.88 ble 5 169.38	117.07	117.07 19.76	(67	7)
(67)m= 19.22 Appliances ga (68)m= 206.67	17.07 ains (calc	13.89 ulated ir 203.41	117.07 opendix 10.51 n Append 191.91	117.07 L, equat 7.86 dix L, eq	117.07 ion L9 or 6.63 uation L 163.73	117.07 L9a), a 7.17 13 or L1 154.61	117.07 Iso see 9.32 3a), also	117.07 Table 5 12.51 see Tal 157.87	117.07 15.88 ble 5 169.38	117.07	117.07 19.76	(67	7)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains	17.07 ains (calc 208.82 s (calcula 34.71	ted in Ap 13.89 ulated in 203.41 ated in A 34.71	117.07 ppendix 10.51 Append 191.91 ppendix 34.71	117.07 L, equat 7.86 dix L, eq 177.38 L, equat	117.07 ion L9 or 6.63 uation L 163.73	117.07 r L9a), a 7.17 13 or L1 154.61 or L15a)	117.07 lso see - 9.32 3a), also 152.47 , also se	117.07 Fable 5 12.51 see Tal 157.87 ee Table	117.07 15.88 ble 5 169.38	117.07 18.53 183.9	117.07 19.76 197.55	(67	7)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71	17.07 ains (calc 208.82 s (calcula 34.71	ted in Ap 13.89 ulated in 203.41 ated in A 34.71	117.07 ppendix 10.51 Append 191.91 ppendix 34.71	117.07 L, equat 7.86 dix L, eq 177.38 L, equat	117.07 ion L9 or 6.63 uation L 163.73	117.07 r L9a), a 7.17 13 or L1 154.61 or L15a)	117.07 lso see - 9.32 3a), also 152.47 , also se	117.07 Fable 5 12.51 see Tal 157.87 ee Table	117.07 15.88 ble 5 169.38	117.07 18.53 183.9	117.07 19.76 197.55	(67	7) 3) 9)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71 Pumps and fa	17.07 ains (calc 208.82 s (calcula 34.71 ans gains 3	ted in Ap 13.89 ulated in 203.41 tted in A 34.71 (Table §	117.07 ppendix 10.51 Append 191.91 ppendix 34.71 5a)	117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71	117.07 ion L9 or 6.63 uation L 163.73 tion L15 34.71	117.07 L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	117.07 Iso see - 9.32 3a), also 152.47 , also se 34.71	117.07 Fable 5 12.51 see Tal 157.87 ee Table 34.71	117.07 15.88 ble 5 169.38 5 34.71	117.07 18.53 183.9 34.71	117.07 19.76 197.55	(67 (68 (69	7) 3) 9)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71 Pumps and fa (70)m= 3	17.07 ains (calc 208.82 s (calcula 34.71 ans gains 3	ted in Ap 13.89 ulated in 203.41 tted in A 34.71 (Table §	117.07 ppendix 10.51 Append 191.91 ppendix 34.71 5a)	117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71	117.07 ion L9 or 6.63 uation L 163.73 tion L15 34.71	117.07 L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	117.07 Iso see - 9.32 3a), also 152.47 , also se 34.71	117.07 Fable 5 12.51 see Tal 157.87 ee Table 34.71	117.07 15.88 ble 5 169.38 5 34.71	117.07 18.53 183.9 34.71	117.07 19.76 197.55	(67 (68 (69	7) 3) 9)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71 Pumps and fa (70)m= 3 Losses e.g. e	17.07 ains (calculation 208.82 s (calculation 34.71 ans gains 3 vaporation -93.66	ted in Ap 13.89 ulated in 203.41 ated in A 34.71 (Table 5 3 on (negar	117.07 ppendix 10.51 n Appendix 191.91 ppendix 34.71 5a) 3 tive valu	117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	117.07 ion L9 or 6.63 uation L 163.73 tion L15 34.71 3	117.07 L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	117.07 Fable 5 12.51 see Tal 157.87 ee Table 34.71	117.07 15.88 ble 5 169.38 5 34.71	117.07 18.53 183.9 34.71	117.07 19.76 197.55 34.71	(67) (68) (69)	7) 3) 9)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -93.66	17.07 ains (calculation 208.82 s (calculation 34.71 ans gains 3 vaporation -93.66	ted in Ap 13.89 ulated in 203.41 ated in A 34.71 (Table 5 3 on (negar	117.07 ppendix 10.51 n Appendix 191.91 ppendix 34.71 5a) 3 tive valu	117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	117.07 ion L9 or 6.63 uation L 163.73 tion L15 34.71 3	117.07 L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	117.07 Fable 5 12.51 see Tal 157.87 ee Table 34.71	117.07 15.88 ble 5 169.38 5 34.71	117.07 18.53 183.9 34.71	117.07 19.76 197.55 34.71	(67) (68) (69)	77) 33) 99)
(67)m= 19.22 Appliances ga (68)m= 206.67 Cooking gains (69)m= 34.71 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -93.66 Water heating	17.07 ains (calcolors) 208.82 s (calculation) 34.71 ans gains 3 vaporation -93.66 g gains (T	ted in Ap 13.89 ulated in 203.41 ted in A 34.71 (Table 5 3 on (nega) -93.66 able 5) 63.71	117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a) 3 tive valu -93.66	117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	117.07 ion L9 or 6.63 uation L 163.73 tion L15 34.71 3 ole 5) -93.66	117.07 L9a), a 7.17 13 or L1 154.61 or L15a) 34.71 3	117.07 Iso see - 9.32 3a), also 152.47 , also se 34.71 3 -93.66	117.07 Fable 5 12.51 see Tal 157.87 ee Table 34.71 3 -93.66	117.07 15.88 ble 5 169.38 5 34.71 3	117.07 18.53 183.9 34.71 3 -93.66	117.07 19.76 197.55 34.71 3 -93.66	(67) (68) (69) (70)	77) 33) 90) 11)

6. Solar gains:

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

Orientation:	Access Factor Table 6d	m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	X	6.51	x	36.79	x	0.45	x	1.11	=	83	(77)
Southeast 0.9x	0.77	X	6.51	x	62.67	x	0.45	x	1.11	=	141.37	(77)
Southeast 0.9x	0.77	X	6.51	x	85.75	X	0.45	X	1.11	=	193.43	(77)
Southeast 0.9x	0.77	x	6.51	x	106.25	x	0.45	x	1.11	=	239.67	(77)
Southeast 0.9x	0.77	X	6.51	x	119.01	x	0.45	x	1.11	=	268.45	(77)
Southeast 0.9x	0.77	x	6.51	x	118.15	x	0.45	X	1.11	=	266.51	(77)
Southeast 0.9x	0.77	X	6.51	x	113.91	x	0.45	x	1.11	=	256.95	(77)
Southeast 0.9x	0.77	x	6.51	x	104.39	x	0.45	x	1.11	=	235.48	(77)
Southeast 0.9x	0.77	X	6.51	x	92.85	x	0.45	x	1.11	=	209.45	(77)
Southeast 0.9x	0.77	X	6.51	x	69.27	x	0.45	x	1.11	=	156.25	(77)
Southeast 0.9x	0.77	x	6.51	x	44.07	x	0.45	x	1.11	=	99.41	(77)
Southeast 0.9x	0.77	x	6.51	x	31.49	x	0.45	x	1.11	=	71.03	(77)
Southwest _{0.9x}	0.77	X	2.28	x	36.79]	0.45	x	1.11	=	29.07	(79)
Southwest _{0.9x}	0.77	X	2.28	x	62.67]	0.45	x	1.11	=	49.51	(79)
Southwest _{0.9x}	0.77	X	2.28	x	85.75		0.45	x	1.11	=	67.75	(79)
Southwest _{0.9x}	0.77	X	2.28	x	106.25]	0.45	x	1.11	=	83.94	(79)
Southwest _{0.9x}	0.77	X	2.28	x	119.01		0.45	x	1.11	=	94.02	(79)
Southwest _{0.9x}	0.77	X	2.28	x	118.15		0.45	x	1.11	=	93.34	(79)
Southwest _{0.9x}	0.77	x	2.28	x	113.91		0.45	x	1.11	=	89.99	(79)
Southwest _{0.9x}	0.77	x	2.28	x	104.39		0.45	x	1.11	=	82.47	(79)
Southwest _{0.9x}	0.77	X	2.28	x	92.85		0.45	X	1.11	=	73.35	(79)
Southwest _{0.9x}	0.77	X	2.28	x	69.27		0.45	X	1.11	=	54.72	(79)
Southwest _{0.9x}	0.77	X	2.28	X	44.07		0.45	X	1.11	=	34.82	(79)
Southwest _{0.9x}	0.77	X	2.28	x	31.49		0.45	X	1.11	=	24.88	(79)
Northwest 0.9x	0.77	X	3.06	X	11.28	X	0.45	X	1.11	=	11.96	(81)
Northwest 0.9x	0.77	X	3.06	X	22.97	X	0.45	X	1.11	=	24.35	(81)
Northwest 0.9x	0.77	X	3.06	x	41.38	X	0.45	X	1.11	=	43.87	(81)
Northwest 0.9x	0.77	X	3.06	X	67.96	X	0.45	X	1.11	=	72.05	(81)
Northwest 0.9x	0.77	X	3.06	X	91.35	X	0.45	X	1.11	=	96.85	(81)
Northwest 0.9x	0.77	X	3.06	x	97.38	X	0.45	X	1.11	=	103.26	(81)
Northwest 0.9x	0.77	X	3.06	x	91.1	X	0.45	X	1.11	=	96.59	(81)
Northwest 0.9x	0.77	X	3.06	X	72.63	X	0.45	X	1.11	=	77.01	(81)
Northwest 0.9x	0.77	X	3.06	x	50.42	x	0.45	x	1.11	=	53.46	(81)
Northwest 0.9x	0.77	X	3.06	x	28.07	X	0.45	x	1.11	=	29.76	(81)
Northwest 0.9x	0.77	X	3.06	x	14.2	x	0.45	x	1.11	=	15.05	(81)
Northwest 0.9x	0.77	X	3.06	x	9.21	x	0.45	x	1.11	=	9.77	(81)

7			alculated				i	` 	um(74)m .			i	I	
(83)m=		215.24	305.05	395.67	459.33	463.11	443.53	394.95	336.26	240.73	149.28	105.67		(83)
Ī			nd solar			` ,						1	1	
(84)m=	481.14	570.27	647.18	717.06	759.74	743.3	710.58	667.84	619.82	545.22	477.8	452.13		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.97	0.95	0.89	0.79	0.64	0.49	0.54	0.75	0.92	0.98	0.99		(86)
Mean	interna	l tampar	ature in	livina ar	22 T1 (fc	ullow sta	ns 3 to 7	in Tabl	o 0c)					
(87)m=	19.37	19.6	19.95	20.35	20.69	20.9	20.97	20.96	20.81	20.36	19.77	19.31		(87)
` ′ [<u>l</u>	<u> </u>	20.00	10.77	10.01		(0.)
·r			eating p					· ·	· ` ′			1	1	
(88)m=	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	0.98	0.97	0.94	0.87	0.74	0.56	0.39	0.43	0.68	0.9	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to	7 in Tabl	e 9c)				
(90)m=	18.5	18.74	19.07	19.46	19.77	19.93	19.98	19.97	19.87	19.47	18.9	18.44		(90)
(3.3)								<u> </u>	l f	LA = Livin		1 4) =	0.2	(91)
											`	,	0.2	
Ī			ature (fo				1		A) × T2			ı	Ī	
(92)m=	18.68	18.91	19.25	19.64	19.96	20.13	20.18	20.17	20.06	19.65	19.08	18.62		(92)
							1	r	ere appro	·			1	
(93)m=	18.53	18.76	19.1	19.49	19.81	19.98	20.03	20.02	19.91	19.5	18.93	18.47		(93)
			uirement											
						ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
tne uti			or gains					I .	0	0.1	NI.	Б		
1.14:1:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.98	0.96	ains, hm _{0.92}	0.86	0.73	0.56	0.39	0.44	0.68	0.88	0.96	0.98		(94)
						0.56	0.39	0.44	0.66	0.66	0.96	0.96		(34)
(95)m=	470.02	546.83	W = (94) 598.63	613.49	557.3	414.96	277.89	290.83	419.3	482.29	459.16	443.55		(95)
							211.09	290.63	419.3	402.29	459.16	443.55		(55)
(96)m=	11y avera	4.9	rnal tem 6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							<u> </u>				7.1	4.2		(30)
r	1178.84		an intern 1043.7	877.23	671.54	445.58	284.06	-``	– (96)m	737.33	979.97	1181.87	I	(97)
` ' L								300.07	481.47			1101.07		(91)
· .							i)m – (95 I	<u> </u>	_	540.04	I	
(98)m=	527.36	404.19	331.13	189.89	85	0	0	0	0	189.75	374.98	549.31		7(00)
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2651.61	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								35.78	(99)
9a. Ene	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems_i	ncluding	micro-C	CHP)					
Space	e heatir	ng:												
Fraction	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)

(s)		(202) = 1	- (201) =				1	(202)		
n 1		(204) = (2	02) x [1 –	(203)] =			1	(204)		
1							90.5	(206)		
eating system	ո, %						0	(208)		
	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar		
 	I 0			100.75	074.00	540.04	1			
85 0	0	0	0	189.75	374.98	549.31		(011)		
3 92 0	Ι ο	l 0	0	209 66	414 34	606 97	1	(211)		
5.02							2929.95	(211)		
nth								_``		
							_			
0 0	0	0	0	0	0	0		_		
		Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)		
)										
	102.2	115.25	116.02	133.45	143.96	155.64				
I	<u> </u>	<u> </u>	I.	<u>I</u>	<u>I</u>	l	87.3	(216)		
3.57 87.3	87.3	87.3	87.3	89.15	89.59	89.77		(217)		
							•			
0.41 124.58	117.07	132.01	132.89	149.69	160.69	173.37				
1							1773.38	(219)		
				k'	Wh/year	•	kWh/year			
							2929.95			
							1773.38			
p-hot										
t or positive i	nput fror	n outside	Э			49.6		(230a		
						30		(2300		
						45		(230		
		sum	of (230a).	(230g) =			124.6	(231)		
								(232)		
								(233)		
(221) ± (231)	+ (232)	(237h)	_					(338)		
, , , ,							4003.32			
systems mon	uaing mi	сто-Спг								
						tor				
(21	1) x			0.2	16	=	632.87	(261)		
Space heating (secondary) (215) \times 0.519 =										
`	-,			0.5	19		0	(263)		
	May Jun bove) 85 0 3.92 0 nth 0 0 e) 4.36 108.76 8.57 87.3 0.41 124.58 ep-hot t or positive in kW (21	m 1 1 eating system, % May Jun Jul bove) 85 0 0 3.92 0 0 nth 0 0 0 re) 4.36 108.76 102.2 8.57 87.3 87.3 0.41 124.58 117.07 ep-hot tor positive input from the t	m 1 (204) = (2 1 eating system, % May Jun Jul Aug bove) 85 0 0 0 Tota nth 0 0 0 0 Tota 14.36 108.76 102.2 115.25 8.57 87.3 87.3 87.3 10.41 124.58 117.07 132.01 Tota rep-hot t or positive input from outside sum (221) + (231) + (232)(237b) systems including micro-CHF Energy kWh/year (211) x	m 1 (204) = (202) × [1 – 1] eating system, % May Jun Jul Aug Sep bove) 85 0 0 0 0 0 Total (kWh/yea nth 0 0 0 0 0 0 Total (kWh/yea ee) 4.36 108.76 102.2 115.25 116.02 8.57 87.3 87.3 87.3 87.3 87.3 10.41 124.58 117.07 132.01 132.89 Total = Sum(2	n 1	m 1	1 (204) = (202) x [1 - (203)] = 1 seating system, % May Jun Jul Aug Sep Oct Nov Dec Dove) 85 0 0 0 0 0 189.75 374.98 549.31 3.92 0 0 0 0 0 209.66 414.34 606.97 Total (kWh/year) = Sum(211) _{1.5.1919} nth 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215) _{1.5.1919} 19) 14.36 108.76 102.2 115.25 116.02 133.45 143.96 155.64 3.57 87.3 87.3 87.3 87.3 87.3 89.15 89.59 89.77 Total = Sum(219a) _{1.12} = kWh/year 10.41 124.58 117.07 132.01 132.89 149.69 160.69 173.37 Total = Sum(219a) _{1.12} = kWh/year 10.41 124.58 117.07 132.01 132.89 149.69 160.69 173.37 Ep-hot t or positive input from outside 49.6 30 45 sum of (230a)(230g) = (221) + (231) + (232)(237b) = systems including micro-CHP Energy kWh/year kWh/year kg CO2/kWh (211) x 0.216 =	1 1 200 20		

Space and water heating	(261) + (262) + (263) + (264) =			1015.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	64.67	(267)
Electricity for lighting	(232) x	0.519	=	176.2	(268)
Energy saving/generation technologies Item 1		0.519	=	-250.12	(269)
Total CO2, kg/year	sum	n of (265)(271) =		1006.68	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =		13.59	(273)
El rating (section 14)				89	(274)

		User Details:			
Assessor Name:	Ben Tunningley	Stroma Nur	nber: STR	O027495	
Software Name:	Stroma FSAP 2012	Software Ve	ersion: Versi	ion: 1.0.5.41	
	Pro	operty Address: Plot 0	32		
Address :	15 Buttercup Road , Bishops	Waltham, SOUTHAM	PTON , SO32 1RF		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m ²	<u>-</u>
Ground floor		37.05 (1a) x	2.4 (2a) =	88.92	(3a)
First floor		37.05 (1b) x	2.67 (2b) =	98.92	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	74.1 (4)			
Dwelling volume		(3a)+(3	(3c)+(3c)+(3d)+(3e)+(3n) =	187.84	(5)
2. Ventilation rate:					
	main secondary heating heating	other	total	m³ per hou	ir
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		3 x 10 =	30	(7a)
Number of passive vents	;		0 x 10 =	0	(7b)
Number of flueless gas fi	res		0 x 40 =	0	(7c)
				hongoo nor h	
Inditantian due to alcience	(Co) (Ch) (70	() (/ 7b) (/ 7c)		changes per ho	_
'	ys, flues and fans = (6a)+(6b)+(7a neen carried out or is intended, proceed		\div (5) =	0.16	(8)
Number of storeys in the		to (11), otherwise continue	110111 (9) 10 (10)	0	(9)
Additional infiltration	To arresming (ine)		[(9)-1]x0.1 =		(10)
Structural infiltration: 0	.25 for steel or timber frame or (0.35 for masonry cons		0	(11)
	resent, use the value corresponding to t				
	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0)	0	(12)
If no draught lobby, en	ter 0.05, else enter 0			0	(13)
Percentage of windows	s and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square r	metre of envelope area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)		0.41	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeabilit	y is being used		
Number of sides sheltered	ed			2	(19)
Shelter factor		(20) = 1 - [0.075 x]		0.85	(20)
Infiltration rate incorporat	_	$(21) = (18) \times (20) =$:	0.35	(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			_	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

vvina racioi (2	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	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
0.44	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41]	
Calculate effe		-	rate for t	he appli	cable ca	se	•	•	•	•	•		(00-)
If exhaust air h			endix N (2	3h) = (23a	ı) × Fmv (e	equation (N	N5)) othe	rwise (23h) = (23a)			0	(23a)
If balanced with) = (20a)			0	(23b) (23c)
a) If balance		,	,	Ū		`		,	2h)m + (23b) x [1 – (23c)		(230)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24b	m = (22)	2b)m + (23b)	I	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h	nouse ex	tract ven	tilation o	or positiv	e input	ventilatio	n from o	outside	•	•		-	
if (22b)r	n < 0.5 ×	(23b), t	hen (24)	c) = (23b)	<u> </u>	wise (24	c) = (22l	o) m + 0.	.5 × (23b)		1	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural	ventilation $n = 1$, the			•	•				0.51				
(24d)m = 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	1	(24d)
Effective air	change	rate - er	ıter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (25)				1	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	1	(25)
3. Heat losse	es and he	eat loss r	paramete	er.								-	
ELEMENT		Ja: 1000 p	Jaraniot	· · ·									
	Gros	SS	Openin	gs	Net Ar	ea	U-val	ue	ΑXU		k-value	9	ΑΧk
	Gros area	_	Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doors	area	_	•	-		m² x	W/m2	2K = [K)			
Doors Windows Type	area	_	•	-	A ,r	m² x	W/m2	2K = [(W/	K)			kJ/K
Doors Windows Type Windows Type	area e 1 e 2	_	•	-	A ,r	m² x x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	2K = [· 0.04] = [· 0.04] = [(W/	K)			kJ/K (26)
Doors Windows Type Windows Type Windows Type	area e 1 e 2	_	•	-	A ,r 2.1 3.06	m ² x x10 x10	W/m2 1 /[1/(1.4)+	2K = [· 0.04] = [· 0.04] = [2.1 4.06	K)			kJ/K (26) (27)
Doors Windows Type Windows Type Windows Type Floor	area e 1 e 2	_	•	-	A ,r 2.1 3.06 6.51	x1. x1. x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	2K = [· 0.04] = [· 0.04] = [2.1 4.06 8.63				kJ/K (26) (27) (27)
Doors Windows Type Windows Type Windows Type Floor Walls	area e 1 e 2	(m²)	•		A ,r 2.1 3.06 6.51 2.28	x1. x1. x1. x1. x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = [0.04] = [0.04] = [0.04] = [2.1 4.06 8.63 3.02				kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Floor Walls Roof	area e 1 e 2 e 3 87.3	(m²) 39	· m		A ,r 2.1 3.06 6.51 2.28 37.05	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = [0.04] = [0.04] = [0.04] = [= = [(W// 2.1 4.06 8.63 3.02 4.8165				kJ/K (26) (27) (27) (27) (28)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	area e 1 e 2 e 3 87.3	(m²) 39	13.9		A ,r 2.1 3.06 6.51 2.28 37.05	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	eK = [0.04] = [0.04] = [0.04] = [= = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22				kJ/K (26) (27) (27) (27) (28) (29)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 39	13.9		A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	eK = [0.04] = [0.04] = [0.04] = [= = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22				(26) (27) (27) (27) (28) (29) (30)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall **	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 39	13.9		A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82				kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 39	13.9		A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82				kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 39	13.9		A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = [- 0.04] = [- 0.04] = [- 0.04] = [- = [- = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82				kJ/K (26) (27) (27) (28) (29) (30) (31) (32) (32c)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal floor Internal ceiling	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 39 05 , m²	13.99 0	5	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	EK = [0.04] = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82		kJ/m²-	K	(26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	area e 1 e 2 e 3 87.3 37.0 elements	(m²) 99 95 , m²	13.90 0	ndow U-va	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	EK = [0.04] = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82		kJ/m²-	K	kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c) (32d)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor Internal ceiling * for windows and	area e 1 e 2 e 3 87.3 37.0 elements area droof winders on both	(m²) 99 95 , m² ows, use e sides of in	13.99 0	ndow U-va	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calcul	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = [0.04] = [0.04] = [0.04] = [(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82		kJ/m²-	K	(26) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32d) (32e)
Doors Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal floor Internal ceiling * for windows and ** include the area	area e 1 e 2 e 3 87.3 37.0 elements d roof winder as on both ss, W/K: Cm = S(ows, use e sides of in = S (A x (A x k)	13.99 0	ndow U-va	A ,r 2.1 3.06 6.51 2.28 37.05 73.44 37.05 161.4 42.73 59.9 90.09 37.05 37.05 alue calculatitions	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	$\begin{array}{cccc} 2K & & & & & & \\ & & & & & & \\ \hline & & & & &$	(W// 2.1 4.06 8.63 3.02 4.8165 13.22 4.82	as given in	kJ/m²-l	K	kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32d) (32e)

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

aan ha waad inata	ad of a day	tailed solo	ulation										
can be used inste Thermal bridge				usina An	nendix l	K						9.09	(36)
if details of therma	,	,			•							9.09	(30)
Total fabric he	0 0		()	(0	.,			(33) +	(36) =			49.75	(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= 37.1	36.87	36.63	35.54	35.34	34.39	34.39	34.21	34.75	35.34	35.75	36.18		(38)
Heat transfer of	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m		'	
(39)m= 86.86	86.62	86.39	85.3	85.09	84.14	84.14	83.96	84.51	85.09	85.51	85.94		
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	85.3	(39)
(40)m= 1.17	1.17	1.17	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		
Number of day	s in moi	nth (Tabl	le 1a)						Average =	Sum(40) ₁	12 /12=	1.15	(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	ting ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	inancy I	N									24	1	(42)
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 (⁻	TFA -13.	.9)	.34		(42)
Annual averag	e hot wa).81		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	f		•	
						•		Con	Oct	Nov	Doo		
Jan Hot water usage i	Feb n 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= 98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42	88.01	91.6	95.2	98.79		
(11)				•					Total = Su	<u> </u>	<u> </u>	1077.7	(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= 146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49	102.7	119.69	130.65	141.88		
									Total = Su	m(45) ₁₁₂ =	=	1413.04	(45)
If instantaneous w			,				· · ·	. ,				I	
(46)m= 21.98 Water storage	19.22	19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,					_							` '
Otherwise if no	•			_			` '	ers) ente	er '0' in (47)			
Water storage												1	
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		_	-		or ic not		(48) x (49)	=			0		(50)
b) If manufactHot water store			-								0		(51)
If community h	•			`									· /
Volume factor			0.1								0		(52)
Temperature f	actor fro	m Table	2b								0		(53)

•.		m water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0	(54) (55)
	` '	loss cal	•	for each	month			((56)m = (55) × (41):	m		0	(55)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)
		-				x [(50) – (-	_		_	` '
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)
Primar	y circuit	loss (an	nual) fro	m Table	3		-			-		0	(58)
	-	,	•			(59)m = ((58) ÷ 36	55 × (41)	m				•
•	dified by	factor f	rom 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)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 30	65 × (41))m					
(61)m=	50.34	43.82	46.68	43.4	43.02	39.86	41.19	43.02	43.4	46.68	46.95	50.34	(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=	196.84	171.95	178.9	158.68	153.63	135.31	129.63	144.51	146.11	166.37	177.6	192.22	(62)
						κ Η (negati				r contributi	on to wate	er heating)	
•			ı —	1	i	applies	· ·					1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)
Output		ater hea	1		-								1
(64)m=	196.84	171.95	178.9	158.68	153.63	135.31	129.63	144.51	146.11	166.37	177.6	192.22	1
								·		ater heater			1951.74 (64)
_				i	i	5 ´ [0.85						 	
(65)m=	61.3	53.56	55.63	49.18	47.53	41.7	39.7	44.5	45	51.47	55.18	59.76	(65)
inclu				!	<u> </u>	Į	<u> </u>			<u> </u>		<u> </u>	` '
	. ,			. ,	•	ylinder i	s in the			<u> </u>		<u> </u>	` '
	ternal ga	ains (see	Table 5	and 5a	•	ylinder i	s in the o			<u> </u>		<u> </u>	` '
	ernal ga	ains (see	Table 5	and 5a):			dwelling	or hot w	ater is fr	om com	munity h	` '
Metabo	ernal gain olic gain Jan	ains (see s (Table Feb	Table 5 5), Wat Mar	ts Apr): May	Jun	Jul	dwelling	or hot w Sep	ater is fr	om com	munity h	eating
Metabo (66)m=	olic gain Jan 117.07	rains (see	2 Table 5 2 5), Wat Mar 117.07	and 5a ts Apr 117.07	May	Jun 117.07	Jul 117.07	Aug	Sep	ater is fr	om com	munity h	` '
Metabo (66)m= Lightin	olic gain Jan 117.07 g gains	s (Table Feb 117.07 (calcula	E Table 5 5), Wat Mar 117.07 ted in Ap	ts Apr 117.07	May 117.07 L, equat	Jun 117.07 ion L9 o	Jul 117.07 r L9a), a	Aug 117.07	Sep 117.07	Oct	Nov	Dec	neating (66)
Metabo (66)m= Lightin (67)m=	olic gain Jan 117.07 g gains	rains (see as (Table Feb 117.07 (calcula 17.07	* Table 5 * 5), Wat Mar 117.07 ted in Ap	ts Apr 117.07 ppendix 10.51	May 117.07 L, equat	Jun 117.07 ion L9 o	Jul 117.07 r L9a), a	Aug 117.07 Iso see	Sep 117.07 Fable 5	Oct 117.07	om com	munity h	eating
Metabo (66)m= Lightin (67)m= Appliar	olic gain Jan 117.07 g gains 19.22 nces ga	res (Table Feb 117.07 (calculation 17.07) ins (calculations)	Mar 117.07 ted in Ap 13.89 ulated ir	ts Apr 117.07 ppendix 10.51 Append	May 117.07 L, equat 7.86 dix L, eq	Jun 117.07 ion L9 o 6.63 uation L	Jul 117.07 r L9a), a 7.17 13 or L1	Aug 117.07 Iso see 9.32 3a), also	Sep 117.07 Table 5 12.51 see Ta	Oct 117.07 15.88 ble 5	Nov 117.07	Dec 117.07	(66) (67)
Metabo (66)m= Lightin (67)m= Appliar (68)m=	olic gain Jan 117.07 g gains 19.22 nces ga	reins (see reb 117.07 (calcula 17.07 ins (calc	Table 5 5), Wat Mar 117.07 ted in Ap 13.89 ulated ir 203.41	Apr 117.07 ppendix 10.51 Appendix 191.91	May 117.07 L, equat 7.86 dix L, eq	Jun 117.07 ion L9 o 6.63 uation L 163.73	Jul 117.07 r L9a), a 7.17 13 or L1	Aug 117.07 Iso see 9.32 3a), also	Sep 117.07 Table 5 12.51 see Ta	Oct 117.07 15.88 ble 5 169.38	Nov	Dec	neating (66)
Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin	Jan 117.07 g gains 19.22 nces ga 206.67	resident (see see see see see see see see see se	Mar 117.07 ted in Ap 13.89 ulated ir 203.41	Apr 117.07 ppendix 10.51 Append 191.91 ppendix	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a	Aug 117.07 Iso see 9.32 3a), also 152.47	Sep 117.07 Table 5 12.51 see Ta 157.87	Oct 117.07 15.88 ble 5 169.38 5	Nov 117.07 18.53	Dec 117.07 19.76	(66) (67) (68)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m=	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71	res (Table Feb 117.07 (calcular 17.07 ins (calcular 208.82 (calcular 34.71	Mar 117.07 ted in Ap 13.89 ulated ir 203.41 tted in A 34.71	ts Apr 117.07 ppendix 10.51 Append 191.91 ppendix 34.71	May 117.07 L, equat 7.86 dix L, eq	Jun 117.07 ion L9 o 6.63 uation L 163.73	Jul 117.07 r L9a), a 7.17 13 or L1	Aug 117.07 Iso see 9.32 3a), also	Sep 117.07 Table 5 12.51 see Ta	Oct 117.07 15.88 ble 5 169.38	Nov 117.07	Dec 117.07	(66) (67)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai	res (Table Feb 117.07 (calcular 17.07 ins (calcular 208.82 (calcular 34.71 ins gains	Table 5 5), Wat Mar 117.07 ted in Ap 13.89 ulated ir 203.41 tted in A 34.71 (Table 5	Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71	Oct 117.07 15.88 ble 5 169.38 5 34.71	Nov 117.07 18.53 183.9	Dec 117.07 19.76 197.55	(66) (67) (68) (69)
Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai	resins (see Feb 117.07 (calcular 17.07 ins (calcular 208.82 (calcular 34.71 ins gains 3	117.07 ted in Ap 13.89 ulated ir 203.41 tted in A 34.71 (Table \$	and 5a ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a)	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a	Aug 117.07 Iso see 9.32 3a), also 152.47	Sep 117.07 Table 5 12.51 see Ta 157.87	Oct 117.07 15.88 ble 5 169.38 5	Nov 117.07 18.53	Dec 117.07 19.76	(66) (67) (68)
Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai	raporatio	Table 5 5), Wat Mar 117.07 ted in Ap 13.89 ulated in 203.41 tted in A 34.71 (Table 5	ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a) 3 tive valu	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a 34.71	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71	Oct 117.07 15.88 ble 5 169.38 5 34.71	Nov 117.07 18.53 183.9 34.71	Dec 117.07 19.76 197.55 34.71	(66) (67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai	raporatio	ted in Apulated in	and 5a ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a)	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71	Oct 117.07 15.88 ble 5 169.38 5 34.71	Nov 117.07 18.53 183.9	Dec 117.07 19.76 197.55	(66) (67) (68) (69)
Metabout (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai s e.g. ev -93.66 heating	raporatio	Table 5 Solution 193.66 Table 5 Table 5 Mar 117.07 ted in Ap 13.89 ulated in Ap 203.41 ted in Ap 34.71 (Table 5 3 on (negar -93.66	ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a) 3 tive valu -93.66	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71 3 ole 5) -93.66	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a) 34.71	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71 3	Oct 117.07 15.88 ble 5 169.38 5 34.71 3	Nov 117.07 18.53 183.9 34.71 3	Dec 117.07 19.76 197.55 34.71 3	(66) (67) (68) (69) (70)
Metabout (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai 3 s e.g. ev -93.66 heating 82.39	raporation realis (see less (Table Feb 117.07) (calcular 17.07) ins (calcular 208.82) (calcular 34.71) reaporation 3 reaporation 79.7	117.07 ted in Ap 13.89 ulated in 203.41 (Table 5 3 on (negar -93.66 Table 5) 74.78	ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a) 3 tive valu	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71 3 ole 5) -93.66	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a 34.71 3	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71 3	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71 3 -93.66	Oct 117.07 15.88 ble 5 169.38 5 34.71 3 -93.66	Nov 117.07 18.53 183.9 34.71 3	Dec 117.07 19.76 197.55 34.71 3	(66) (67) (68) (69) (70)
Metabout (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	polic gain Jan 117.07 g gains 19.22 nces ga 206.67 ng gains 34.71 s and fai 3 s e.g. ev -93.66 heating 82.39	raporatio	117.07 ted in Ap 13.89 ulated in 203.41 (Table 5 3 on (negar -93.66 Table 5) 74.78	ts Apr 117.07 ppendix 10.51 Appendix 191.91 ppendix 34.71 5a) 3 tive valu -93.66	May 117.07 L, equat 7.86 dix L, eq 177.38 L, equat 34.71 3 es) (Tab	Jun 117.07 ion L9 o 6.63 uation L 163.73 tion L15 34.71 3 ole 5) -93.66	Jul 117.07 r L9a), a 7.17 13 or L1 154.61 or L15a 34.71 3	Aug 117.07 Iso see 9.32 3a), also 152.47 , also se 34.71 3	Sep 117.07 Table 5 12.51 see Ta 157.87 ee Table 34.71 3 -93.66	Oct 117.07 15.88 ble 5 169.38 5 34.71 3	Nov 117.07 18.53 183.9 34.71 3	Dec 117.07 19.76 197.55 34.71 3	(66) (67) (68) (69) (70)

6. Solar gains:

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

Orientation: A	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	6.51	x	36.79	x	0.63	x	0.7	= [73.2	(77)
Southeast _{0.9x}	0.77	x	6.51	x	62.67	x	0.63	x	0.7	=	124.69	(77)
Southeast _{0.9x}	0.77	x	6.51	x	85.75	x	0.63	x	0.7	=	170.61	(77)
Southeast 0.9x	0.77	x	6.51	x	106.25	x	0.63	x	0.7	=	211.39	(77)
Southeast _{0.9x}	0.77	x	6.51	x	119.01	x	0.63	x	0.7	=	236.78	(77)
Southeast 0.9x	0.77	x	6.51	x	118.15	x	0.63	x	0.7	=	235.06	(77)
Southeast _{0.9x}	0.77	x	6.51	x	113.91	x	0.63	x	0.7	=	226.63	(77)
Southeast _{0.9x}	0.77	x	6.51	x	104.39	x	0.63	x	0.7	=	207.69	(77)
Southeast _{0.9x}	0.77	x	6.51	x	92.85	x	0.63	x	0.7	=	184.73	(77)
Southeast _{0.9x}	0.77	x	6.51	x	69.27	x	0.63	x	0.7	=	137.81	(77)
Southeast 0.9x	0.77	x	6.51	x	44.07	x	0.63	x	0.7	=	87.68	(77)
Southeast _{0.9x}	0.77	x	6.51	x	31.49	x	0.63	x	0.7	=	62.65	(77)
Southwest _{0.9x}	0.77	x	2.28	x	36.79		0.63	x	0.7	= [25.64	(79)
Southwest _{0.9x}	0.77	x	2.28	x	62.67		0.63	X	0.7	=	43.67	(79)
Southwest _{0.9x}	0.77	x	2.28	x	85.75		0.63	x	0.7	=	59.75	(79)
Southwest _{0.9x}	0.77	x	2.28	x	106.25		0.63	x	0.7	= [74.04	(79)
Southwest _{0.9x}	0.77	x	2.28	x	119.01		0.63	X	0.7	=	82.93	(79)
Southwest _{0.9x}	0.77	x	2.28	x	118.15		0.63	x	0.7	=	82.33	(79)
Southwest _{0.9x}	0.77	x	2.28	x	113.91		0.63	x	0.7	= [79.37	(79)
Southwest _{0.9x}	0.77	x	2.28	x	104.39		0.63	x	0.7	= [72.74	(79)
Southwest _{0.9x}	0.77	x	2.28	x	92.85		0.63	x	0.7	=	64.7	(79)
Southwest _{0.9x}	0.77	x	2.28	x	69.27		0.63	X	0.7	=	48.27	(79)
Southwest _{0.9x}	0.77	x	2.28	x	44.07		0.63	X	0.7	=	30.71	(79)
Southwest _{0.9x}	0.77	x	2.28	x	31.49		0.63	X	0.7	=	21.94	(79)
Northwest _{0.9x}	0.77	x	3.06	x	11.28	x	0.63	x	0.7	=	10.55	(81)
Northwest _{0.9x}	0.77	x	3.06	x	22.97	x	0.63	x	0.7	=	21.48	(81)
Northwest 0.9x	0.77	x	3.06	x	41.38	x	0.63	x	0.7	=	38.7	(81)
Northwest _{0.9x}	0.77	x	3.06	x	67.96	x	0.63	x	0.7	=	63.55	(81)
Northwest _{0.9x}	0.77	x	3.06	x	91.35	x	0.63	x	0.7	=	85.42	(81)
Northwest 0.9x	0.77	x	3.06	x	97.38	x	0.63	x	0.7	=	91.07	(81)
Northwest _{0.9x}	0.77	x	3.06	x	91.1	x	0.63	X	0.7	=	85.2	(81)
Northwest _{0.9x}	0.77	x	3.06	х	72.63	X	0.63	X	0.7	=	67.92	(81)
Northwest 0.9x	0.77	x	3.06	x	50.42	х	0.63	x	0.7	=	47.15	(81)
Northwest 0.9x	0.77	X	3.06	x	28.07	х	0.63	x	0.7	=	26.25	(81)
Northwest 0.9x	0.77	X	3.06	x	14.2	x	0.63	x	0.7	j = j	13.28	(81)
Northwest _{0.9x}	0.77	X	3.06	x	9.21	х	0.63	х	0.7	=	8.62	(81)

ī			alculated				·	` 	um(74)m .		1		ı	(00)
(83)m=	109.39	189.84	269.06	348.98	405.13	408.46	391.19	348.35	296.58	212.32	131.66	93.2		(83)
Ĭ			nd solar	` ,	, ,						ı		1	
(84)m=	478.8	556.55	622.25	680.82	715.38	697.87	667.47	631.07	590.59	527.88	471.86	451.96		(84)
7. Mea	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area t	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							_
ſ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.95	0.87	0.71	0.54	0.59	0.83	0.97	0.99	1		(86)
Mean	internal	temper	atura in	living ar	22 T1 (fc	ullow sta	ns 3 to 7	in Tabl	o 0c)		<u> </u>			
(87)m=	19.77	19.94	20.19	20.52	20.79	20.95	20.99	20.98	20.88	20.53	20.09	19.74		(87)
` ′ L							<u> </u>	<u> </u>	ļ	20.00	20.00	10.7 4		(0.)
· r								able 9, T	<u> </u>				ı	
(88)m=	19.94	19.94	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.95		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.94	0.83	0.62	0.42	0.47	0.75	0.95	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to	7 in Tabl	e 9c)				
(90)m=	18.31	18.55	18.92	19.39	19.75	19.94	19.97	19.97	19.87	19.42	18.79	18.28		(90)
(3.3)								<u> </u>	l f	LA = Livin	g area ÷ (4		0.2	(91)
											`	,	0.2	
Г			· `				1	+ (1 – fL	A) × T2		T		i	
(92)m=	18.61	18.84	19.18	19.62	19.97	20.14	20.18	20.18	20.08	19.64	19.05	18.58		(92)
г							1	r	ere appro	·			1	
(93)m=	18.61	18.84	19.18	19.62	19.97	20.14	20.18	20.18	20.08	19.64	19.05	18.58		(93)
•		·	uirement											
						ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
tne uti			or gains					I .	0	0.1		Dire		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	ains, hm _{0.97}	0.93	0.83	0.64	0.45	0.49	0.76	0.95	0.99	1		(94)
L						0.64	0.45	0.49	0.76	0.95	0.99	1		(34)
(95)m=	476.17	550.05	W = (94)	633.26	591.67	444.54	298.04	312.14	451.13	500.15	466.53	450.06		(95)
L							296.04	312.14	451.13	500.15	400.55	450.06		(55)
(96)m=	11y avera	age exte	rnal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
L							<u> </u>				7.1	4.2		(30)
г	1243.02		an intern 1095.71	914.57	703.38	Lm , vv =	=[(39)m 300.96	x [(93)m 316.97	- (96)m	769.57	1021.00	1005.67	I	(97)
` ′ L							<u> </u>	L				1235.67		(97)
. г		<u> </u>					·	`)m – (95 I	<u> </u>		5045	I	
(98)m=	570.54	441.67	364.69	202.55	83.11	0	0	0	0	200.45	399.93	584.5		7(00)
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2847.44	(98)
Space	e heating	g require	ement in	kWh/m²	?/year								38.43	(99)
9a. Ene	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems_i	ncluding	micro-C	CHP)					
Space	e heatir	ıg:												
Fraction	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)

									_
Fraction of space heat from main system(s)		(202) = 1 - (201) =							(202)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =								1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above) 570.54 441.67 364.69 202.55 83.11	0	0	0	0	200.45	399.93	584.5	1	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$			Ŭ I	0	200.40	000.00	004.0	J	(211)
610.85 472.88 390.46 216.86 88.99	0	0	0	0	214.62	428.2	625.8]	(211)
			Total	(kWh/yea	ar) =Sum(2	L 211) _{15,1012}	=	3048.65	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Total	0	0	0	0	_	7(045)
Materia			Total	(KVVII/yea	ar) =Surri(2	215) _{15,1012}	=	0	(215)
Water heating Output from water heater (calculated above)									
	135.31	129.63	144.51	146.11	166.37	177.6	192.22		
Efficiency of water heater								80.3	(216)
(217)m= 87.57 87.32 86.81 85.67 83.58	80.3	80.3	80.3	80.3	85.52	87.03	87.67		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '								1	
(219)m= 224.77 196.91 206.09 185.22 183.81	168.5	161.44	179.96	181.95	194.54	204.06	219.25		
(219)m= 224.77 196.91 206.09 185.22 183.81	168.5	161.44		181.95 = Sum(2		204.06	219.25	2306.51	(219)
Annual totals	168.5	161.44			19a) ₁₁₂ =	204.06 Wh/year		2306.51 kWh/year	(219)
Annual totals Space heating fuel used, main system 1	168.5	161.44			19a) ₁₁₂ =	<u>I</u>			(219)
Annual totals	168.5	161.44			19a) ₁₁₂ =	<u>I</u>		kWh/year	(219)
Annual totals Space heating fuel used, main system 1	168.5	161.44			19a) ₁₁₂ =	<u>I</u>		kWh/year 3048.65	(219)
Annual totals Space heating fuel used, main system 1 Water heating fuel used	168.5	161.44			19a) ₁₁₂ =	<u>I</u>		kWh/year 3048.65	(219) (230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	168.5	161.44			19a) ₁₁₂ =	<u>I</u>		kWh/year 3048.65	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	168.5	161.44	Total	= Sum(2 ⁻¹	19a) ₁₁₂ =	Wh/year	30	kWh/year 3048.65	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	168.5	161.44	Total	= Sum(2 ⁻¹	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 3048.65 2306.51	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Total	= Sum(2 ⁻¹)	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 3048.65 2306.51	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) +	(231)	+ (232).	sum (= Sum(2)	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 3048.65 2306.51 75 339.51	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	(231)	+ (232).	sum (= Sum(2)	19a) ₁₁₂ = k 1	Wh/year	30 45	kWh/year 3048.65 2306.51 75 339.51 5769.66	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) +	· (231) ns inclu Enc	+ (232). ding mid	sum (= Sum(2)	19a) ₁₁₂ = k1	Wh/year	30 45	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system	· (231) ns inclu Enc	+ (232). ding midergy h/year	sum (= Sum(2)	19a) ₁₁₂ = k1(230g) =	ion fac	30 45	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions kg CO2/yea	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1)	e (231) ns inclu End kW (211	+ (232). ding midergy h/year	sum (= Sum(2)	19a) ₁₁₂ = k1(230g) = Emiss kg CO2	ion fac 2/kWh	30 45 tor	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions kg CO2/yea 658.51	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	(231)	+ (232). ding mid ergy h/year) ×) ×	sum (= Sum(2)	19a) ₁₁₂ = k1(230g) = Emiss kg CO: 0.2	ion fac 2/kWh	30 45 tor =	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions kg CO2/yea 658.51	(230c) (230e) (231) (232) (338) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	(231) es inclu Enc kW (211 (215 (219	+ (232). ding mid ergy h/year) ×) ×) ×	sum o	= Sum(2'	19a) ₁₁₂ = k1(230g) = Emiss kg CO2	ion fac 2/kWh	30 45 tor	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions kg CO2/yea 658.51	(230c) (230e) (231) (232) (338) (338) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	(231) es inclu Enc kW (211 (215 (219	+ (232). ding mid ergy h/year) x) x) + (262)	sum (= Sum(2'	19a) ₁₁₂ = k1(230g) = Emiss kg CO: 0.2	ion fac 2/kWh	30 45 tor =	kWh/year 3048.65 2306.51 75 339.51 5769.66 Emissions kg CO2/yea 658.51	(230c) (230e) (231) (232) (338) (338)

Electricity for lighting (232) x 0.519 = 176.2 (268)

Total CO2, kg/year sum of (265)...(271) = 1371.84 (272)

TER = 18.51 (273)