Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 *Printed on 22 June 2021 at 09:42:37*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Semi-detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 132.24m²

Site Reference: Hilltop Road - BASE

Plot Reference: Hilltop Road

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.98 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.98 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 65.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 58.3 kWh/m²

OK

2 Fabric U-values

Element Highest Average External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK Party wall 0.00 (max. 0.20) **OK** Floor 0.15 (max. 0.25) OK 0.15 (max. 0.70) Roof 0.12 (max. 0.20) 0.12 (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 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls TTZC by plumbing and electrical services

No cylinder thermostat

No cylinder

Boiler interlock: Yes OK

Medium

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0% Minimum 75.0%

75.0% **OK**

OK

OK

8 Mechanical ventilation

Hot water controls:

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):

on·

Based on:

Overshading: Average or unknown

Windows facing: East 18.74m²
Windows facing: West 13.99m²
Windows facing: North 0.26m²
Windows facing: South 5.43m²
Roof windows facing: Horizontal 6.31m²
Ventilation rate: 4.00

10 Key features

Roofs U-value 0.12 W/m²K
Party Walls U-value 0 W/m²K

			Jser De	staile: _						
								0700	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 201	2			a Num are Ver				010943 on: 1.0.5.41	
Software Name:	Stioma PSAP 201				Hilltop			versio)II. 1.0.3. 4 1	
Address :		110	porty /\	aaress.	i i ilitop i	rtodd				
1. Overall dwelling dime	nsions:									
			Area((m²)		Av. Hei	ght(m)		Volume(m³)
Ground floor			54	.76	(1a) x	2.	4	(2a) =	131.42	(3a)
First floor			49	.73	(1b) x	2.	9	(2b) =	144.22	(3b)
Second floor			27	.75	(1c) x	2.	7	(2c) =	74.93	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	132	2.24	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d)	+(3e)+	(3n) =	350.57	(5)
2. Ventilation rate:										
2. Ventuation rate.		econdary	C	other		total			m³ per hou	r
Number of chimneys	heating h	eating 0	+	0] = [0	x	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	×	20 =	0	(6b)
Number of intermittent fa	ns L				,	4	x	10 =	40	(7a)
Number of passive vents						0	×	10 =	0	(7b)
Number of flueless gas fi	res				F	0	x	40 =	0	(7c)
					L					
								Air ch	anges per ho	our
Infiltration due to chimney						40		÷ (5) =	0.11	(8)
If a pressurisation test has be		ed, proceed to	o (17), oti	herwise d	continue fr	om (9) to (1	(6)			7(0)
Number of storeys in the Additional infiltration	ie dweiling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel or timber	frame or 0.	.35 for i	masonr	v constr	uction	[(0)	1]XO:1 =	0	(11)
	resent, use the value corres				•				Ŭ	(· · · /
If suspended wooden f		ed) or 0.1	(sealed	d), else	enter 0				0	(12)
If no draught lobby, ent	,	,	`	,,					0	(13)
Percentage of windows		ripped							0	(14)
Window infiltration	_		0	.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			3)	8) + (10)	+ (11) + (1	2) + (13) +	(15) =		0	(16)
Air permeability value,	q50, expressed in cub	ic metres	per hou	ır per s	quare m	etre of er	rvelope	area	5	(17)
If based on air permeabil	ity value, then (18) = [(1	7) ÷ 20]+(8),	otherwise	e (18) = (16)				0.36	(18)
Air permeability value applie	s if a pressurisation test ha	s been done d	or a degr	ee air pe	rmeability	is being us	ed	·		
Number of sides sheltere	d			00) 4	:0 0 7 5 /4	0)1			0	(19)
Shelter factor					[0.075 x (1	ਰ)] =			1	(20)
Infiltration rate incorporat	-		(2	21) = (18)) x (20) =				0.36	(21)
Infiltration rate modified for			. 1			<u> </u>			1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7					-			•	

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

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	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.46	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.36	0.39	0.41	0.43]	
Calculate effect		•	rate for t	he appli	cable ca	se							(226
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N5)) . othe	rwise (23h) = (23a)			0	(23a (23b
If balanced with		0		, ,	, ,	. `	,, .	`	(200)			0	(230
a) If balance		•	-	_					2h)m + (23h) 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 (I	л МV) (24k	(22)	2b)m + (23b)	Į	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b
c) If whole h	ouse ex	tract ver	tilation c	or positiv	e input	ventilatio	on from (outside				4	
if (22b)n	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); other	wise (24	c) = (22l	b) m + 0	.5 × (23b	o)	_	_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(240
d) If natural									o =1				
	n = 1, the	- 			·		T	 	1	0.50	0.50	1	(240
(24d)m= 0.61	0.6	0.6	0.58	0.58	0.56	0.56	0.56	(0.57	0.58	0.58	0.59	J	(240
Effective air (25)m= 0.61	cnange _{0.6}	rate - er	o.58) or (24) 0.58	0.56 or (24)	c) or (24 0.56	0.56	X (25) 0.57	0.58	0.58	0.59	1	(25)
(23)111= 0.01	0.0	0.0	0.56	0.56	0.50	0.50	0.50	0.57	0.56	0.56	0.59]	(23)
3. Heat losse													
		•											
ELEMENT	s and he Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-valu kJ/m²·		A X k kJ/K
	Gros	SS	Openin	gs		m²							
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
ELEMENT Doors	Gros area e 1	SS	Openin	gs	A ,r	m ² x 3 x ¹	W/m2	2K = - 0.04] =	(W/ 2.628	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1	SS	Openin	gs	A ,r 2.19	m ² x 3 x ¹ x ¹	W/m2 1.2 /[1/(1.4)+	2K = -0.04] = -0.04] =	(W/ 2.628 17.14	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.19 12.93 9.66	m ²	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.0	(W/ 2.628 17.14 12.81	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.19 12.93 9.66 0.18	m ²	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = - 0.04] = - 0.04] =	(W/ 2.628 17.14 12.81 0.24	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 2.19 12.93 9.66 0.18 3.75	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = - 0.04] = - 0.04] =	(W/ 2.628 17.14 12.81 0.24 4.97	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights	Gros area e 1 e 2 e 3	ss (m²)	Openin	gs ²	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+	2K = -0.04 = -0.04 = -0.04 = -0.04 = -0.04 =	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ²	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + 0.13	2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls	Gros area 1 2 2 3 3 4 4 2 2 4 5 4 7 5 4 7 5 4 7 5 4 7 5 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7	59 76	Openin m	gs ²	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + 0.13 0.18	2K = 0.04] = -0.04] =	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78	K)			kJ/K (26) (27) (27) (27) (27) (27) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Roof	Gros area 1 2 2 3 3 4 4 2 2 4 5 4 7 5 4 7 5 4 7 5 4 7 5 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7	59 76	Openin m	gs ²	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + 0.13 0.18	2K = 0.04] = -0.04] =	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78	K)			kJ/K (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Roof Total area of e Party wall * for windows and	Gros area e 1 e 2 e 3 e 4 238. 54.7 elements	59 76 5, m ²	Openin m 28.7' 4.35	gs 2 1 ndow U-va	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8 50.41 7.06 alue calcul	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ 0.13 0.18 0	2K = -0.04 = -0.04 = -0.04 = -0.04 = -0.04 = = = = = = = = = =	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78 6.55	K)	kJ/m²-	K E	kJ/K (26) (27) (27) (27) (27) (27) (28) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Roof Total area of e Party wall * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4 238. 54.7 elements	59 76 5, m² cows, use exides of ir	28.7' 4.35	gs 2 1 ndow U-va	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8 50.41 7.06 alue calcul	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ 0.13 0.18 0	2K = -0.04 = -0.0	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78 6.55	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Roof Total area of e Party wall * for windows and	Gros area e 1 e 2 e 3 e 4 238. 54.7 elements I roof winddas on both ess, W/K =	59 76 ows, use e sides of ir = S (A x	28.7' 4.35	gs 2 1 ndow U-va	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8 50.41 7.06 alue calcul	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + 0.13 0.18 0 of formula 1	2K = -0.04 = -0.0	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78 6.55	K)	kJ/m²-	K E	kJ/K (26) (27) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	Gros area 1 1 2 2 2 2 3 3 4 4 5 4 7 5 4 7 5 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	59 76 ows, use esides of ir = S (A x (A x k)	28.7' 4.35 ffective winternal wall U)	gs 2 ndow U-va	A ,r 2.19 12.93 9.66 0.18 3.75 4.3547 54.76 209.8 50.41 348.1 7.06 alue calculatitions	m ²	W/m ² 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + 0.13 0.18 0 of formula 1	2K = -0.04 = -0.0	(W/ 2.628 17.14 12.81 0.24 4.97 7.40314 7.1188 37.78 6.55	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (27) (28) (29) (30) (31) (32) 7 (33)

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can be used instead of a detailed calculation.

							_					1		_
	_	•	,		using Ap	•	<						21.58	(36)
	s of therma abric he		are not kn	10wn (36) =	= 0.05 x (3	1)			(33) +	(36) =			447.75	(37)
			alculated	d monthl	M						25)m x (5)		117.75	(37)
v C i itilio	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	70.31	69.83	69.35	67.12	66.71	64.76	64.76	64.4	65.51	66.71	67.55	68.43		(38)
. ,			<u> </u>			• •	0 0	•		l		00.10		(==)
(39)m=	188.06	oefficier	187.1	184.87	184.46	182.52	182.52	182.16	183.26	= (37) + (3 184.46	185.3	186.18		
(59)111=	100.00	107.50	107.1	104.07	104.40	102.32	102.32	102.10			Sum(39) ₁ .		184.87	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K						$= (39)m \div$		12712—	101.01	(3.37
(40)m=	1.42	1.42	1.41	1.4	1.39	1.38	1.38	1.38	1.39	1.39	1.4	1.41		
					•					Average =	Sum(40) ₁ .	12 /12=	1.4	(40)
Numb		/s in moi	`			_						_	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ned occu	ıpancy, l	N								2	.9		(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13.		.0		()
	A £ 13.9	•						(O.S. N.I.)	00				I	
					es per da 5% if the a					se target o		3.09		(43)
		_				_	-							
	o mat 120	ilites per j	berson pei	r day (all w	ater use, l	not and co	ld)			Ü				
	Jan	Feb	Mar	r day (all w Apr	vater use, l May	ot and co	<i>J</i> ul	Aug	Sep	Oct	Nov	Dec		
	Jan	Feb	Mar	Apr		Jun	Jul		Г	·	1	Dec		
	Jan	Feb	Mar	Apr	May	Jun	Jul		Г	·	1	Dec 113.4		
Hot wat (44)m=	Jan er usage ii 113.4	Feb n litres per 109.27	Mar day for ea	Apr ach month	May Vd,m = fa 96.9	Jun ctor from 7	Jul Fable 1c x 92.78	(43) 96.9	Sep 101.03	Oct 105.15	Nov 109.27 m(44) ₁₁₂ =	113.4	1237.06	(44)
Hot wat (44)m=	Jan er usage ii 113.4	Feb n litres per 109.27	Mar day for ea	Apr ach month	May Vd,m = fa 96.9	Jun ctor from 7	Jul Fable 1c x 92.78	(43) 96.9	Sep 101.03	Oct 105.15	Nov 109.27	113.4	1237.06	(44)
Hot wat (44)m=	Jan er usage ii 113.4	Feb n litres per 109.27	Mar day for ea	Apr ach month	May Vd,m = fa 96.9	Jun ctor from 7	Jul Fable 1c x 92.78	(43) 96.9	Sep 101.03	Oct 105.15	Nov 109.27 m(44) ₁₁₂ =	113.4	1237.06	
Hot wat (44)m= Energy (45)m=	Jan er usage is 113.4 content of 168.17	Feb n litres per 109.27 thot water 147.08	Mar day for ea 105.15 used - cal	Apr ach month 101.03 culated me	May $Vd, m = fa$ 96.9 $onthly = 4.$ 126.96	Jun ctor from 7 92.78 190 x Vd,r 109.56	Jul Fable 1c x 92.78 m x nm x E 101.52	(43) 96.9 07m / 3600 116.5	Sep 101.03 0 kWh/mor	Oct 105.15 Total = Su 137.39	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1	113.4 = c, 1d)	1237.06 1621.98	(44)
Hot wat (44)m= Energy (45)m=	Jan er usage ii 113.4 content of 168.17 taneous w	Feb n litres per 109.27 thot water 147.08	Mar day for ea 105.15 used - cal 151.77	Apr ach month 101.03 culated me 132.32 t of use (no	May $Vd, m = fa$ 96.9 $onthly = 4.$ 126.96 $o hot water$	Jun ctor from 7 92.78 190 x Vd,r 109.56	Jul Fable 1c x 92.78 m x nm x E 101.52 enter 0 in	(43) 96.9 07m / 3600 116.5 boxes (46)	Sep 101.03 0 kWh/mor 117.89 1 to (61)	Oct 105.15 Total = Su 137.39 Total = Su	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ =	113.4 = c, 1d) 162.86		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m=	Jan er usage is 113.4 content of 168.17 taneous w	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06	Mar day for ea 105.15 used - cal	Apr ach month 101.03 culated me	May $Vd, m = fa$ 96.9 $onthly = 4.$ 126.96	Jun ctor from 7 92.78 190 x Vd,r 109.56	Jul Fable 1c x 92.78 m x nm x E 101.52	(43) 96.9 07m / 3600 116.5	Sep 101.03 0 kWh/mor	Oct 105.15 Total = Su 137.39	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97	113.4 = c, 1d)		
Hot wat (44)m= Energy (45)m= If instant (46)m= Water	Jan er usage is 113.4 content of 168.17 taneous w 25.22 storage	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06 loss:	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77	Apr ach month 101.03 culated me 132.32 for use (no	May $Vd, m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04	Jun 92.78 190 x Vd,ri 109.56 - storage), 16.43	Jul Fable 1c x 92.78 n x nm x E 101.52 enter 0 in 15.23	(43) 96.9 07m / 3600 116.5 boxes (46) 17.47	Sep 101.03 kWh/mor 117.89) to (61) 17.68	Oct 105.15 Total = Su 137.39 Total = Su 20.61	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storage	Jan er usage is 113.4 content of 168.17 taneous w 25.22 storage ge volum	Feb n litres per 109.27 hot water 147.08 vater heatil 22.06 loss: he (litres)	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77	Apr ach month 101.03 culated me 132.32 t of use (no	May $Vd,m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04 olar or W	Jun 2007 192.78 190 x Vd,rd 109.56 109.56 109.56	Jul Fable 1c x 92.78 n x nm x E 101.52 enter 0 in 15.23 storage	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa	Sep 101.03 kWh/mor 117.89) to (61) 17.68	Oct 105.15 Total = Su 137.39 Total = Su 20.61	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volum munity h	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06 loss: ne (litres)	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir	Apr ach month 101.03 culated me 132.32 for use (no	May $Vd, m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110	Jul Fable 1c x 92.78 n x nm x E 101.52 enter 0 in 15.23 storage litres in	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa	Sep 101.03 kWh/mor 117.89) to (61) 17.68 ame ves	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Otherw	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volum munity h	Feb n litres per 109.27 109.27 147.08 147.08 122.06 10ss: he (litres) heating a postored	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir	Apr ach month 101.03 culated me 132.32 for use (no	May $Vd,m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04 $0 lar or W$ $velling, e$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110	Jul Fable 1c x 92.78 n x nm x E 101.52 enter 0 in 15.23 storage litres in	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa	Sep 101.03 kWh/mor 117.89) to (61) 17.68 ame ves	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Othern Water	Jan er usage is 113.4 content of 168.17 taneous w 25.22 storage ye volum munity h vise if no	Feb n litres per 109.27 hot water 147.08 vater heating 22.06 loss: he (litres) heating a stored loss:	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate	Apr ach month 101.03 culated me 132.32 for use (not) 19.85 and any seank in dweer (this in	May $Vd,m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04 $0 lar or W$ $velling, e$	Jun ctor from 7 92.78 190 x Vd,r. 109.56 1 storage), 16.43 /WHRS nter 110	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous co	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa	Sep 101.03 kWh/mor 117.89) to (61) 17.68 ame ves	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Othery Water a) If n	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volum munity h vise if no storage nanufact	Feb n litres per 109.27 hot water 147.08 vater heating 22.06 loss: he (litres) heating a stored loss:	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate	Apr ach month 101.03 culated me 132.32 for use (not) 19.85 and any search in dweer (this in oss factors)	May $Vd,m = fac$ 96.9 $0 to the water$ 19.04 Dolar or W $velling, e$ $ncludes i$	Jun ctor from 7 92.78 190 x Vd,r. 109.56 1 storage), 16.43 /WHRS nter 110	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous co	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47)	Sep 101.03 kWh/mor 117.89) to (61) 17.68 ame ves	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Other Water a) If m Tempe Energy	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volum munity h vise if no storage nanufact erature fi	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06 loss: ne (litres) neating a o stored loss: urer's de actor fro	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate eclared I m Table storage	Apr ach month 101.03 culated me 132.32 for use (not) 19.85 and any search in dweer (this in oss factors 2b a, kWh/ye	May $Vd, m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04 $0lar or Water$ $velling, e$ $ncludes i$ $0r is knowear$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110 nstantar wn (kWh	Jul Fable 1c x 92.78 n x nm x E 101.52 enter 0 in 15.23 storage litres in neous con/day):	(43) 96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47)	Sep 101.03 kWh/mor 117.89 10 (61) 17.68 ame ves ers) ente	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storage If com Othery Water a) If m Tempe Energy b) If m	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ye volum munity h vise if no storage nanufact erature fi	Feb n litres per 109.27 thot water 147.08 vater heatin 22.06 loss: ne (litres) neating a costored loss: urer's de actor from water urer's de actor from water	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate eclared I m Table storage	Apr ach month 101.03 culated mo 132.32 for use (no 19.85 ank in dw er (this ir oss factor 2b cylinder	May $Vd, m = fa$ 96.9 $0 thing = 4.$ 126.96 $0 that water$ 19.04 $0 that or Water 0 that constant is the constant in t$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110 nstantar wn (kWh	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous con/day): known:	96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47) mbi boil	Sep 101.03 kWh/mor 117.89 10 (61) 17.68 ame ves ers) ente	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47) (48) (49) (50)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Otherw Water a) If n Tempe Energy b) If n Hot wat	Jan er usage is 113.4 content of 168.17 taneous w 25.22 storage ye volume munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06 loss: ne (litres) neating a costored loss: urer's de actor fro om water urer's de age loss	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate eclared I m Table storage eclared of	Apr ach month 101.03 culated me 132.32 for use (not) 19.85 ank in dweer (this in oss factors (b) cylinder from Tabi	May $Vd, m = fa$ 96.9 $0nthly = 4.$ 126.96 $0 hot water$ 19.04 $0lar or Water$ $velling, e$ $ncludes i$ $0r is knowear$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110 nstantar wn (kWh	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous con/day): known:	96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47) mbi boil	Sep 101.03 kWh/mor 117.89 10 (61) 17.68 ame ves ers) ente	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47) (48) (49)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storag If com Other Water a) If m Tempe Energy b) If m Hot wat If com	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volum munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h	Feb n litres per 109.27 thot water 147.08 vater heatin 22.06 loss: ne (litres) neating a costored loss: urer's de actor from water urer's de actor from water	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate eclared I m Table eclared of factor fri	Apr ach month 101.03 culated me 132.32 for use (not) 19.85 ank in dweer (this in oss factors (b) cylinder from Tabi	May $Vd, m = fa$ 96.9 $0 thing = 4.$ 126.96 $0 that water$ 19.04 $0 that or Water 0 that constant is the constant in t$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110 nstantar wn (kWh	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous con/day): known:	96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47) mbi boil	Sep 101.03 kWh/mor 117.89 10 (61) 17.68 ame ves ers) ente	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47) (48) (49) (50) (51)
Hot wat (44)m= Energy (45)m= If instant (46)m= Water Storage If com Othery Water a) If m Tempe Energy b) If m Hot wat If com Volume	Jan er usage ii 113.4 content of 168.17 taneous w 25.22 storage ge volume munity h vise if no storage nanufact erature f: y lost fro nanufact ater stora munity h e factor	Feb n litres per 109.27 hot water 147.08 vater heatin 22.06 loss: ne (litres) neating a o stored loss: curer's de actor fro om water curer's de age loss neating s	Mar day for ea 105.15 used - cal 151.77 ng at point 22.77 includir and no ta hot wate eclared I m Table storage eclared of factor fr fiee sections in the sector for the sections in the sector for the sector for the sector free sections in the sector free sections in the sector for the s	Apr ach month 101.03 culated mo 132.32 for use (no 19.85 and in dw er (this ir oss factor 2b e, kWh/ye cylinder from Tabl on 4.3	May $Vd, m = fa$ 96.9 $0 thing = 4.$ 126.96 $0 that water$ 19.04 $0 that or Water 0 that constant is the constant in t$	Jun ctor from 7 92.78 190 x Vd,r 109.56 storage), 16.43 /WHRS nter 110 nstantar wn (kWh	Jul Fable 1c x 92.78 101.52 enter 0 in 15.23 storage litres in neous con/day): known:	96.9 97m / 3600 116.5 boxes (46) 17.47 within sa (47) mbi boil	Sep 101.03 kWh/mor 117.89 10 (61) 17.68 ame ves ers) ente	Oct 105.15 Total = Su 137.39 Total = Su 20.61 sel	Nov 109.27 m(44) ₁₁₂ = ables 1b, 1 149.97 m(45) ₁₁₂ = 22.5	113.4 = c, 1d) 162.86 = 24.43		(45) (46) (47) (48) (49) (50)

	Energy lost from water storage, kWh/year Enter (50) or (54) in (55)								x (52) x (53) =	-	0	(54 (55	•
	. ,	. , .	,	for each	month			((56)m = (55) × (41):	m		0	(50))
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56	6)
	_		-					-	-	m where (,	,
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57	')
Primar	y circuit	loss (ar	nual) fro	om Table	3	-	-			_		0	(58	3)
	-					59)m = ((58) ÷ 36	55 × (41)	m				•	
,	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59	9)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	50.96	46.03	50.96	49.32	49.38	45.75	47.28	49.38	49.32	50.96	49.32	50.96	(61)
Total h	eat req	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=	219.12	193.11	202.73	181.63	176.34	155.31	148.8	165.88	167.2	188.35	199.29	213.82	(62	2)
	•		•			, •				r contributi	on to wate	er heating)		
•		r	r	r	i	applies	· ·						l	
(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)
-		ater hea	r	ı		1				1			ı	
(64)m=	219.12	193.11	202.73	181.63	176.34	155.31	148.8	165.88	167.2	188.35	199.29	213.82	7,0	
								·		ater heater			2211.59 (64	1)
_		i		1	i	i -	 			k [(46)m			I	
(65)m=	68.65	60.41	63.2	56.32	54.56	47.87	45.58	51.08	51.53	58.42	62.19	66.89	(65	o)
	. , ,					ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
		·		and 5a).									
Metab	olic gain Jan	s (Table	95), Wat Mar	ts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	145.03	145.03	145.03	145.03	145.03	145.03	145.03	145.03	145.03	145.03	145.03	145.03	(66	5)
` '			<u> </u>	<u> </u>		ion L9 o	<u> </u>			1 10.00	1 10.00	1 10.00	(,
(67)m=	26.78	23.79	19.34	14.65	10.95	9.24	9.99	12.98	17.42	22.12	25.82	27.53	(67	7)
			l			uation L						21.00	(**	,
(68)m=				i Append	IIX L, Eq	ualion L	13 01 L1	Jaj, alsu	See Ta	טוכ ט				
	I 300.4	L 303.52	295.66	278.94	257.83	237.99	224.74	221.62			267.31	287.15	(68	3)
LOOKIN	300.4	303.52	295.66	278.94	257.83	237.99	224.74	221.62	229.47	246.2	267.31	287.15	(68	3)
	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	229.47 ee Table	246.2			(68)	
(69)m=	ng gains 37.5	(calcula	ited in A	ppendix 37.5	!	<u> </u>	ļ		229.47	246.2	267.31 37.5	287.15 37.5		
(69)m= Pumps	ng gains 37.5 and fai	(calcula 37.5 ns gains	ated in A 37.5 (Table §	ppendix 37.5	L, equat 37.5	37.5	or L15a) 37.5	, also se	229.47 ee Table 37.5	246.2 5 37.5	37.5	37.5	(69	9)
(69)m= Pumps (70)m=	ng gains 37.5 s and fai	37.5 ns gains	37.5 (Table \$	ppendix 37.5 5a)	L, equat 37.5	37.5	or L15a)	, also se	229.47 ee Table	246.2				9)
(69)m= Pumps (70)m= Losses	ng gains 37.5 s and fai	(calcula 37.5 ns gains 3	37.5 (Table \$	ppendix 37.5	L, equat 37.5	37.5	or L15a) 37.5	, also se	229.47 ee Table 37.5	246.2 5 37.5	37.5	37.5	(69	9)
(69)m= Pumps (70)m= Losses (71)m=	37.5 s and far 3 s e.g. ev -116.02	(calcula 37.5 ns gains 3 vaporatio	ted in A 37.5 (Table { 3 on (nega	ppendix 37.5 5a) 3	L, equat 37.5 3 es) (Tab	37.5 30le 5)	or L15a) 37.5	37.5	229.47 ee Table 37.5	246.2 5 37.5	37.5	37.5	(69	9)
(69)m= Pumps (70)m= Losses (71)m= Water	ng gains 37.5 s and fai 3 s e.g. ev -116.02 heating	(calcula 37.5 ns gains 3	137.5 (Table 5 3 on (nega -116.02	ppendix 37.5 5a) 3 tive valu	37.5 3 es) (Tab	3 3 3 3 5 6 5 5 5 6 5 6 5 6 6 6 6 6 6 6	or L15a) 37.5 3	37.5 3	229.47 ee Table 37.5 3	246.2 5 5 37.5 3	37.5	37.5	(69))))
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	37.5 s and far 3 s e.g. ev -116.02 heating 92.28	(calcula 37.5 ns gains 3 vaporatio -116.02 gains (7	37.5 (Table 5 3 on (nega -116.02 able 5) 84.95	ppendix 37.5 5a) 3	L, equat 37.5 3 es) (Tab	37.5 30le 5) -116.02	or L15a) 37.5 3 -116.02	37.5 3 -116.02	229.47 ee Table 37.5 3 -116.02	246.2 5 37.5 3 -116.02	37.5 3 -116.02 86.38	37.5 3 -116.02 89.91	(69)))))
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	37.5 s and far 3 s e.g. ev -116.02 heating 92.28	(calcula 37.5 ns gains 3 vaporatio -116.02 gains (T	37.5 (Table 5 3 on (nega -116.02 able 5) 84.95	ppendix 37.5 5a) 3 tive valu	37.5 3 es) (Tab	37.5 30le 5) -116.02	or L15a) 37.5 3 -116.02	37.5 3 -116.02	229.47 ee Table 37.5 3 -116.02	246.2 5 5 37.5 3	37.5 3 -116.02 86.38	37.5 3 -116.02 89.91	(69)	9)

6. Solar gains:

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

Orientat	tion:	Access Factor Table 6d	r	Area m²	Flux Table 6a			g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	0.18	x	10.63	x	0.63	x	0.7	=	0.58	(74)
North	0.9x	0.77	x	0.18	x	20.32	x	0.63	x	0.7	=	1.12	(74)
North	0.9x	0.77	x	0.18	x	34.53	x	0.63	x	0.7	=	1.9	(74)
North	0.9x	0.77	x	0.18	x	55.46	x	0.63	x	0.7	=	3.05	(74)
North	0.9x	0.77	x	0.18	x	74.72	x	0.63	X	0.7	=	4.11	(74)
North	0.9x	0.77	x	0.18	x	79.99	x	0.63	x	0.7	=	4.4	(74)
North	0.9x	0.77	x	0.18	x	74.68	x	0.63	x	0.7	=	4.11	(74)
North	0.9x	0.77	x	0.18	x	59.25	x	0.63	x	0.7	=	3.26	(74)
North	0.9x	0.77	x	0.18	x	41.52	x	0.63	x	0.7	=	2.28	(74)
North	0.9x	0.77	x	0.18	x	24.19	x	0.63	x	0.7	=	1.33	(74)
North	0.9x	0.77	x	0.18	x	13.12	x	0.63	x	0.7	=	0.72	(74)
North	0.9x	0.77	x	0.18	x	8.86	x	0.63	x	0.7	=	0.49	(74)
East	0.9x	0.77	x	12.93	x	19.64	x	0.63	x	0.7	=	77.61	(76)
East	0.9x	0.77	x	12.93	x	38.42	x	0.63	x	0.7	=	151.82	(76)
East	0.9x	0.77	x	12.93	x	63.27	x	0.63	x	0.7	=	250.03	(76)
East	0.9x	0.77	x	12.93	x	92.28	x	0.63	x	0.7	=	364.65	(76)
East	0.9x	0.77	x	12.93	x	113.09	x	0.63	x	0.7	=	446.89	(76)
East	0.9x	0.77	x	12.93	x	115.77	x	0.63	x	0.7	=	457.48	(76)
East	0.9x	0.77	x	12.93	x	110.22	x	0.63	x	0.7	=	435.54	(76)
East	0.9x	0.77	x	12.93	x	94.68	x	0.63	x	0.7	=	374.12	(76)
East	0.9x	0.77	x	12.93	x	73.59	x	0.63	x	0.7	=	290.79	(76)
East	0.9x	0.77	x	12.93	x	45.59	x	0.63	x	0.7	=	180.15	(76)
East	0.9x	0.77	X	12.93	x	24.49	x	0.63	x	0.7	= [96.77	(76)
East	0.9x	0.77	X	12.93	x	16.15	x	0.63	X	0.7	=	63.82	(76)
South	0.9x	0.77	X	3.75	X	46.75	X	0.63	X	0.7	=	53.58	(78)
South	0.9x	0.77	X	3.75	x	76.57	x	0.63	X	0.7	=	87.75	(78)
South	0.9x	0.77	X	3.75	x	97.53	x	0.63	X	0.7	=	111.78	(78)
South	0.9x	0.77	X	3.75	X	110.23	X	0.63	X	0.7	=	126.33	(78)
South	0.9x	0.77	X	3.75	x	114.87	x	0.63	X	0.7	=	131.65	(78)
South	0.9x	0.77	X	3.75	x	110.55	x	0.63	X	0.7	=	126.69	(78)
South	0.9x	0.77	X	3.75	X	108.01	X	0.63	X	0.7	=	123.79	(78)
South	0.9x	0.77	X	3.75	x	104.89	x	0.63	X	0.7	=	120.21	(78)
South	0.9x	0.77	X	3.75	x	101.89	x	0.63	x	0.7	= [116.77	(78)
South	0.9x	0.77	X	3.75	x	82.59	x	0.63	x	0.7	= [94.65	(78)
South	0.9x	0.77	X	3.75	x	55.42	x	0.63	x	0.7	=	63.51	(78)
South	0.9x	0.77	X	3.75	X	40.4	x	0.63	x	0.7	= [46.3	(78)

West 0.9x	0.77		., l	0.00	1 .		0.04	1 ,	0.00	\neg ,	0.7		57.00	(80)
		=	X 	9.66] X]		9.64] X]	0.63	x	0.7	=	57.98	= '
		=	X 	9.66] X]	—	8.42] X]	0.63	x	0.7	=	113.43	(80)
		=	X	9.66] X		3.27] X	0.63	X	0.7	=	186.8	(80)
		=	X	9.66	J X	_	2.28] X]	0.63	→ ×	0.7	=	272.43	(80)
West 0.9x		=	X	9.66	X		13.09] X	0.63	_ ×	0.7	=	333.87	(80)
West 0.9x		_	Х	9.66	X		15.77	X	0.63	×	0.7	_ =	341.78	(80)
West 0.9x	0.77		Х	9.66	X	11	10.22	X	0.63	×	0.7	=	325.39	(80)
West 0.9x	0.77		х	9.66	X	9	4.68	X	0.63	Х	0.7	=	279.5	(80)
West 0.9x	0.77		x	9.66	X	7	3.59	X	0.63	X	0.7	=	217.25	(80)
West 0.9x	0.77		X	9.66	X	4	5.59	X	0.63	X	0.7	=	134.59	(80)
West 0.9x	0.77		x	9.66	X	2	4.49	X	0.63	X	0.7	=	72.3	(80)
West 0.9x	0.77		х	9.66	X	1	6.15	X	0.63	X	0.7	=	47.68	(80)
Rooflights 0.9x	1		x	4.35	x		26	X	0.63	X	0.7	=	44.94	(82)
Rooflights 0.9x	1		х	4.35	X		54	X	0.63	X	0.7	=	93.33	(82)
Rooflights 0.9x	1		X	4.35	x		96	X	0.63	X	0.7	=	165.93	(82)
Rooflights 0.9x	1		х	4.35	x	_	150	x	0.63	x	0.7	 =	259.26	(82)
Rooflights 0.9x	1		х	4.35	x		192	х	0.63	x	0.7	=	331.86	(82)
Rooflights 0.9x	1		x	4.35	x	2	200	x	0.63	= x	0.7	-	345.68	(82)
Rooflights 0.9x	1		x	4.35	x	<u> </u>	189	x	0.63	×	0.7	-	326.67	(82)
Rooflights 0.9x	1		х	4.35	X	<u> </u>	157	X	0.63	= x	0.7		271.36	(82)
Rooflights 0.9x	1		х	4.35) x		115	X	0.63	= x	0.7	=	198.77	(82)
Rooflights 0.9x		\equiv	x	4.35) 		66)]	0.63	╡ x	0.7	╡ -	114.08	(82)
Rooflights 0.9x		==	x	4.35			33]] x	0.63	= x	0.7	= =	57.04	(82)
Rooflights 0.9x		=	x	4.35]]		21]]	0.63	= x	0.7	= =	36.3	(82)
					J			J						``
Solar gains ir	n watts, ca	lculate	ed :	for each mon	th			(83)m	n = Sum(74)m .	(82)ı	n			
				1025.73 1248.3		276.03	1215.49					194.59	7	(83)
Total gains –	internal a	nd sol	ar	(84)m = (73) r	n + (83)m ,	, watts		!		!		_	
(84)m= 723.66	934.16	1185.9)	1467.05 1660	16	559.25	1580.98	142	1.22 1213.83	941.	14 739.35	668.67	7	(84)
7 Mean inte	ernal temp	eratur	e (heating seaso	on)			-	<u>'</u>			•		
				eriods in the li		area f	rom Tal	ole 9	Th1 (°C)				21	(85)
•	•	_	•	ving area, h1,	_			0.00	, (3)					(==)
Jan	Feb	Mar	\neg	Apr Ma	Ť	Jun	Jul	Α	ug Sep	0	t Nov	Dec	٦	
(86)m= 1	1	0.98	\dagger	0.94 0.83	_	0.65	0.49	0.5		0.9		1	┪	(86)
` '				ļ .	!				!				_	, ,
			$\overline{}$	ving area T1	Ì					20.0	2 40.75	10.22	٦	(87)
(87)m= 19.36	19.58	19.95		20.41 20.76	<u> </u>	20.94	20.99	20.	98 20.82	20.3	2 19.75	19.33		(87)
· -			÷	eriods in rest	\neg			able 9	9, Th2 (°C)				7	
(88)m= 19.75	19.75	19.75	\perp	19.76 19.77	<u> </u>	19.78	19.78	19.	78 19.77	19.7	7 19.76	19.76	_	(88)
Utilisation fa	ctor for ga	ains fo	r re	est of dwelling	g, h2	,m (se	e Table	9a)					_	
(89)m= 1	0.99	0.98		0.91 0.77		0.55	0.36	0.4	13 0.75	0.9	5 1	1		(89)
Mean intern	al tempera	ature ii	า th	ne rest of dwe	elling	T2 (fc	ollow ste	eps 3	to 7 in Tab	le 9c)				

(90)m= 17.58	17.01	10.44	10.1	10 FF	19.74	10.77	10.77	10.64	18.99	18.16	17.51		(90)
` ′	17.91	18.44	19.1	19.55	19.74	19.77	19.77	19.64			17.54		¬ `´
								'	LA = Livin	g area - (4	+) =	0.1	(91)
Mean_interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m= 17.76	18.07	18.59	19.23	19.67	19.86	19.89	19.89	19.75	19.12	18.31	17.72		(92)
Apply adjustn	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 17.76	18.07	18.59	19.23	19.67	19.86	19.89	19.89	19.75	19.12	18.31	17.72		(93)
8. Space hea	ting requ	uirement											
Set Ti to the r			•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation					l .								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	ains, nm	0.9	0.76	0.55	0.38	0.44	0.74	0.95	0.99	1		(94)
(94)m= 1					0.55	0.38	0.44	0.74	0.95	0.99	1		(94)
Useful gains, (95)m= 721.15	924.92	, VV = (9 ² 1148.9	<u> </u>	1260.86	920.28	595.21	624.78	902.45	896.96	733.76	667		(95)
Monthly average					<u> </u>	393.21	024.70	902.43	890.90	733.70	007		(55)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate										7.1	7.2		(00)
(97)m= 2530.59		2261.73		1469.79	959.68	600.76	635.42	``	1570.76	2078.14	2516.56		(97)
Space heatin									l				, ,
(98)m= 1346.22	1038.61	827.95	422.79	155.44	0	0	0	0	501.31	967.96	1376.07		
()					ļ		Tota	l per year		l	l	6636.35	(98)
0			1.10/15/22	26			7010	ii poi youi	(ittring oai) = Gam(G	O)15,512 —		亅``
Space heatin	g require	ement in	KVVN/m²	/year								50.18	(99)
Oa Engray roc													_
	•	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heatir	ng:							CHP)					7,004
Space heating Fraction of sp	ng: pace hea	at from se	econdar	y/supple		system		,				0	╡`
Space heatir	ng: pace hea	at from se	econdar	y/supple		system		,				0	╡`
Space heating Fraction of sp	ng: pace hea pace hea	at from so at from m	econdar ain syst	y/supple em(s)		system	(202) = 1	,	(203)] =				(202
Space heating Fraction of spacetion of spacetion of spacetion of spaceting spacetimes.	ng: pace hea pace hea tal heati	at from so at from m	econdar ain syst main sys	y/supple em(s) stem 1		system	(202) = 1	- (201) =	(203)] =			1	(202
Space heatir Fraction of sp Fraction of sp Fraction of to	ng: pace hea pace hea tal heati main spa	at from seat from many from the sace heat	econdar ain syst main sys ing syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1	- (201) =	(203)] =			1	(202
Space heating Fraction of space of the Efficiency of space of space of the Efficiency of the	ng: pace hea pace hea tal heati main spa	at from se at from m ng from a ace heati	econdary ain syst main system ing systementar	y/supple em(s) stem 1 em 1 y heating	mentary g systen	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	1 1 93.4 0	(202 (204 (206 (208
Space heating Fraction of space Fraction of space Fraction of to Efficiency of space	ng: pace hea pace hea tal heati main spa seconda	at from so at from m ng from l ace heati ry/supple Mar	econdar nain syst main sys ng syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1	- (201) =	(203)] =	Nov	Dec	1 1 93.4	(202 (204 (206 (208
Space heating Fraction of space Fraction of to Efficiency of a Efficiency of space of the Efficiency of the Efficiency of space of the Efficiency of the Eff	ng: pace hea pace hea tal heati main spa seconda Feb g require	at from so at from m ng from l ace heati ry/supple Mar	econdar nain syst main sys ng syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov 967.96	Dec 1376.07	1 1 93.4 0	(202 (204 (206 (208
Space heating Fraction of space fraction of to Efficiency of a Efficiency of space heating 1346.22	ng: pace hea pace hea tal heati main spa seconda Feb g require	at from set from many from the control of the contr	econdary ain systemain systementar Apr alculatee	y/supple em(s) stem 1 em 1 y heating May d above;	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 -	Oct			1 1 93.4 0	(202 (204 (206 (208 (208
Space heating Fraction of space fraction of to Efficiency of a Efficiency of space heating [1346.22]	ng: pace hea pace hea tal heati main spa seconda Feb g require 1038.61)m x (20	at from set from many from the ace heating ry/supplement (colors across	econdary nain systemain systementar Apr alculatee 422.79 00 ÷ (20	y/supple em(s) stem 1 em 1 y heating May d above 155.44	g system Jun 0	y system	(202) = 1 (204) = (204) = (204) = 0	- (201) = 02) × [1 - Sep	Oct 501.31	967.96	1376.07	1 1 93.4 0	(202 (204 (206 (208 (208
Space heating Fraction of space fraction of to Efficiency of a Efficiency of space heating 1346.22	ng: pace hea pace hea tal heati main spa seconda Feb g require	at from set from many from the control of the contr	econdary ain systemain systementar Apr alculatee	y/supple em(s) stem 1 em 1 y heating May d above;	mentary g system Jun	system 1, % Jul	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 501.31 536.73	967.96	1376.07	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Space heatir Fraction of sp Fraction of to Efficiency of se Efficiency of se Jan Space heatin 1346.22 (211)m = {[(98) 1441.35]	ng: pace heate hea	at from set from many from the ace heating supplement (constant) and the action of the	econdary nain systemain systemain systementar Apralculated 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06)	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - Sep	Oct 501.31 536.73	967.96	1376.07	1 1 93.4 0	(202 (204 (206 (208 ear
Space heating Fraction of space fraction of to Efficiency of a Efficiency of a Space heating 1346.22 (211)m = {[(98) 1441.35]	ng: pace hea pace hea tal heati main spa seconda Feb g require 1038.61)m x (20 1112 g fuel (s	at from set from ming from mace heating mar lement (compared at 1827.95 minus 1886.45	econdary nain systemain systematar Apr alculated 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06)	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 501.31 536.73	967.96	1376.07	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Space heating Fraction of space fraction of the Efficiency of the	ng: pace hea pace hea tal heati main spa seconda Feb g require 1038.61)m x (20 1112 g fuel (s	at from set from ming from mace heating mar lement (compared at 1827.95 minus 1886.45	econdary nain systemain systematar Apr alculated 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06)	g system Jun 0	y system	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 501.31 536.73	967.96	1376.07	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear
Space heating Fraction of space fraction of the Efficiency of the	reg: pace heater heate	at from set from ming from mace heating mar lement (constant) x 1 886.45 econdary 00 ÷ (20	econdary nain systemain systematar Apr alculater 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06) 166.43	g system Jun 0	y system n, % Jul 0	(202) = 1 (204) = (204	- (201) = 02) × [1 - Sep 0 0 I (kWh/yea	Oct 501.31 536.73 sar) =Sum(2	967.96 1036.35 211) _{15,1012}	1376.07 1473.31 =	1 93.4 0 kWh/ye	(202 (204 (206 (208 ear (211
Space heating Fraction of space fraction of space fraction of to efficiency of space heating the space	reg: pace heater heate	at from set from ming from mace heating mar lement (constant) x 1 886.45 econdary 00 ÷ (20	econdary nain systemain systematar Apr alculater 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06) 166.43	g system Jun 0	y system n, % Jul 0	(202) = 1 (204) = (204	- (201) = 02) × [1 - Sep 0	Oct 501.31 536.73 sar) =Sum(2	967.96 1036.35 211) _{15,1012}	1376.07 1473.31 =	1 1 93.4 0 kWh/ye	(202 (204 (206 (208 ear (211
Space heating Fraction of space fraction of to Efficiency of a	reg: pace heater	at from set from ming from mace heating mar lement (compared as 1886.45) econdary oo ÷ (20) 0	econdary nain systemain systemain systemater Apr alculater 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06) 166.43	g system Jun 0	y system n, % Jul 0	(202) = 1 (204) = (204	- (201) = 02) × [1 - Sep 0 0 I (kWh/yea	Oct 501.31 536.73 sar) =Sum(2	967.96 1036.35 211) _{15,1012}	1376.07 1473.31 =	1 93.4 0 kWh/ye	(202 (204 (206 (208 ear (211
Space heating Fraction of space fraction of space fraction of to efficiency of space heating the space	reg: pace heater	at from set from ming from mace heating mar lement (compared as 1886.45) econdary oo ÷ (20) 0	econdary nain systemain systemain systemater Apr alculater 422.79 00 ÷ (20 452.66	y/supple em(s) stem 1 em 1 y heating May d above 155.44 06) 166.43	g system Jun 0	y system n, % Jul 0	(202) = 1 (204) = (204	- (201) = 02) × [1 - Sep 0 0 I (kWh/yea	Oct 501.31 536.73 sar) =Sum(2	967.96 1036.35 211) _{15,1012}	1376.07 1473.31 =	1 93.4 0 kWh/ye	(201 (202 (204 (206 (208 (211 (211 (211
Space heating Fraction of space fraction of to Efficiency of a	reg: pace heater	at from set from ming from ming from mace heating mar ment (color secondary on the following secondary of the following secondary on the following secondary of the following secondary	econdary nain systemain systemater Apr alculated 422.79 00 ÷ (20 452.66 y), kWh/ 8) 0	y/supple em(s) stem 1 em 1 y heating d above 155.44 06) 166.43 emonth 0	g system Jun 0	y system n, % Jul 0	(202) = 1 (204) = (204	- (201) = 02) × [1 - Sep 0 0 I (kWh/yea	Oct 501.31 536.73 536.73 0 ar) =Sum(2	967.96 1036.35 211) _{15,1012} 0	1376.07	1 93.4 0 kWh/ye	(202 (204 (206 (208 ear (211

			1	1	i			(-,-)
` '	80.3 80	0.3 80.3	80.3	87.4	88.5	88.9		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
, , , , , , , , , , , , , , , , , , , ,	193.42 185	5.31 206.57	208.23	215.51	225.18	240.53		
	•	Tota	I = Sum(2	19a) ₁₁₂ =	•	•	2585.66	(219)
Annual totals				k'	Wh/yeaı		kWh/year	-
Space heating fuel used, main system 1							7105.3	_
Water heating fuel used							2585.66]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							472.96	(232)
Total delivered energy for all uses (211)(221) +	(231) + (2	232)(237b)	=				10238.92	(338)
12a. CO2 emissions – Individual heating system	ns includin	g micro-CHF						
	Energ	У		Emiss	ion fac	tor	Emissions	
	kWh/y	ear		kg CO	2/kWh		kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	1534.74	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	558.5	(264)
Space and water heating	(261) + (2	262) + (263) + ((264) =				2093.25	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	245.47	(268)
Total CO2, kg/year			sum o	f (265)(271) =		2377.64	(272)

TER =

(273)

17.98