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 09:50:07*

Project Information:

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

Dwelling Details:

NEW DWELLING AS BUILT

Site Reference: Albany Farm

Total Floor Area: 78.3m²

Plot Reference: Plot 034

Address: 19 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) 17.12 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.57 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 36.1 kWh/m²

ОК

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 4.06
Maximum 10.0 OK

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

Regulations Compliance Report

Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls	Programmer, room therm	ostat and TRVs	ОК
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
3 Mechanical ventilation			
Continuous extract system (decentralised)		
Specific fan power:	,	0.16 0.18	
Maximum		0.7	OK
9 Summertime temperature			
Overheating risk (South Eng	land):	Slight	ОК
ased on:		•	
Overshading:		Very Little	
Windows facing: North East		3.72m²	
Windows facing: South Wes	t	7.36m²	
Ventilation rate:		4.00	
Blinds/curtains:		None	
10 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: Software Name:	Ben Tunningley Stroma FSAP 2012		Stroma Softwa	re Ve	rsion:			0027495 on: 1.0.5.41	
A dalagoo :			Address:			∩ 22.4 D	_		
Address: 1. Overall dwelling dimer	19 Buttercup Road , Bishop	os vvaili i	am, SOO	I HAIVIE	TON, S	032 IK	Г		
1. Overall awelling diffier	11310113.	Δre	a(m²)		Av. Hei	iaht(m)		Volume(m³)	
Ground floor			<u> </u>	(1a) x		.4	(2a) =	93.96	(3a)
First floor		3	9.15	(1b) x	2.	.67	(2b) =	104.53	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	78.3	(4)			_		J
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+	.(3n) =	198.49	(5)
2. Ventilation rate:									
z. vondadorrato.	main seconda	iry	other		total			m³ per hour	
Number of chimneys	heating heating 0 + 0	+ [0] = [0	x -	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	; =	0	x	20 =	0	(6b)
Number of intermittent far	ns			, <u> </u>	0	X	10 =	0	(7a)
Number of passive vents				Ī	0	x	10 =	0	(7b)
Number of flueless gas fir	res			Ĺ	0	x -	40 =	0	(7c)
				_					_
							Air cl	nanges per hou	ır
•	rs, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in th	een carried out or is intended, proce	ed to (17),	otherwise c	ontinue fi	rom (9) to (16)		0	(9)
Additional infiltration	ic dwelling (113)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	or 0.35 fo	r masonr	y consti	ruction	. ,		0	(11)
	esent, use the value corresponding	to the great	er wall area	a (after					_
deducting areas of opening	gs); if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (seale	ed) else e	enter 0				0	(12)
If no draught lobby, ent	,	, (ooa.	,, 0.00					0	(13)
•	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10) +	- (11) + (12) + (13) +	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	nvelope	area	4.05999994277954	4 (17)
·	ty value, then $(18) = [(17) \div 20] +$							0.2	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has been do	one or a de	gree air per	meability	is being us	sed			7(40)
Shelter factor	u		(20) = 1 - [0.075 x (⁻	19)] =			0.85	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18)					0.17](21)
Infiltration rate modified for	_							<u> </u>	J` ′
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind spe	eed from Table 7		1				•	•	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(22)m=

	actor (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]	
Adjuste	ed infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
·	0.22	0.22	0.21	0.19	0.19	0.16	0.16	0.16	0.17	0.19	0.19	0.2]	
		<i>tive air</i> o	change i	rate for t	he appli	cable ca	se	•				•		(220)
				endix N. (2	3b) = (23a	a) × Fmv (e	eguation (f	N5)) . othe	erwise (23b	n) = (23a)			0.5	(23a) (23b)
			overy: effici		, ,	, ,	. ,	,, .	,	, (<u> </u>			0.5	(23c)
			-	•	_					2h)m + (23h) x [1 – (23c)	,	(230)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If b	oalance	d mecha	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24k	(22)	2b)m + (2	23b)		J	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If v	whole h	ouse ex	tract ven	tilation o	or positiv	e input	ventilatio	n from	outside	!	!		4	
i <u>f</u>	(22b)m	า < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22	b) m + 0	.5 × (23b)	_	_	
(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)
,			on or wh		•	•				0.51				
Г	(22b)n	0 = 1, the	en (24d) 0	m = (221)	o)m otne	erwise (2	$\frac{(4a)m}{0}$	$\frac{0.5 + [(2)]}{0}$	22b)m² x	0.5]	0	Ι ,	1	(24d)
(24d)m=						<u> </u>	<u> </u>					0]	(240)
(25)m=	0.5	0.5	rate - er	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	(25)
						0.0	0.0		1 0.0	1 0.0	0.0	1 0.0	J	()
	at losse	s and he	eat loss r	paramete	⊃r•									
FI FM		_											_	
	ENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value		X X k J/K
Doors	ENT		SS	Openin	gs						K)			
		area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	K)			J/K
Doors	vs Type	area	SS	Openin	gs	A ,r	m ² x x ¹	W/m2	2K = - 0.04] =	(W/I 2.94	K)			J/K (26)
Doors Windov	vs Type	area	SS	Openin	gs	A ,r 2.1 3.72	m² x x1 x1	W/m2 1.4 /[1/(1.4)+	2K = - 0.04] =	(W/I 2.94 4.93				(26) (27) (27)
Doors Windov Windov	vs Type	area	ss (m²)	Openin	gs ²	A ,r 2.1 3.72 7.36	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = + 0.04] = + 0.04] =	(W/I 2.94 4.93 9.76		kJ/m²-	K k	(26) (27) (27) (27) (25) (28)
Doors Window Window Floor	vs Type	area	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = + 0.04] = + 0.04] =	(W/I 2.94 4.93 9.76 4.3065		kJ/m²·	K k	(26) (27) (27) (25) (28) (29)
Doors Window Window Floor Walls Roof	vs Type vs Type	area 1 2 48.3	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = -0.04] = -0.04] = = =	(W/l 2.94 4.93 9.76 4.3065 8.45		kJ/m²-	2936 2111	J/K (26) (27) (27) (28) (29)
Doors Window Window Floor Walls Roof	vs Type vs Type rea of e	area 1 2 2 48.3 39.1	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = -0.04] = -0.04] = = =	(W/l 2.94 4.93 9.76 4.3065 8.45		kJ/m²-	2936 2111	(26) (27) (27) (27) (25) (28) (4) (29) (35) (30) (31)
Doors Window Window Floor Walls Roof Total an	vs Type vs Type rea of e	area a 1 a 2 a 2 a 48.3 a 39.1 lements	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.04] = = = =	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		kJ/m²- 75 60 9	2936 2111 352.	J/K (26) (27) (27) (25) (28) (30) (31) (95) (32)
Doors Window Window Floor Walls Roof Total an	vs Type vs Type rea of e vall	area 41 42 48.3 39.1 Ilements	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.04] = = = =	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		kJ/m ² - 75 60 9	2936 2111 352. 3856 593.5	J/K (26) (27) (27) (28) (38) (30) (31) (95) (32) (381) (32c)
Doors Window Window Floor Walls Roof Total an Party w Internal	vs Type vs Type rea of e vall I wall **	area 41 42 48.3 39.1 Ilements	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.04] = = = =	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		kJ/m ² - 75 60 9 45	2936 2111 352. 3856 593.5	J/K (26) (27) (27) (25) (28) (30) (31) (32) (32c) (32c)
Doors Window Window Floor Walls Roof Total an Party w Internal	vs Type vs Type rea of e vall I wall ** I wall **	area a 1 a 2 a 48.3 a 39.1 lements	ss (m²)	Openin m	gs ²	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.71 65.95 68.46	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.04] = = = =	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		75 60 9 45 9	2936 2111 352. 3856 593.50	(26) (27) (27) (25) (28) (4) (29) (35) (30) (31) (95) (32) (581) (32c) (7) (32d)
Doors Window Window Floor Walls Roof Total aid Party w Internal Internal Internal Internal Internal Internal Internal	vs Type vs Type rea of e vall I wall ** I wall ** I floor I ceiling	area 1 2 48.3 39.1 lements	5S (m²) 5 , m²	Openin m 13.18 0	gs 2 3	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15 alue calcul	m ²	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.04 = = = =	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		75 60 9 45 9 9	2936 2111 352. 3856 593.5 616.1: 704	(26) (27) (27) (25) (28) (30) (31) (32) (32) (32c) (32d) (32d) (32d) (32d)
Doors Window Window Floor Walls Roof Total an Party w Internal Internal Internal * for wind ** include	vs Type vs Type vall I wall ** I floor I ceiling dows and e the area	area 1 2 48.3 39.1 Ilements	ss (m²) 5 5, m²	Openin m 13.13 0	gs 2 3	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15 alue calcul	x1 x1 x1 x1 x x x x x x x x x x x x x x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.0	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31		kJ/m ² - 75 60 9 45 9 18	2936 2111 352. 3856 593.5 616.1: 704 352.	(26) (27) (27) (25) (28) (30) (31) (32) (32) (32c) (32d) (32d) (32d) (32d)
Doors Window Window Floor Walls Roof Total an Party w Internal Internal Internal Internal ** for wind ** include Fabric I	vs Type vs Type vs Type vall l wall ** l wall ** l floor l ceiling dows and e the area heat los	area 1 2 48.3 39.1 Ilements	ss (m²) 5 , m² ows, use e sides of in = S (A x	Openin m 13.13 0	gs 2 3	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15 alue calcul	x1 x1 x1 x1 x x x x x x x x x x x x x x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04 = -0.0	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31	as given ir	kJ/m ² - 75 60 9 45 9 18 9 paragraph	2936 2111 352. 3856 593.5 616.1: 704	J/K (26) (27) (27) (25) (28) (30) (31) (95) (32) (581) (32c) (7) (32d) (35) (32e)
Doors Window Window Floor Walls Roof Total an Party w Internal Internal Internal Internal * for wind ** include Fabric I Heat ca	vs Type vs Type rea of e vall I wall ** I floor I ceiling dows and the area heat los	area 48.3 39.1 Ilements roof winders on both as, W/K = Cm = S(ss (m²) 5 , m² ows, use e sides of in = S (A x	Openin m 13.11 0 offective winternal walk U)	gs 2 3 3 ds and part	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15 39.15 ititions	x1 x1 x1 x2 x x x x x x x x x x x x x x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.0	(W/I 2.94 4.93 9.76 4.3065 8.45 4.31	as given ir	kJ/m ² - 75 60 9 45 9 18 9 paragraph	2936 2111 352. 3856 593.50 616.12 704 352. h 3.2	J/K (26) (27) (27) (25) (28) (4) (29) (35) (30) (31) (95) (32) (681) (32c) (7) (32d) (35) (32e) (33)

an be used inste	au oi a ue												_
hermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix I	K						7.19	(36)
details of therm	0 0	are not kn	own (36) =	= 0.05 x (3	1)								_
otal fabric he								(33) +	(36) =			41.88	(37)
entilation he			l monthly	y I	i				= 0.33 × (25)m x (5)	·	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75		(38
leat transfer	coefficie	nt, W/K	_					(39)m	= (37) + (3	38)m		_	
39)m= 74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63		
leat loss para	ameter (H	HLP), W/	/m²K						Average = = (39)m ÷		12 /12=	74.63	(39
40)m= 0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
lumber of da	ys in mo	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.95	(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	tina ene	av reaui	irement:								kWh/y	ear:	
ssumed occ	upancy, l	N								2.	43	1	(42
if TFA > 13	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		43]	(42
if TFA > 13. if TFA £ 13. Annual averageduce the annual	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)	.91]	(42
if TFA > 13. if TFA £ 13. Innual averag	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36 a water us		9)]	,
if TFA > 13. if TFA £ 13. Annual averageduce the annuot more that 125	9, N = 1 9, N = 1 ge hot wa al average blitres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36		9)]	•
if TFA > 13. if TFA £ 13. Annual averageduce the annuot more that 125	9, N = 1 9, N = 1 ge hot wa al average be litres per l Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the o rater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed in did	(25 x N) to achieve Aug	+ 36 a water us Sep	ose target o	9) 91 Nov	.91]	•
if TFA > 13. if TFA £ 13. Annual averageduce the annuot more that 125	9, N = 1 9, N = 1 ge hot wa al average blitres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 90.07	Oct	9) 91 Nov 97.42	.91 Dec 101.1]	(43
if TFA > 13. if TFA £ 13. Annual averageduce the annual ot more that 125 Jan dot water usage	9, N = 1 9, N = 1 ge hot waal average is litres per per litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 86.39	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed in did) Jul Table 1c x 82.72	(25 x N) to achieve Aug (43) 86.39	+ 36 a water us Sep	Oct 93.75 Total = Sur	9) Nov 97.42 m(44) ₁₁₂ =	.91 Dec 101.1	1102.9	(43
if TFA > 13. if TFA £ 13. Annual average Reduce the annual of more that 128 Jan dot water usage 144)m= 101.1	9, N = 1 9, N = 1 ge hot waal average is litres per per litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 86.39	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed in did) Jul Table 1c x 82.72	(25 x N) to achieve Aug (43) 86.39	+ 36 a water us Sep	Oct 93.75 Total = Sur	9) Nov 97.42 m(44) ₁₁₂ =	.91 Dec 101.1	1102.9	(43
if TFA > 13. if TFA £ 13. annual average deduce the annual of more that 128 Jan dot water usage 141)m= 101.1 Energy content of 149.93	9, N = 1 9, N = 1 ge hot waal average of litres per	+ 1.76 x ater usag hot water person per Mar day for ea 93.75 used - calc 135.31	ge in litre usage by day (all w Apr ach month 90.07 culated me	es per da 5% if the orater use, I May $Vd,m = fa$ 86.39 $onthly = 4$.	ay Vd,av lwelling is not and co Jun ctor from 7 82.72 190 x Vd,r 97.68	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 86.39 07m / 3600 103.86	+ 36 a water us Sep 90.07 0 kWh/more 105.1	Oct 93.75 Total = Suith (see Tail	9) Nov 97.42 m(44) ₁₁₂ = ables 1b, 1 133.71	.91 Dec 101.1 c, 1d) 145.2	1102.9	(43
if TFA > 13. if TFA £ 13. Annual average deduce the annual of more that 125 Jan dot water usage 14)m= 101.1	9, N = 1 9, N = 1 ge hot waal average of litres per	+ 1.76 x ater usag hot water person per Mar day for ea 93.75 used - calc 135.31	ge in litre usage by day (all w Apr ach month 90.07 culated me	es per da 5% if the orater use, I May $Vd,m = fa$ 86.39 $onthly = 4$.	ay Vd,av lwelling is not and co Jun ctor from 7 82.72 190 x Vd,r 97.68	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 86.39 07m / 3600 103.86	+ 36 a water us Sep 90.07 0 kWh/more 105.1	Oct 93.75 Total = Sur 122.49	9) Nov 97.42 m(44) ₁₁₂ = ables 1b, 1 133.71	.91 Dec 101.1 c, 1d) 145.2		(43
if TFA > 13. if TFA £ 13. annual average duce the annual of more that 125 Jan dot water usage 144)m= 101.1 Energy content of 149.93 instantaneous 146)m= 22.49	9, N = 1 9, N = 1 ge hot was al average to litres per	+ 1.76 x ater usag hot water person per Mar day for ea 93.75 used - calc 135.31	ge in litre usage by day (all w Apr ach month 90.07 culated me	es per da 5% if the orater use, I May $Vd,m = fa$ 86.39 $onthly = 4$.	ay Vd,av lwelling is not and co Jun ctor from 7 82.72 190 x Vd,r 97.68	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 86.39 07m / 3600 103.86	+ 36 a water us Sep 90.07 0 kWh/more 105.1	Oct 93.75 Total = Sur 122.49	9) Nov 97.42 m(44) ₁₁₂ = ables 1b, 1 133.71	.91 Dec 101.1 c, 1d) 145.2		(44
if TFA > 13. if TFA £ 13. Annual average Reduce the annual of more that 128 Jan dot water usage 44)m= 101.1 Energy content of 45)m= 149.93 instantaneous (46)m= 22.49 Vater storage	9, N = 1 9, N = 1 ge hot was all average in litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calce 135.31 and at point 20.3	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no	es per da 5% if the a rater use, I May Vd,m = fa 86.39 conthly = 4. 113.19 co hot water 16.98	ay Vd,av lwelling is not and co Jun ctor from 1 82.72 190 x Vd,r 97.68	erage = designed in ld) Jul Table 1c x 82.72 m x nm x E 90.51 enter 0 in 13.58	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77	Oct 93.75 Total = Sunth (see Tail 122.49) Total = Sunth 18.37	9) Nov 97.42 m(44) 112 = ables 1b, 1 133.71 m(45) 112 = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78		(44)
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average Reduce the annual of more that 128 Jan Hot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous (146)m= 22.49 Vater storage Storage voluments	9, N = 1 9, N = 1 ge hot was all average to litres per	+ 1.76 x ater usag hot water person per Mar day for ea 93.75 used - calc 135.31 ag at point 20.3	ge in litre usage by day (all w Apr ach month 90.07 culated me 117.97 r of use (no	es per da 5% if the of stater use, I May Vd,m = fact 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W	ay Vd,av welling is not and co Jun ctor from 82.72 190 x Vd,r 97.68 storage), 14.65	erage = designed to ld) Jul Table 1c x 82.72 m x nm x E 90.51 enter 0 in 13.58 storage	(25 x N) to achieve Aug (43) 86.39 7m / 3600 103.86 boxes (46) 15.58 within sa	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77	Oct 93.75 Total = Sunth (see Tail 122.49) Total = Sunth 18.37	9) Nov 97.42 m(44) 112 = ables 1b, 1 133.71 m(45) 112 = 20.06	.91 Dec 101.1 c, 1d) 145.2		(43
if TFA > 13. if TFA £ 13. Annual average Reduce the annual of more that 128 Jan dot water usage 44)m= 101.1 Energy content of 45)m= 149.93 instantaneous of 46)m= 22.49 Vater storage Storage volum is community	9, N = 1 9, N = 1 ge hot was all average is litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calce 135.31 and at point 20.3 including and no talce 135.31	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no	es per da 5% if the of rater use, I May Vd,m = fat 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W relling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 82.72 190 x Vd,r 97.68 r storage), 14.65	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58 within sa (47)	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = sbles 1b, 1 133.71 m(45) ₁₁₂ = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78		(43
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average Reduce the annual of more that 128 Jan Hot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous (146)m= 22.49 Vater storage Storage voluments	9, N = 1 9, N = 1 ge hot was all average is litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calce 135.31 and at point 20.3 including and no talce 135.31	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no	es per da 5% if the of rater use, I May Vd,m = fat 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W relling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 82.72 190 x Vd,r 97.68 r storage), 14.65	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58 within sa (47)	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = sbles 1b, 1 133.71 m(45) ₁₁₂ = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78		(43
if TFA > 13. if TFA £ 13. annual average Reduce the annual of more that 128 Jan Hot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous of Vater storage Storage volum community of Otherwise if n	9, N = 1 9, N = 1 ge hot was all average to litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calcal 135.31 and at point 20.3 including and no tal hot water water series are series at the control of the con	ge in litre usage by day (all w Apr ach month 90.07 culated me 117.97 for use (no	es per da 5% if the of water use, I May Vd,m = fact 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e	ay Vd,av welling is not and co Jun ctor from 82.72 190 x Vd,r 97.68 r storage), 14.65 /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58 within sa (47)	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = sbles 1b, 1 133.71 m(45) ₁₁₂ = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78		(43)
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average Reduce the annual of more that 128 Jan Hot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous i	9, N = 1 9, N = 1 ge hot was all average is litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calc 135.31 and at point 20.3 including and no talchot water eclared left.	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no 17.7 ang any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fact 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e	ay Vd,av welling is not and co Jun ctor from 82.72 190 x Vd,r 97.68 r storage), 14.65 /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58 within sa (47)	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = 10bles 1b, 1 133.71 m(45) ₁₁₂ = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78		(43 (44 (45 (46 (47
if TFA > 13. if TFA £ 13. Annual average Reduce the annual to timore that 128 Jan Hot water usage 14)m= 101.1 Energy content of 15)m= 149.93 instantaneous of 140,m= 22.49 Vater storage Storage volum f community of 150 therwise if no 150	9, N = 1 9, N = 1 ge hot was all average is litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calc 135.31 and at point 20.3 including and no tale hot water eclared leared leared storage	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no 17.7 ing 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 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e ocludes i or is knowear	ay Vd,av fwelling is foot and co Jun ctor from 7 82.72 190 x Vd,r 97.68 14.65 /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 77m / 3600 103.86 boxes (46) 15.58 within sa (47)	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess ers) ente	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = ables 1b, 1 133.71 m(45) ₁₁₂ = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78 0		(44) (45) (46) (47) (48) (49)
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average deduce the annual of more that 128 Jan dot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous in the storage volumes and the storage volumes and the storage and th	9, N = 1 9, N = 1 ge hot was al average is litres per	+ 1.76 x ater usage hot water person per Mar day for ear 93.75 used - calce 135.31 and at point 20.3 including and no talce hot water eclared lear man Table eclared colored storage eclared of the storage ec	ge in litre usage by day (all w Apr ach month 90.07 culated me 117.97 ref use (no 17.7 ng any se ank in dw er (this in oss facto 2b cylinder l	es per da 5% if the of water use, I May Vd,m = far 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e ncludes i or is kno	ay Vd,av welling is not and co	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 7m / 3600 103.86 boxes (46) 15.58 within sa (47) pmbi boil	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess ers) ente	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44)12 = sbles 1b, 1 133.71 m(45)112 = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78 0 0 0		(43 (44 (45 (46 (47 (48 (49 (50
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average deduce the average deduced ded	9, N = 1 9, N = 1 ge hot was al average to litres per l	ter usage hot water overson per Mar day for ear 93.75 used - calce 135.31 ing at point 20.3 including and no talce the market water eclared lear to factor fr	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no 17.7 ag any so ank in dw er (this in oss facto 2b cylinder l com Table	es per da 5% if the of water use, I May Vd,m = far 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e ncludes i or is kno	ay Vd,av welling is not and co	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 7m / 3600 103.86 boxes (46) 15.58 within sa (47) pmbi boil	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess ers) ente	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44)12 = sbles 1b, 1 133.71 m(45)112 = 20.06	.91 Dec 101.1 c, 1d) 145.2 21.78 0		•
if TFA > 13. if TFA £ 13. if TFA £ 13. annual average deduce the annual of more that 128 Jan dot water usage 141)m= 101.1 Energy content of 15)m= 149.93 instantaneous in the storage volumes and the storage volumes and the storage and th	9, N = 1 9, N = 1 ge hot was all average is litres per	ter usage hot water person per Mar day for ear 93.75 used - calc 135.31 and at point 20.3 including and no talc hot water eclared less storage eclared of factor free sections.	ge in litre usage by day (all w Apr ach month 90.07 culated mo 117.97 for use (no 17.7 ag any so ank in dw er (this in oss facto 2b cylinder l com Table	es per da 5% if the of water use, I May Vd,m = far 86.39 onthly = 4. 113.19 o hot water 16.98 olar or W velling, e ncludes i or is kno	ay Vd,av welling is not and co	erage = designed in designed i	(25 x N) to achieve Aug (43) 86.39 7m / 3600 103.86 boxes (46) 15.58 within sa (47) pmbi boil	+ 36 a water us Sep 90.07 0 kWh/mor 105.1 15.77 ame vess ers) ente	Oct 93.75 Total = Sunth (see Tail 122.49 Total = Sunth (see Tail 18.37	9) Nov 97.42 m(44) ₁₁₂ = 20.06 47)	.91 Dec 101.1 c, 1d) 145.2 21.78 0 0 0		(43 (44 (45 (46 (47 (48 (49 (50

Energy lost from water storage, kWh/year	(47) x (51) x (5.	52) x (53) =	0)	((54)
Enter (50) or (54) in (55)			0)	((55)
Water storage loss calculated for each month	$((56)m = (55) \times$	k (41)m			I	
(56)m= 0 0 0 0 0 0	0 0	0 0	0	0	((56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50)	- (H11)] ÷ (50), else (57)m =	= (56)m where (I	H11) is fron	n Append	ix H	
(57)m= 0 0 0 0 0 0	0 0	0 0	0	0	((57)
Primary circuit loss (annual) from Table 3			0)	((58)
Primary circuit loss calculated for each month (59)m	= (58) ÷ 365 × (41)m				1	
(modified by factor from Table H5 if there is solar v	ater heating and a cyli	inder thermos	stat)			
(59)m= 0 0 0 0 0	0 0	0 0	0	0	((59)
Combi loss calculated for each month (61)m = (60) ÷	365 × (41)m					
(61)m= 13.76 12.43 13.76 13.31 13.76 13.3	13.76 13.76 13	3.31 13.76	13.31	13.76	((61)
Total heat required for water heating calculated for e	ach month (62)m = 0.8	35 × (45)m + ((46)m + ((57)m +	(59)m + (61)m	
(62)m= 163.68 143.55 149.07 131.28 126.95 110.9	9 104.27 117.62 118	8.42 136.25	147.02	158.95	((62)
Solar DHW input calculated using Appendix G or Appendix H (neg	ative quantity) (enter '0' if no	o solar contributi	on to water	r heating)	'	
(add additional lines if FGHRS and/or WWHRS appli	es, see Appendix G)				_	
(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	0	((63) (G2)
Output from water heater						
(64)m= 163.68 143.55 149.07 131.28 126.95 110.9	9 104.27 117.62 118	8.42 136.25	147.02	158.95		
	Output fro	om water heater	(annual) ₁	.12	1608.04	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.	$85 \times (45)$ m + (61)m] +	0.8 x [(46)m ·	+ (57)m -	+ (59)m]	
(65)m= 53.29 46.71 48.43 42.55 41.08 35.8	33.53 37.97 38	3.28 44.17	47.79	51.72	((65)
include (57)m in calculation of (65)m only if cylinde	r is in the dwelling or h	not water is fro	om comn	nunity h	eating	
5. Internal gains (see Table 5 and 5a):						
Metabolic gains (Table 5), Watts						
Jan Feb Mar Apr May Ju	n Jul Aug S	Sep Oct	Nov	Dec		
(66)m= 145.79 145.79 145.79 145.79 145.79 145.79	9 145.79 145.79 145	5.79 145.79	145.79	145.79	((66)
Lighting gains (calculated in Appendix L, equation LS	or L9a), also see Tabl	le 5			'	
(67)m= 49.59 44.05 35.82 27.12 20.27 17.1	18.49 24.04 32	2.26 40.97	47.81	50.97	((67)
Appliances gains (calculated in Appendix L, equation	L13 or L13a), also see	e Table 5			'	
(68)m= 322.17 325.51 317.08 299.15 276.51 255.2	3 241.02 237.67 24	16.1 264.03	286.67	307.95	((68)
Cooking gains (calculated in Appendix L, equation L	5 or L15a), also see T	able 5	•		ı	
(69)m= 52.01 52.01 52.01 52.01 52.01 52.01 52.0	52.01 52.01 52	2.01 52.01	52.01	52.01	((69)
Pumps and fans gains (Table 5a)		•	•		ı	
(70)m= 3 3 3 3 3 3	3 3	3 3	3	3	((70)
Losses e.g. evaporation (negative values) (Table 5)	· · ·	•	<u>.</u>			
(71)m= -97.19 -97.19 -97.19 -97.19 -97.19 -97.19	9 -97.19 -97.19 -97	7.19 -97.19	-97.19	-97.19	((71)
		•			1	
Water heating gains (Table 5)						
Water heating gains (Table 5) (72)m= 71.63 69.5 65.09 59.1 55.21 49.7	3 45.07 51.04 53	3.16 59.36	66.37	69.51	((72)
(72)m= 71.63 69.5 65.09 59.1 55.21 49.7	3 45.07 51.04 53 66)m + (67)m + (68)m + (69)				((72)

6. Solar gai	ns:												
Solar gains are	e calculated usin	ng solar	flux from Ta	ble 6a a	and asso	ciated equa	ations	to convert to th	e applic	able orienta	tion.		
Orientation:	Access Fact Table 6d	tor	Area m²			ux able 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	1	x	3.72		x	11.28	x	0.45	×	1.11	=	18.89	(75)
Northeast 0.9x	1	×	3.72		x 🔚	22.97	j×	0.45	×	1.11	_ =	38.45	(75)
Northeast 0.9x	1	×	3.72	-	x =	41.38	X	0.45	x	1.11	=	69.27	(75)
Northeast 0.9x	1	×	3.72	:	x 🔚	67.96	X	0.45	×	1.11	=	113.76	(75)
Northeast 0.9x	1	×	3.72	<u> </u>	x =	91.35	x	0.45	×	1.11	=	152.91	(75)
Northeast 0.9x	1	×	3.72		x	97.38	X	0.45	X	1.11	=	163.02	(75)
Northeast 0.9x	1	x	3.72		x	91.1	X	0.45	x	1.11	=	152.5	(75)
Northeast 0.9x	1	x	3.72		x	72.63	X	0.45	x	1.11	=	121.58	(75)
Northeast 0.9x	1	x	3.72	;	x	50.42	X	0.45	x	1.11	=	84.4	(75)
Northeast 0.9x	1	x	3.72	;	x	28.07	X	0.45	x	1.11	=	46.98	(75)
Northeast 0.9x	1	x	3.72		x	14.2	X	0.45	x	1.11	=	23.77	(75)
Northeast 0.9x	1	x	3.72	;	x	9.21	X	0.45	x	1.11	=	15.42	(75)
Southwest _{0.9x}	1	x	7.36		x	36.79		0.45	x	1.11	=	121.86	(79)
Southwest _{0.9x}	1	x	7.36	;	x	62.67]	0.45	x	1.11	=	207.57	(79)
Southwest _{0.9x}	1	X	7.36		x	85.75		0.45	x	1.11	=	284.01	(79)
Southwest _{0.9x}	1	x	7.36		х 🗌	106.25		0.45	X	1.11	=	351.91	(79)
Southwest _{0.9x}	1	X	7.36		x	119.01		0.45	X	1.11	=	394.16	(79)
Southwest _{0.9x}	1	X	7.36		x	118.15		0.45	x	1.11	=	391.31	(79)
Southwest _{0.9x}	1	X	7.36	- :	x	113.91		0.45	X	1.11	=	377.27	(79)
Southwest _{0.9x}	1	X	7.36		x	104.39		0.45	X	1.11	=	345.74	(79)
Southwest _{0.9x}	1	X	7.36		x	92.85		0.45	X	1.11	=	307.53	(79)
Southwest _{0.9x}	1	X	7.36		x	69.27		0.45	X	1.11	=	229.41	(79)
Southwest _{0.9x}	1	X	7.36		x	44.07		0.45	X	1.11	=	145.96	(79)
Southwest _{0.9x}	1	X	7.36	;	x	31.49		0.45	X	1.11	=	104.29	(79)
Solar gains i	n watts, calcu	ılated	for each r	nonth			(83)m	ı = Sum(74)m .	(82)m				
(83)m= 140.7		53.28		47.08	554.33	529.77	467		276.4	169.73	119.71]	(83)
Total gains -	internal and	solar	(84)m = (7)	73)m +	- (83)n	n , watts	!	!			!	J	
(84)m= 687.7	4 788.68 87	74.89	954.64 10	002.67	980.02	937.96	883	.68 827.06	744.3	7 674.19	651.75		(84)
7. Mean into	ernal tempera	ature (heating se	eason))								
Temperatur	e during hea	ting p	eriods in th	ne livin	ng area	from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fa	actor for gain	s for li	ving area,	h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.95	0.92	0.87	0.77	0.63	0.47	0.35	0.3	0.58	0.81	0.92	0.96		(86)
Mean intern	al temperatu	ıre in I	iving area	T1 (fo	llow st	eps 3 to	7 in T	able 9c)					
(87)m= 19.89		20.4		20.88	20.97	20.99	20.		20.68	20.22	19.82]	(87)
Temperatur	e during hea	ting p	eriods in re	est of o	dwellin	g from Ta	able 9	9, Th2 (°C)				_	
(88)m= 20.12	20.12 2	0.12	20.12	20.12	20.12	20.12	20.	12 20.12	20.12	20.12	20.12		(88)

l Itilisa	ation fac	tor for a	ains for	rest of d	welling, I	h2 m (se	e Table	9a)						
(89)m=	0.94	0.91	0.85	0.74	0.58	0.41	0.28	0.31	0.52	0.78	0.91	0.95		(89)
` ′			<u> </u>	ļ	of dwelli		<u> </u>	<u> </u>	ļ	e 9c)				
(90)m=	19.12	19.34	19.61	19.88	20.04	20.11	20.12	20.12	20.08	19.87	19.45	19.06		(90)
` ′			<u> </u>				l		l f	LA = Livin	g area ÷ (4	4) =	0.21	(91)
Moon	intornal	l tompor	oturo (fo	r tho wh	olo dwol	ling) – f	ΙΛ ν Τ1	ı (1 fl	۸) ب T2					
(92)m=	19.28	19.5	19.77	20.04	ole dwel	20.29	20.3	20.3	20.26	20.04	19.61	19.22		(92)
					tempera						10.01			(-)
(93)m=	19.13	19.35	19.62	19.89	20.07	20.14	20.15	20.15	20.11	19.89	19.46	19.07		(93)
	ace hea		uirement											
Set Ti	i to the r	nean int		mperatu		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l Utilisa			ains, hm	<u> </u>	Iviay	Juli	<u> </u>	Aug	ОСР	001	1100	Dec		
(94)m=	0.93	0.9	0.84	0.73	0.58	0.41	0.28	0.31	0.52	0.77	0.9	0.94		(94)
	l gains,	hmGm	, W = (94	1 4)m x (8	L 4)m		l							
(95)m=	641.7	707.6	731.79	697.14	582.36	404.55	263.63	277.6	428.22	569.5	605.02	614.44		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8	!				l			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1107.11	1078.31	979.39	820.55	624.46	413.21	265.09	279.87	448.64	693.3	922.53	1109.55		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	346.26	249.12	184.21	88.86	31.32	0	0	0	0	92.11	228.61	368.37		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1588.85	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								20.29	(99)
9a. En	ergy red	uiremer	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatir	_										•		_
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	- ear
Space	e heating	g require	ement (c	alculate	d above)									
	346.26	249.12	184.21	88.86	31.32	0	0	0	0	92.11	228.61	368.37		
(211)m	$1 = \{[(98)]$)m x (20	(4)] } x 1	00 ÷ (20	06)									(211)
	382.61	275.27	203.55	98.18	34.6	0	0	0	0	101.77	252.61	407.04		
•								Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	F	1755.63	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month							!		_
= {[(98))m x (20	1)]}x1	00 ÷ (20	8)				-						
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)

Output from water heater (calculated 163.68 143.55 149.07 131.29		0.99 104.27	117.62	118.42	136.25	147.02	158.95		
Efficiency of water heater) 120.95 110	0.99 104.27	117.02	110.42	130.23	147.02	136.93	87.3	(216
(217)m= 89.45 89.3 89.04 88.56	87.92 8	7.3 87.3	87.3	87.3	88.56	89.22	89.51	01.0	」` (217
Fuel for water heating, kWh/month									
(219) m = (64) m x $100 \div (217)$ m (219)m = 182.99 160.75 167.42 148.23	3 144.4 12	7.14 119.44	134.73	135.64	153.84	164.78	177.58		
102.00 100.70 107.42 140.20	/ 144.4 12	7.14 113.44		I = Sum(2		104.70	177.50	1816.94	(219
Annual totals						Wh/yea	r	kWh/year	
Space heating fuel used, main syster	n 1							1755.63	
Water heating fuel used								1816.94	
Electricity for pumps, fans and electri	c keep-hot								
mechanical ventilation - balanced, e	xtract or posit	ive input fron	n outside	Э			51.24		(230
central heating pump:							30		(230
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/ye	ear		sum	of (230a).	(230g) =			126.24	(231
Electricity for lighting								350.32] (232
Electricity generated by PVs							[-240.96	_ (233
Total delivered energy for all uses (2:	11)(221) + (231) + (232).	(237b)	=			l I	3808.17	」` ີ](338
10a. Fuel costs - individual heating	systems:								
		Fuel			Fuel P	rice		Fuel Cost	
		kWh/year			(Table			£/year	
Space heating - main system 1		(011)						,	
		(211) x			3.4	.8	x 0.01 =	61.1	(240
Space heating - main system 2		(211) x (213) x			3.4		x 0.01 = x 0.01 =		(240
							l	61.1	_
Space heating - secondary		(213) x			0	19	x 0.01 =	61.1	(241
Space heating - secondary Water heating cost (other fuel)		(213) x (215) x			13.7	19 8	x 0.01 = x 0.01 =	61.1 0 0 63.23	[241] (242] (247]
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot	, (230g) separ	(213) x (215) x (219) (231)	licable a	nd apply	13. ⁴	19 8 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	61.1 0 0 63.23 16.65	[241] (242] (247]
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to	ı (230g) separ	(213) x (215) x (219) (231)	licable a	nd apply	13. ⁴	19 8 19 ce acco	x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	61.1 0 0 63.23 16.65](241](242
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting	. 0, .	(213) x (215) x (219) (231) rately as app	licable a	nd apply	13. ² 3.4 13. ² 14 15 15 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	19 8 19 ce acco	$x \ 0.01 = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	61.1 0 0 63.23 16.65 Table 12a	(241 (242 (247 (249 (250
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting	. 0, .	(213) x (215) x (219) (231) rately as app		nd apply	13.4 3.4 13.7 fuel prid	19 8 19 ce accor	$x \ 0.01 = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	61.1 0 0 63.23 16.65 Table 12a 46.21 120	(241 (242 (247 (249 (250 (251
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting Additional standing charges (Table 1)	2)	(213) x (215) x (219) (231) rately as app (232)		nd apply	13. ² 3.4 13. ² 14 15 15 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	19 8 19 ce accor	x 0.01 = [x 0.01 = [x 0.01 = [x 0.01 = [rding to T x 0.01 = [61.1 0 0 63.23 16.65 Table 12a 46.21	(241 (242 (247 (249
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting Additional standing charges (Table 1:	2) and (254) as	(213) x (215) x (219) (231) rately as app (232)	o (235) x)	nd apply	13.4 3.4 13.7 fuel prid	19 8 19 ce accor	x 0.01 = [x 0.01 = [x 0.01 = [x 0.01 = [rding to T x 0.01 = [61.1 0 0 63.23 16.65 Table 12a 46.21 120	(241) (242) (247) (249) (250) (251) (252)
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting Additional standing charges (Table 1:	2) and (254) as (245)(247)	(213) x (215) x (219) (231) rately as app (232) one of (233) to	o (235) x)	nd apply	13.4 3.4 13.7 fuel prid	19 8 19 ce accor	x 0.01 = [x 0.01 = [x 0.01 = [x 0.01 = [rding to T x 0.01 = [61.1 0 0 63.23 16.65 Table 12a 46.21 120 -31.78	(241) (242) (247) (249) (250) (251) (252)
Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting Additional standing charges (Table 1: Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating	2) and (254) as (245)(247)	(213) x (215) x (219) (231) rately as app (232) one of (233) to	o (235) x)	nd apply	13.4 3.4 13.7 fuel prid	19 8 19 ce accor	x 0.01 = [x 0.01 = [x 0.01 = [x 0.01 = [rding to T x 0.01 = [61.1 0 0 63.23 16.65 Table 12a 46.21 120 -31.78	(241) (242) (242) (242) (252) (251) (252) (252)
Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to Energy for lighting Additional standing charges (Table 1: Appendix Q items: repeat lines (253) Total energy cost 11a. SAP rating - individual heating Energy cost deflator (Table 12) Energy cost factor (ECF)	2) and (254) as (245)(247) systems	(213) x (215) x (219) (231) rately as app (232) one of (233) to	o (235) x) =	nd apply	13.4 3.4 13.7 fuel prid	19 8 19 ce accor	x 0.01 = [x 0.01 = [x 0.01 = [x 0.01 = [rding to T x 0.01 = [61.1 0 0 63.23 16.65 Table 12a 46.21 120 -31.78	[(241)] ((242)] ((247)] ((249)] ((250)] ((251)] ((252)]

12a. CO2 emissions – Individual heating system	s including micro-CHF		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	379.22 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	392.46 (264)
Space and water heating	(261) + (262) + (263) + ((264) =	771.68 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	65.52 (267)
Electricity for lighting	(232) x	0.519 =	181.82 (268)
Energy saving/generation technologies			
Item 1		0.519	-125.06 (269)
Total CO2, kg/year		sum of (265)(271) =	893.95 (272)
CO2 emissions per m ²		(272) ÷ (4) =	11.42 (273)
El rating (section 14)			90 (274)
El rating (section 14) 13a. Primary Energy			90 (274)
,	Energy kWh/year	Primary factor	90 (274) P. Energy kWh/year
,			P. Energy
13a. Primary Energy	kWh/year	factor	P. Energy kWh/year
13a. Primary Energy Space heating (main system 1)	kWh/year (211) x	factor =	P. Energy kWh/year
13a. Primary Energy Space heating (main system 1) Space heating (secondary)	kWh/year (211) x (215) x	factor = 1.22 = 1.22 = 1.22 = 1.22	P. Energy kWh/year 2141.87 (261) 0 (263)
13a. Primary Energy Space heating (main system 1) Space heating (secondary) Energy for water heating	kWh/year (211) x (215) x (219) x	factor = 1.22 = 1.22 = 1.22 = 1.22	P. Energy kWh/year 2141.87 (261) 0 (263) 2216.66 (264)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (factor = 1.22 = 3.07 = 1.22 = (264) =	P. Energy kWh/year 2141.87 (261) 0 (263) 2216.66 (264) 4358.53 (265)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (231) x	factor 1.22 = 3.07 = 1.22 = 3.07 = 3.07 =	P. Energy kWh/year 2141.87 (261) 0 (263) 2216.66 (264) 4358.53 (265) 387.55 (267)

 $(272) \div (4) =$

Primary energy kWh/m²/year

(273)

64.9

		User Details:				
Assessor Name:	Ben Tunningley	Stroma I	Number:	STRC	027495	
Software Name:	Stroma FSAP 2012	Software	e Version:	Versio	n: 1.0.5.41	
	Pro	operty Address: P	lot 034			
Address :	19 Buttercup Road , Bishops	Waltham, SOUTH	HAMPTON , SO32	1RF		
1. Overall dwelling dime	nsions:					
		Area(m²)	Av. Height(m)	Volume(m³)	_
Ground floor		39.15 (1a	a) x 2.4	(2a) =	93.96	(3a)
First floor		39.15 (1b	o) x 2.67	(2b) =	104.53	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	78.3 (4)				
Dwelling volume		(3	a)+(3b)+(3c)+(3d)+(3e))+(3n) =	198.49	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hour	
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 far	ns		0	x 10 =	0	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fin	res		0	x 40 =	0	(7c)
				A ir ok	nanges per hou	
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$)+(7h)+(7c) =				_
•	een carried out or is intended, proceed		0 tinue from (9) to (16)	÷ (5) =	0	(8)
Number of storeys in th	ne dwelling (ns)				0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or 0	0.35 for masonry of	construction		0	(11)
if both types of wall are pr deducting areas of openin	resent, use the value corresponding to t	he greater wall area (a	after			
	loor, enter 0.2 (unsealed) or 0.1	(sealed), else en	ter 0		0	(12)
If no draught lobby, ent	,	, , , , ,			0	(13)
•	s and doors draught stripped				0	(14)
Window infiltration		0.25 - [0.2 x ((14) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (10)	11) + (12) + (13) + (15)	=	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per squa	are metre of envelo	ope area	4.05999994277954	4 (17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)	1		0.2	(18)
Air permeability value applies	s if a pressurisation test has been done	or a degree air perme	eability is being used			_
Number of sides sheltere	d	,,			2	(19)
Shelter factor		(20) = 1 - [0.0]			0.85	(20)
Infiltration rate incorporat		(21) = (18) x	(20) =		0.17	(21)
Infiltration rate modified for		T T	, , , , , , , , , , , , , , , , , , , 	<u> </u>	1	
Jan Feb	Mar Apr May Jun	Jul Aug	Sep Oct N	ov 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

Wind Factor (22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infilt	ration rat	e (allowi	na for st	nelter an	d wind s	speed) =	(21a) x	(22a)m	-				
0.22	0.22	0.21	0.19	0.19	0.16	0.16	0.16	0.17	0.19	0.19	0.2]	
Calculate effe		-	rate for t	he appli	cable ca	se	!	!	<u>!</u>	!	·	J	_
If mechanic			andiv N. (2	12h) _ (22c) v Emy (aguatian (N	VEVV otho	muino (22h) - (225)			0.5	(23a)
If exhaust air h) = (23a)			0.5	(23b)
a) If balance		-	-	_					2h\m . (23h) ~ [1 (226)	0	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balanc	 ed mech:	ı anical ve	L entilation	without	heat red	coverv (N	I ЛV) (24b)m = (22	L 2b)m + (1 23b)		J	, ,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole I	nouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	on from (outside	!			J	
if (22b)	m < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22l	b) m + 0.	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									0.51				
(24d)m = 0	$\frac{m = 1, th}{1}$	0	111 = (221	0	o wise (2	0	$\frac{0.5 + [(2)]}{0}$	0	0.5]	0	0	1	(24d)
Effective air				<u> </u>									(= : =)
(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)
	1			I			1	1		1		1	
2 Hoot loce	oc and he	of loce r	aaramat	or:									
3. Heat losse		•			Net Ar	ea	U-val	ue	AXU		k-value	e A)	(k
3. Heat losse ELEMENT	es 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·		
	Gros	SS	Openin	gs									
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/				K
ELEMENT Doors	Gros area e 1	SS	Openin	gs	A ,r	m² x x1.	W/m2	2K = - 0.04] =	(W/ 2.94				(26)
ELEMENT Doors Windows Typ	Gros area e 1	SS	Openin	gs	A ,r 2.1 3.72	m² x x1.	W/m2 1.4 /[1/(1.4)+	2K = - 0.04] =	(W/ 2.94 4.93	K)			(26) (27) (27)
ELEMENT Doors Windows Typ Windows Typ	Gros area e 1	ss (m²)	Openin	gs ₁ ²	A ,r 2.1 3.72 7.36	x1.	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] =	(W/ 2.94 4.93 9.76	K)	kJ/m²-	K kJ/	(26) (27) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Floor	Gros area e 1 e 2	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.18	x1.	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] =	(W/ 2.94 4.93 9.76 4.3065	K)	kJ/m²-	K kJ/	(26) (27) (27) (27) (5) (28) (29)
ELEMENT Doors Windows Typ Windows Typ Floor Walls	Gros area e 1 e 2 48.3	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.18 35.19	x1. x1. x1. x x x x x x x x x x x x x x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = - 0.04] = - 0.04] = = =	(W/ 2.94 4.93 9.76 4.3065 8.45	K)	kJ/m²- 75	2936.25 2111.4	(26) (27) (27) (27) (5) (28) (29)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof	Gros area e 1 e 2 48.3	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.15 35.19	x1. x1. x1. x2. x2. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = - 0.04] = - 0.04] = = =	(W/ 2.94 4.93 9.76 4.3065 8.45	K)	kJ/m²- 75	2936.25 2111.4	(26) (27) (27) (5) (28) (29) (30) (31)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of	Gros area e 1 e 2 48.3 39.1 elements	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15	x1.	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	kJ/m²- 75 60 9	2936.25 2111.4 352.35	(26) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of or Party wall	Gros area e 1 e 2 48.3 39.1 elements	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.7	x1. x1. x x x x x x x x x x x x x x x x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	kJ/m ² - 75 60 9	2936.25 2111.4 352.35	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) (1) (32c)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of elements Party wall Internal wall *	Gros area e 1 e 2 48.3 39.1 elements	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.7	x1.	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	75 60 9 45	2936.25 2111.4 352.35 3856.95 593.568	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) (1) (32c)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of or Party wall Internal wall * Internal wall *	Gros area e 1 e 2 48.3 39.1 elements	ss (m²)	Openin m	gs ₁ ²	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.7 65.96	x1. x1. x	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	75 60 9 45 9	2936.25 2111.4 352.35 3856.95 593.568 616.129	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) 1 (32c) 2 (32c) (32d)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of of Party wall Internal wall * Internal wall * Internal floor	Gros area e 1 e 2 48.3 39.1 elements *	ss (m²) 37 15 ., m²	Openin m 13.18 0	gs 1 ² 8	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.7 65.95 68.46 39.15 39.15	x10	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.04 = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	75 60 9 45 9 9	2936.25 2111.4 352.35 3856.95 593.568 616.129 704.7 352.35	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) 1 (32c) 2 (32c) (32d)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of elements Party wall Internal wall * Internal floor Internal ceiling * for windows and	Gros area e 1 e 2 48.3 39.1 elements * * d roof winderas on both	ows, use e	Openin m 13.13 0	gs 1 ² 8	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.7 65.95 68.46 39.15 39.15	x1.	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.04 = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	75 60 9 45 9 9	2936.25 2111.4 352.35 3856.95 593.568 616.129 704.7 352.35	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) 1 (32c) 2 (32c) (32d)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of e Party wall Internal wall * Internal floor Internal ceiling * for windows and ** include the area	Gros area e 1 e 2 48.3 39.1 elements * * d roof wind has on both ss, W/K:	ows, use e sides of in= S (A x	Openin m 13.13 0	gs 1 ² 8	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.7 65.95 68.46 39.15 39.15 alue calcul	x1.	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.0	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	kJ/m²- 75 60 9 45 9 18 9 paragraph	2936.28 2111.4 352.35 3856.98 593.568 616.129 704.7 352.35	(26) (27) (27) (5) (28) (29) (30) (31) (5) (32) (1) (32c) (2) (32c) (32d) (32e)
ELEMENT Doors Windows Typ Windows Typ Floor Walls Roof Total area of elements wall * Internal wall * Internal floor Internal ceiling * for windows and ** include the are Fabric heat lo	Gros area e 1 e 2 48.3 39.1 elements * * * d roof winder as on both ss, W/K: Cm = S(ows, use esides of interest (A x k)	Openin m 13.13 0 effective winternal walk U)	gs 8 8 Indow U-va	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.77 65.95 68.46 39.15 39.15 alue calculations	x1 x1 x1 x1 x2 x2 x2 x2 x3 x4	W/m ² 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = -0.04 = -0.04 = = = = = = = = = =	(W/ 2.94 4.93 9.76 4.3065 8.45 4.31	K)	kJ/m²- 75 60 9 45 9 18 9 paragraph	2936.28 2111.4 352.35 3856.98 593.568 616.129 704.7 352.35 13.2	(26) (27) (27) (28) (29) (30) (31) (5) (32) (1) (32c) (32c) (32d) (32e)

oon he wood instan	ad of a do	tailed solo	ulation										
can be used instead Thermal bridge				usina An	nendix k	K						7.19	(36)
if details of therma	,	•			•							7.19	(30)
Total fabric hea	0 0		()	(0	-/			(33) +	(36) =			41.88	(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= 32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75	32.75		(38)
Heat transfer of	coefficier	nt, W/K		-		-		(39)m	= (37) + (37)	38)m	-	•	
(39)m= 74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63	74.63		
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	74.63	(39)
(40)m= 0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Number of day	s in mor	nth (Tabl	le 1a)					•	Average =	Sum(40) ₁	12 /12=	0.95	(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	43		(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)	40		(12)
Annual averag	e hot wa										.91		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	f		•	
	Feb	Mar				Jul	Διια	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= 101.1	97.42	93.75	90.07	86.39	82.72	82.72	86.39	90.07	93.75	97.42	101.1		
` '						<u> </u>			Total = Su	<u> </u>	<u> </u>	1102.9	(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= 149.93	131.13	135.31	117.97	113.19	97.68	90.51	103.86	105.1	122.49	133.71	145.2		
If instantaneous w	atar haati	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	havas (16		Total = Su	m(45) ₁₁₂ =	=	1446.07	(45)
		· ·	,		,		` ′	· , ,	10.07	00.00	04.70	I	(46)
(46)m= 22.49 Water storage	19.67 loss:	20.3	17.7	16.98	14.65	13.58	15.58	15.77	18.37	20.06	21.78		(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 امسمام	ft-	معامات	/1.\\/h	- /-l-: ·\·						1	(10)
a) If manufact				or is kno	wn (kvvr	n/day):					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	actor 110	III TADIC	20								0		(53)

٠,		m water (54) in (5	•	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0	(54)	
,	` '	. , .	,	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))
			-					-	_	m where (` '	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57))
Primary	y circuit	loss (ar	nual) fro	om Table	3	-	-			-		0	(58))
-						59)m = ((58) ÷ 36	55 × (41)	m				•	
` г	lified 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)	1
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 eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	163.68	143.55	149.07	131.28	126.95	110.99	104.27	117.62	118.42	136.25	147.02	158.95	(62))
										r contributi	on to wate	er heating)		
` г			r	r		applies	· ·							
(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	ter										•	
(64)m=	163.68	143.55	149.07	131.28	126.95	110.99	104.27	117.62	118.42	136.25	147.02	158.95		
										ater heater	,		1608.04 (64)	1
Ī				1						([(46)m				
(65)m=	53.29	46.71	48.43	42.55	41.08	35.81	33.53	37.97	38.28	44.17	47.79	51.72	(65)	1
	` '					ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
		·		and 5a):									
Metabo			5), Wat		N 4 -			Δ.	0	0.1	NI.	D	1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)	\
(66)m=	121.49	121.49	121.49	121.49	121.49	121.49	121.49	121.49	121.49	121.49	121.49	121.49	(00)	!
Ť		<u> </u>		`		ion L9 o				47.04	40.00	04.47	(67)	\
(67)m=	20.6	18.29	14.88	11.26	8.42	7.11	7.68	9.98	13.4	17.01	19.86	21.17	(67))
		<u> </u>				uation L		3a), also			100.07	200 22	(68)	١
(68)m=	215.85	218.09	212.45	200.43	185.26	171.01	161.48	159.24	164.89	176.9	192.07	206.33	(00)	,
Cookin		/ I . I .	1 - 1 · - A			45								
Г		·				tion L15					05.45	05.45	(60)	
(69)m=	35.15	35.15	35.15	35.15	L, equat 35.15	35.15	or L15a) 35.15	, also se 35.15	e Table 35.15	5 35.15	35.15	35.15	(69)	ı
(69)m= [Pumps	35.15 and far	35.15	35.15 (Table \$	35.15 5a)	35.15	35.15	35.15	35.15	35.15	35.15				
(69)m= [Pumps (70)m= [35.15 and far	35.15 ns gains 3	35.15 (Table 5	35.15 5a)	35.15	35.15					35.15	35.15	(69)	
(69)m= [Pumps (70)m= [Losses	35.15 and far 3 e.g. ev	35.15 ns gains 3 aporation	35.15 (Table 5 3 on (nega	35.15 5a) 3 tive valu	35.15 3 es) (Tab	35.15 3 ble 5)	35.15	35.15	35.15	35.15	3	3	(70))
(69)m= [Pumps (70)m= [Losses (71)m= [35.15 and far 3 e.g. ev	35.15 ns gains 3 raporatic	35.15 (Table § 3 on (nega	35.15 5a)	35.15	35.15	35.15	35.15	35.15	35.15)
(69)m= [Pumps (70)m= [Losses (71)m= [Water h	35.15 and far 3 6 e.g. ev -97.19	35.15 ns gains 3 aporatic -97.19 gains (T	35.15 (Table 5 3 on (nega -97.19 able 5)	35.15 5a) 3 tive valu	35.15 3 es) (Tab	35.15 3 ble 5) -97.19	35.15	35.15	35.15	35.15	3 -97.19	3 -97.19	(70))
(69)m= [Pumps (70)m= [Losses (71)m= [Water r (72)m= [35.15 and far 3 e.g. ev -97.19 heating 71.63	35.15 ns gains 3 raporatic -97.19 gains (T	35.15 (Table 5 3 on (nega -97.19 Table 5) 65.09	35.15 5a) 3 tive valu	35.15 3 es) (Tab	35.15 3 ole 5) -97.19 49.73	35.15 3 -97.19 45.07	35.15 3 -97.19 51.04	35.15 3 -97.19 53.16	35.15 3 -97.19 59.36	-97.19 66.37	-97.19 69.51	(70))
(69)m= [Pumps (70)m= [Losses (71)m= [Water r (72)m= [35.15 and far 3 e.g. ev -97.19 heating 71.63	35.15 ns gains 3 aporatic -97.19 gains (T	35.15 (Table 5 3 on (nega -97.19 Table 5) 65.09	35.15 5a) 3 tive valu	35.15 3 es) (Tab	35.15 3 ole 5) -97.19 49.73	35.15 3 -97.19 45.07	35.15 3 -97.19 51.04	35.15 3 -97.19 53.16	35.15	-97.19 66.37	-97.19 69.51	(70))

	_			10 0u ui			3110115	to convert to the	е аррііс		uori.		
	Access Factor Table 6d	•	Area m²		Flu Tal	x ble 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	3.72	x	: 1	1.28	x	0.45	×	1.11	=	14.54	(75)
Northeast _{0.9x}	0.77	X	3.72	×	2	22.97	x	0.45	×	1.11	=	29.6	(75)
Northeast _{0.9x}	0.77	X	3.72	×	:	11.38	x	0.45	×	1.11	=	53.34	(75)
Northeast 0.9x	0.77	X	3.72	x		67.96	x	0.45	×	1.11	=	87.59	(75)
Northeast _{0.9x}	0.77	X	3.72	×	: 9	91.35	x	0.45	x	1.11	=	117.74	(75)
Northeast _{0.9x}	0.77	X	3.72	×	: [9	97.38	x	0.45	x	1.11	=	125.53	(75)
Northeast _{0.9x}	0.77	X	3.72	×		91.1	x	0.45	x	1.11	=	117.43	(75)
Northeast _{0.9x}	0.77	X	3.72	×	7	72.63	X	0.45	X	1.11	=	93.61	(75)
Northeast _{0.9x}	0.77	X	3.72	×	5	50.42	X	0.45	×	1.11	=	64.99	(75)
Northeast _{0.9x}	0.77	X	3.72	×	2	28.07	x	0.45	X	1.11	=	36.18	(75)
Northeast _{0.9x}	0.77	X	3.72	X		14.2	x	0.45	X	1.11	=	18.3	(75)
Northeast _{0.9x}	0.77	X	3.72	X		9.21	X	0.45	X	1.11	=	11.88	(75)
Southwest _{0.9x}	0.77	X	7.36	×	3	36.79]	0.45	X	1.11	=	93.83	(79)
Southwest _{0.9x}	0.77	X	7.36	×	. 6	62.67]	0.45	X	1.11	=	159.83	(79)
Southwest _{0.9x}	0.77	X	7.36	×	8	35.75]	0.45	X	1.11	=	218.69	(79)
Southwest _{0.9x}	0.77	X	7.36	×	1	06.25]	0.45	X	1.11	=	270.97	(79)
Southwest _{0.9x}	0.77	X	7.36	X	1	19.01]	0.45	X	1.11	=	303.51	(79)
Southwest _{0.9x}	0.77	X	7.36	×	1	18.15]	0.45	X	1.11	=	301.31	(79)
Southwest _{0.9x}	0.77	X	7.36	×	1	13.91]	0.45	X	1.11	=	290.5	(79)
Southwest _{0.9x}	0.77	X	7.36	×	1	04.39]	0.45	X	1.11	=	266.22	(79)
Southwest _{0.9x}	0.77	X	7.36	×	: 9	92.85]	0.45	X	1.11	=	236.79	(79)
Southwest _{0.9x}	0.77	X	7.36	×	. 6	9.27]	0.45	X	1.11	=	176.65	(79)
Southwest _{0.9x}	0.77	X	7.36	X	. 4	14.07		0.45	X	1.11	=	112.39	(79)
Southwest _{0.9x}	0.77	X	7.36	X	3	31.49		0.45	X	1.11	=	80.3	(79)
Solar gains in	ı watts, calcula	ted	for each m	onth			(83)m	= Sum(74)m .	(82)m				
(83)m= 108.38		_			426.84	407.92	359	84 301.79	212.8	3 130.69	92.18]	(83)
Total gains -	internal and so	olar	(84)m = (7)	3)m +	(83)m	, watts						_	
(84)m= 478.9	557.77 626.	89	691.8 73	2.59	717.13	684.61	642	55 595.68	528.5	5 471.43	451.63		(84)
7. Mean inte	rnal temperatu	ıre (heating sea	ason)									
Temperature	e during heatin	g pe	eriods in the	e livin	g area	from Ta	ble 9	Th1 (°C)				21	(85)
Utilisation fa	ctor for gains f	or li	ving area, l	ո1,m (see Ta	ble 9a)				_			
Jan	Feb Ma	ar	Apr I	Лау	Jun	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m= 0.98	0.97 0.94	4	0.88 0	.77	0.61	0.46	0.5	1 0.73	0.91	0.97	0.99		(86)
Mean interna	al temperature	in li	iving area	1 (fol	low ste	ps 3 to	7 in T	able 9c)					
(87)m= 19.55	19.76 20.0	-).76	20.93	20.98	20.		20.45	19.91	19.48		(87)
	a during heatin	a ne	eriods in re	st of d	welling	from Ta	able 9), Th2 (°C)		-		-	
Temperature	z uullilu libaliil												

l Itilisa	ition fac	tor for a	ains for	rest of di	welling l	h2 m (se	ee Table	9a)						
(89)m=	0.98	0.97	0.93	0.86	0.73	0.54	0.38	0.42	0.67	0.89	0.97	0.99		(89)
` ′ L		l temper	ļ		of dwelli		ollow ste	<u> </u>		<u> </u>				
(90)m=	18.79	19	19.31	19.67	19.95	20.08	20.11	20.11	20.03	19.67	19.15	18.73		(90)
L							l		f	L LA = Livin	g area ÷ (4	4) =	0.21	(91)
Mean	internal	l temner	ature (fo	r the wh	ole dwel	ling) – f	LA × T1	+ (1 – fl	Δ) v T2					
(92)m=	18.95	19.16	19.47	19.83	20.12	20.26	20.3	20.29	20.2	19.84	19.31	18.88		(92)
L	adiustn	nent to t	L he mear	L internal	tempera	ature fro	m Table	4e. whe		L opriate	<u> </u>			
(93)m=	18.8	19.01	19.32	19.68	19.97	20.11	20.15	20.14	20.05	19.69	19.16	18.73		(93)
8. Spa	ace hea	ting requ	uirement											
				mperatui using Ta		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	uains, hm	<u> </u>			<u> </u>		'	<u> </u>	<u> </u>			
(94)m=	0.98	0.96	0.92	0.85	0.72	0.54	0.38	0.42	0.67	0.88	0.96	0.98		(94)
Useful	l gains,	hmGm	, W = (94	4)m x (84	4)m							•	l	
(95)m=	467.18	534.12	578.44	587.75	528.25	389.09	260.42	272.71	396.23	465.08	452.11	442.55		(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able 8							' '	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
					erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			ı	
` ′ L		1053.07	957.06	804.81	616.86	411.03	264.6	279.14	444.11	678.12	900.27	1084.76		(97)
· .			i				th = 0.02			 	<u> </u>	1	l	
(98)m=	457.34	348.74	281.69	156.29	65.93	0	0	0	0	158.5	322.68	477.81		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2268.97	(98)
Space	e heating	g require	ement in	kWh/m²	/year								28.98	(99)
9a. Ene	ergy req	luiremer	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatir	_										,		_
Fraction	on of sp	ace hea	nt from s	econdar	y/supple	mentary	system						0	(201)
Fraction	on of sp	ace hea	nt from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	າ, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	– ear
Space	heating	g require	ement (c	alculate	d above)		•				•		l.	
[457.34	348.74	281.69	156.29	65.93	0	0	0	0	158.5	322.68	477.81		
(211)m	= {[(98])m x (20	4)] } x 1	00 ÷ (20	06)									(211)
· [505.34	385.35	311.26	172.7	72.85	0	0	0	0	175.14	356.55	527.97		
_								Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	F	2507.15	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month									_
= {[(98 <u>)</u>	m x (20)1)]}x1	00 ÷ (20	8)				T	·	1			ı	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)

Water heating								
Output from water heater (calculated above)	40.00 404.07	447.00	140.40	100.05	1,47,00	1,50.05	1	
163.68 143.55 149.07 131.28 126.95 1 Efficiency of water heater	10.99 104.27	117.62	118.42	136.25	147.02	158.95	07.0	(216)
·	87.3 87.3	87.3	87.3	88.99	89.47	89.68	87.3	(217)
Fuel for water heating, kWh/month	57.10	01.10	00	00.00	00	00.00		,
(219) m = (64) m x $100 \div (217)$ m			ı				1	
(219)m= 182.61 160.32 166.81 147.49 143.66 1	27.14 119.44	134.73	135.64 Il = Sum(2	153.1	164.32	177.25	4040.40	7,040)
Annual totals		Tota	ii – Guiii(2		Wh/yea	•	1812.49 kWh/year	(219)
Space heating fuel used, main system 1					vvii, y ca		2507.15	7
Water heating fuel used							1812.49	Ī
Electricity for pumps, fans and electric keep-hot								_
mechanical ventilation - balanced, extract or pos	sitive input fron	n outside	Э			51.24		(230a)
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =	:		126.24	(231)
Electricity for lighting							363.74	(232)
Electricity generated by PVs							-240.96	(233)
Electricity generated by PVs Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b)	=				-240.96 4568.66	(233)
	` ' ` '	` '						_
Total delivered energy for all uses (211)(221) +	` ' ` '	` '		Emiss kg CO	ion fac 2/kWh	tor		(338)
Total delivered energy for all uses (211)(221) +	s including mi	` '			2/kWh	tor =	4568.66 Emissions	(338)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system	Energy kWh/year	` '		kg CO	2/kWh		4568.66 Emissions kg CO2/yea	(338)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	` '		kg CO	2/kWh	=	4568.66 Emissions kg CO2/yea	(338) ur (261)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	cro-CHP		0.2 0.5	2/kWh	=	4568.66 Emissions kg CO2/yea 541.54	(338) Ir (261) (263)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x	cro-CHP		0.2 0.5	2/kWh 16 19 16	=	4568.66 Emissions kg CO2/yea 541.54 0 391.5	(338) (338) (261) (263) (264)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)	cro-CHP		0.2 0.5 0.2	2/kWh 16 19 16	= = =	4568.66 Emissions kg CO2/yea 541.54 0 391.5 933.04	(338) (261) (263) (264) (265)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	cro-CHP		0.2 0.5 0.2	2/kWh 16 19 16 19 19	= = =	4568.66 Emissions kg CO2/yea 541.54 0 391.5 933.04 65.52	(338) (261) (263) (264) (265) (267)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	cro-CHP	(264) =	0.2 0.5 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = = = = = = = = = = = = = = = = = = =	4568.66 Emissions kg CO2/yea 541.54 0 391.5 933.04 65.52 188.78	(338) (338) (261) (263) (264) (265) (267) (268) (269)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	cro-CHP	(264) = sum o	0.2 0.5 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = = = = = = = = = = = = = = = = = = =	4568.66 Emissions kg CO2/yea 541.54 0 391.5 933.04 65.52 188.78	(338) (338) (261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

88

		User Details:			
Accesser Name	Pon Tunninglov		abor. C	TRO027495	
Assessor Name: Software Name:	Ben Tunningley Stroma FSAP 2012	Stroma Nun Software Ve		ersion: 1.0.5.41	
Software Name.	Ottoma i OAI 2012	Property Address: Plot 03		C131011. 1.0.0.41	
Address :	19 Buttercup Road , Bisho	· · · · ·			
Overall dwelling dime	·	po waitham, coom in the	1011, 0002 1111		
<u> </u>		Area(m²)	Av. Height(m)	Volume(m	³)
Ground floor		39.15 (1a) x) = 93.96	(3a)
First floor		39.15 (1b) x	2.67 (2b) = 104.53	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n) 78.3 (4)			
Dwelling volume		(3a)+(3l	o)+(3c)+(3d)+(3e)+(3n)	= 198.49	(5)
2. Ventilation rate:					
	main second heating heating		total	m³ per hoւ	ır
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 far	าร		3 x 10 =	30	(7a)
Number of passive vents			0 x 10 =	0	(7b)
Number of flueless gas fin	res		0 x 40 =	0	(7c)
			Δ	ir changes per h	our
Infiltration due to chimne	vs, flues and fans = $(6a)+(6b)$	+(7a)+(7b)+(7c) =	30 ÷ (5)		(8)
•	een carried out or is intended, proc			0.13	
Number of storeys in the	e dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0	0.1 = 0	(10)
	25 for steel or timber frame	•	ruction	0	(11)
if both types of wall are pr deducting areas of openin	esent, use the value corresponding as): if equal user 0.35	to the greater wall area (after			
=	oor, enter 0.2 (unsealed) or	0.1 (sealed), else enter 0		0	(12)
If no draught lobby, ent	er 0.05, else enter 0			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 me	res per hour per square n	netre of envelope are	ea 5	(17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 20]	+(8), otherwise (18) = (16)		0.4	(18)
Air permeability value applies	s if a pressurisation test has been o	lone or a degree air permeability	is being used		
Number of sides sheltere	d			2	(19)
Shelter factor		$(20) = 1 - [0.075 \times 0.000]$	[19)] =	0.85	(20)
Infiltration rate incorporati	ng shelter factor	(21) = (18) x (20) =		0.34	(21)
Infiltration rate modified for	or monthly wind speed				
Jan Feb	Mar Apr May Jur	Jul Aug Sep	Oct Nov [Dec	
	eed from Table 7				

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor	(22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infil	tration rat	e (allowi	ng for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.43	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4		
Calculate eff		•	rate for t	he appli	cable ca	ise	-			-			(23a)
If exhaust air			endix N, (2	23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
If balanced w									, (,			0	(23c)
a) If baland	ced mecha	anical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)		(===)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If baland	ced mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (2)	2b)m + (23b)	•	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole	house ex	tract ven	tilation o	or positiv	e input	ventilatio	n from o	outside	-	-	-	-	
)m < 0.5 ×	(23b), t	hen (24	c) = (23b	o); other	wise (24	c) = (22l	b) m + 0	.5 × (23b) 		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natura	al ventilation) $m = 1$, the								0.51				
(24d)m = 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.5 1 [(2	0.56	0.57	0.57	0.58]	(24d)
Effective a				<u> </u>	<u> </u>						<u> </u>		,
(25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. Heat loss	oo ood be	oot loop r	aramat	or.			·		1			l	
	ses and ne	tai 1055 þ											
EI EMENT	Gros				Net Ar	ea	U-val	ue	AXU		k-value	a.	ΑΧk
ELEMENT	Gros area	SS	Openin m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
Doors		SS	Openin	ıgs						K)			
	area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
Doors	area	SS	Openin	ıgs	A ,r	m² x x1.	W/m2	2K = -0.04] =	(W/ 2.1	K)			kJ/K (26)
Doors Windows Typ	area	SS	Openin	ıgs	A ,r 2.1 3.72	m² x x10 x10	W/m2 1 /[1/(1.4)+	2K = -0.04] =	(W/ 2.1 4.93				kJ/K (26) (27)
Doors Windows Typ Windows Typ	area	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	2K = - 0.04] = - 0.04] =	(W/ 2.1 4.93 9.76				kJ/K (26) (27) (27)
Doors Windows Typ Windows Typ Floor	area	ss (m²)	Openin m	gs 1 ²	A ,r 2.1 3.72 7.36 39.15	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	2K = -0.04] = -0.04] = = = = = = = = = = = = = = = = = = =	(W// 2.1 4.93 9.76 5.0895				kJ/K (26) (27) (27) (28)
Doors Windows Typ Windows Typ Floor Walls	area pe 1 pe 2 48.3 39.1	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19	x1. x1. x1. x x x x x x x x x x x x x x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33				kJ/K (26) (27) (27) (28) (29)
Doors Windows Typ Windows Typ Floor Walls Roof	area pe 1 pe 2 48.3 39.1	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19	x1. x1. x2. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33				kJ/K (26) (27) (27) (28) (29) (30)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of	area pe 1 pe 2 48.3 39.1 elements	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09				kJ/K (26) (27) (27) (28) (29) (30) (31)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall	area pe 1 pe 2 48.3 39.1 elements	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71	x1. x1. x x x x x x x x x x x x x x x x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09				kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall	area pe 1 pe 2 48.3 39.1 elements	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09				kJ/K (26) (27) (27) (28) (29) (30) (31) (32)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall	area pe 1 pe 2 48.3 39.1 elements	ss (m²)	Openin	gs 1 ²	A ,r 2.1 3.72 7.36 39.15 35.19 126.6 85.71 65.95 68.46	x1. x1. x	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04] = -0.04] = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09				kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall Internal floor	area pe 1 pe 2 48.3 39.1 elements ** **	ss (m²) 37 15 ., m²	Openin m 13.1 0	gs ₁ 2 8	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15	x10	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04] = -0.04] = = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09		kJ/m²-l		kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall Internal floor Internal ceilin * for windows an	area pe 1 pe 2 48.3 39.1 elements ** ** ** ** ** ** ** ** **	ows, use e sides of in	Openin m 13.1 0	gs ₁ 2 8	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04 = -0.04 = = = = = = = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09		kJ/m²-l		kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c) (32d) (32e)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall Internal floor Internal ceilin * for windows an ** include the an	area pe 1 pe 2 48.3 39.1 elements ** ** area 48.3 39.1 felements ** ** ** ** ** ** ** ** **	ows, use e sides of in = S (A x	Openin m 13.1 0	gs ₁ 2 8	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15	x1.	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04 = -0.04 = = = = = = = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09	as given in	kJ/m²-l	K	kJ/K (26) (27) (27) (28) (30) (31) (32c) (32c) (32c) (32e)
Doors Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall Internal floor Internal ceilin * for windows an ** include the an Fabric heat le	area pe 1 pe 2 48.3 39.1 elements ** ** ** triang area on both oss, W/K = y Cm = S(ows, use e sides of in = S (A x k)	Openin m 13.1 0 ffective witernal wall U)	indow U-va	A ,r 2.1 3.72 7.36 39.15 35.19 39.15 126.6 85.71 65.95 68.46 39.15 39.15 alue calculatitions	x1 x1 x1 x1 x2 x2 x2 x2 x3 x4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K = -0.04 = -0.04 = = = = = = = = = =	(W// 2.1 4.93 9.76 5.0895 6.33 5.09	as given in (2) + (32a).	kJ/m²-l	33.2	kJ/K (26) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32d) (32e)

A		ai briage	85:5(L	x Y) cale	culated ι	using Ap	pendix ł	<						9.01	(3
antilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Sep	etails	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)						<u>'</u>		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38.94 38.7 38.46 37.36 37.15 36.19 36.19 36.01 36.56 37.15 37.57 38.01	tal fa	abric hea	at loss							(33) +	(36) =			42.31	(:
38.94 38.7 38.46 37.66 37.15 36.19 36.19 36.01 36.56 37.15 37.57 38.01	ntilat: r	tion hea			monthly	/					= 0.33 × (25)m x (5)			
Past transfer coefficient, W/K (39)m = (37) + (38)m (37) + (38)m (38)m (37) + (38)m	,	Jan	Feb	Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Section Sect)m=	38.94	38.7	38.46	37.36	37.15	36.19	36.19	36.01	36.56	37.15	37.57	38.01		(
Average = Sum(39). a/12= 79.67 Average = Sum(39). a/12= 79.67 (40)m = (39)m = (4) Average = Sum(40). a/12= 1.02 India 1.03 1.03 1.03 1.03 1.03 1.03 1.03 1.02 1.01 1 1 1 1.01 1.01 1.01 1.03 Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Average = Sum(40). a/12= 1.02 Imber of days in month (Table 1a) Imber of days in month (Ta	at tra	ansfer c	oefficier	nt, W/K				ī	,	(39)m	= (37) + (3	38)m	-		
at loss parameter (HLP), W/m²K (40)m = (39)m + (4) (40)m = (39)m + (40)m (40)m = (30)m + (40)m)m=	81.25	81.01	80.78	79.67	79.46	78.5	78.5	78.32						_
Average = Sum(40)	at lo	ss para	meter (H	ILP), W/	′m²K								12 /12=	79.67	'
May Jun Jul Aug Sep Oct Nov Dec)m=	1.04	1.03	1.03	1.02	1.01	1	1	1	1.01	1.01	1.02	1.03		_
Water heating energy requirement: WWh/year: Wwwh/year: Wwwwh/wear: Wwh/year: Wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww	ımbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.02	
Water heating energy requirement:		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
sumed occupancy, N f TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) f TFA £ 13.9, N = 1 nual average hot water usage in litres per day Vd,average = (25 x N) + 36 gl.)m=	31	28	31	30	31	30	31	31	30	31	30	31		(
sumed occupancy, N f TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) f TFA £ 13.9, N = 1 nual average hot water usage in litres per day Vd,average = (25 x N) + 36 fuce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Im= 101.1 97.42 93.75 90.07 86.39 82.72 82.72 86.39 90.07 93.75 97.42 101.1 Total = Sum(44)9 = 1102.9 ergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) Im= 149.93 131.13 135.31 117.97 113.19 97.68 90.51 103.86 105.1 122.49 133.71 145.2 Total = Sum(45)2 = 1446.07 Istantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Im= 22.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Interest storage loss: Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling, enter 110 litres in (47) Interest or and no tank in dwelling in the factor from Table 2b Interest or and no tank in dwelling in the factor from Table 2b Interest or and no tank in dwelling in the factor from Table 2b Interest or and no tank in dwelling in the factor from Table 2b Interest or and no tank in dwelling in the factor from Table 2 (kWh/litre/day) Interest or and no tank in dwell in the dwelling in the factor from Table 2 (kWh/litre/day)															
f TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 nual average hot water usage in litres per day Vd, average = (25 x N) + 36 nual average hot water usage by 5% if the dwelling is designed to achieve a water use target of more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Imm 101.1 97.42 93.75 90.07 86.39 82.72 82.72 86.39 90.07 93.75 97.42 101.1 Total = Sum(41) = 1102.9 Imm 149.93 131.13 135.31 117.97 113.19 97.68 90.51 103.86 105.1 122.49 133.71 145.2 Total = Sum(45) = 1102.9 Imm 149.93 131.13 135.31 117.97 113.19 97.68 90.51 103.86 105.1 122.49 133.71 145.2 Total = Sum(45) = 1102.9 Imm 22.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 22.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 24.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 25.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 26.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 26.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 26.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 26.49 19.67 20.3 17.7 16.98 14.65 13.58 15.58 15.77 18.37 20.06 21.78 Imm 26.49 19.6	Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
f TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) f TFA £ 13.9, N = 1 nual average hot water usage in litres per day Vd, average = (25 x N) + 36 yuce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec water usage in litres per day for each month Vd,m = factor from Table 1c x (43) ym= 101.1 97.42 93.75 90.07 86.39 82.72 82.72 86.39 90.07 93.75 97.42 101.1 Total = Sum(44) yes arrow and the sum of the s	eum	של טכנוו	nancy N	NI.									40		
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argy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d))m=)m=	101.1	97.42	93.75	90.07	86.39	82.72	82.72	86.39	90.07	93.75	97.42	101.1		
149.93 131.13 135.31 117.97 113.19 97.68 90.51 103.86 105.1 122.49 133.71 145.2			la a 4 a 4 a			antlele	400 \/-/		T / 200/					1102.9	
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instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) i)m= 22.49		149.93	131.13	135.31	117.97	113.19	97.68	90.51	103.86	105.1				4.440.07	
m= 22.49 19.67 20.3 17.7 16.98 14.65 13.58 15.77 18.37 20.06 21.78 ater storage loss: prage volume (litres) including any solar or WWHRS storage within same vessel 0 community heating and no tank in dwelling, enter 110 litres in (47) therwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss: If manufacturer's declared loss factor is known (kWh/day): mperature factor from Table 2b ergy lost from water storage, kWh/year (48) × (49) = 0 If manufacturer's declared cylinder loss factor is not known: at water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3)m=														\neg
ter storage loss: orage volume (litres) including any solar or WWHRS storage within same vessel community heating and no tank in dwelling, enter 110 litres in (47) herwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss: If manufacturer's declared loss factor is known (kWh/day): operature factor from Table 2b ergy lost from water storage, kWh/year If manufacturer's declared cylinder loss factor is not known: ot water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3	Ĺ	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =		1440.07	
community heating and no tank in dwelling, enter 110 litres in (47) herwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) here storage loss: If manufacturer's declared loss factor is known (kWh/day): If manufacturer factor from Table 2b Here gy lost from water storage, kWh/year If manufacturer's declared cylinder loss factor is not known: He water storage loss factor from Table 2 (kWh/litre/day) Community heating see section 4.3	stanta) to (61)				1446.07	
herwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss: If manufacturer's declared loss factor is known (kWh/day): mperature factor from Table 2b ergy lost from water storage, kWh/year If manufacturer's declared cylinder loss factor is not known: at water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3	nstanta)m= [22.49	19.67) to (61)				1440.07	
ater storage loss: If manufacturer's declared loss factor is known (kWh/day): mperature factor from Table 2b ergy lost from water storage, kWh/year If manufacturer's declared cylinder loss factor is not known: at water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3	ostanta om= [ater s	22.49 storage	19.67 loss:	20.3	17.7	16.98	14.65	13.58	15.58) to (61) 15.77	18.37	20.06	21.78	1446.07	
If manufacturer's declared loss factor is known (kWh/day): mperature factor from Table 2b ergy lost from water storage, kWh/year If manufacturer's declared cylinder loss factor is not known: ot water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3	ostanta)m= [ater s orage	22.49 storage e volum	19.67 loss: e (litres)	20.3	17.7	16.98 Dlar or W	14.65 /WHRS	13.58 storage	15.58 within sa) to (61) 15.77	18.37	20.06	21.78	1446.07	
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If manufacturer's declared cylinder loss factor is not known: at water storage loss factor from Table 2 (kWh/litre/day) community heating see section 4.3	stanta)m= [ater s orage comn herw ater s	22.49 storage e volume nunity he rise if no storage anufacte	19.67 loss: e (litres) eating a stored loss: urer's de	20.3 including nd no tale hot water	ag any so ank in dw er (this in	16.98 Dlar or W relling, e	14.65 /WHRS nter 110 nstantar	13.58 storage litres in neous co	15.58 within sa (47)	15.77 ame ves	18.37 sel	20.06	21.78	1446.07	(
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Long feeting from Tellings	nstanta i)m= [ater sorage common herwater so If manual	22.49 storage e volume nunity he rise if no storage anufacte rature fa	19.67 loss: e (litres) eating a stored loss: urer's de actor from	20.3 including nd no tale hot water eclared less to table storage	any so ank in dw er (this in oss facto 2b , kWh/ye	16.98 plar or Warelling, eacludes in the control of the control o	14.65 /WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day):	15.58 within sa (47) ombi boil	15.77 15.77 ame vesa ers) ente	18.37 sel	20.06	21.78	1440.07	(
lume factor from Table 2a	ostanta)m= [ater sorage commenter water so If managed ergy If managed	22.49 storage e volumerise if no storage anufactor rature far	19.67 loss: e (litres) eating a stored loss: urer's de actor from	20.3 including and no tale hot water eclared learned learned storage eclared of	ag any so ank in dw er (this in oss facto 2b , kWh/ye	16.98 Dlar or Warelling, eacludes in the control of the control o	14.65 /WHRS nter 110 nstantar wn (kWh	storage in heous con/day):	15.58 within sa (47) ombi boil	15.77 15.77 ame vesa ers) ente	18.37 sel	20.06	21.78 0 0 0	1440.07	(
emperature factor from Table 2b	nstanta i)m= [ater s orage comm herw ater s empe nergy If ma ot was comm	22.49 storage e volume nunity he storage anufactor rature far lost from anufactor anufactor anufactor anufactor anufactor	19.67 loss: e (litres) eating a stored loss: urer's de actor from water urer's de age loss eating s	20.3 including not not a hot water eclared to storage eclared of factor free sections.	17.7 ag any so the ser (this in 2b) by kWh/ye cylinder I com Table	16.98 Dlar or Warelling, eacludes in the control of the control o	14.65 /WHRS nter 110 nstantar wn (kWh	storage in heous con/day):	15.58 within sa (47) ombi boil	15.77 15.77 ame vesa ers) ente	18.37 sel	20.06	21.78 0 0 0	1446.07	

Enter (50) or	om water	_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0	(5	•
Water storage	. , .	,	for each	month			((56)m = (55) × (41)ı	m		0	(5	5)
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0	(5	6)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m		H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Append	I lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0	(5	7)
Primary circuit	t loss (an	nual) fro	m Table	3	•						0	(5	8)
Primary circuit					59)m = ((58) ÷ 36	55 × (41)	m				•	
(modified by	/ factor fi	om 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	(5	9)
Combi loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 50.96	44.84	47.77	44.42	44.03	40.79	42.15	44.03	44.42	47.77	48.04	50.96	(6	1)
Total heat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 200.89	175.97	183.08	162.39	157.22	138.47	132.66	147.89	149.52	170.26	181.75	196.15	(6	2)
Solar DHW input									r contributi	ion to wate	er heating)		
(add additiona	1				· · ·	·						(6	2)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	· ·	•
FHRS 0	0	0	0	0	0	0	0	0	0	0	0	(0	3) (G2)
Output from w $(64)m = 200.89$	175.97	ter 183.08	162.39	157.22	138.47	132.66	147.89	149.52	170.26	181.75	196.15	1	
(64)m= 200.89	175.97	103.00	102.39	137.22	130.47	132.00			ater heater	<u> </u>		1996.25 (6	4)
Heat gains fro	m water	hoating	k\\/h/m/	onth 0.2	5 ′ [N 95	v (45)m	·						.,
(65)m= 62.59	54.81	56.93	50.33	48.64	42.68	40.63	45.54	46.05	52.67	56.47	61.02	[6]	5)
include (57)	ļ		ļ.		ļ	ļ			ļ.	ļ		l neating	
5. Internal ga				•	y iii laar ii		211011111g	01 1101 11	uto: 10 11	0111 00111		.camig	
Metabolic gair	`		aria oa										
Jan	is (Table	5) Wat	to	, ·									
Jan	Feb				Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 121.49	Feb 121.49	5), Wat Mar 121.49	ts Apr 121.49	May	Jun 121.49	Jul 121.49	Aug 121.49	Sep 121.49	Oct 121.49	Nov 121.49	Dec 121.49	(6	6)
	121.49	Mar 121.49	Apr 121.49	May 121.49	121.49	121.49	121.49	121.49	-			(6	6)
(66)m= 121.49	121.49	Mar 121.49	Apr 121.49	May 121.49	121.49	121.49	121.49	121.49	-			(6	,
(66)m= 121.49 Lighting gains	121.49 (calcula 18.29	Mar 121.49 ted in Ap 14.88	Apr 121.49 opendix 11.26	May 121.49 L, equat 8.42	121.49 ion L9 or 7.11	121.49 r L9a), a 7.68	121.49 lso see	121.49 Table 5	121.49	121.49	121.49	`	,
(66)m= 121.49 Lighting gains (67)m= 20.6	121.49 (calcula 18.29	Mar 121.49 ted in Ap 14.88	Apr 121.49 opendix 11.26	May 121.49 L, equat 8.42	121.49 ion L9 or 7.11	121.49 r L9a), a 7.68	121.49 lso see	121.49 Table 5	121.49	121.49	121.49	`	7)
(66)m= 121.49 Lighting gains (67)m= 20.6 Appliances ga	121.49 (calcular 18.29 ins (calc 218.09	Mar 121.49 ted in Ap 14.88 ulated in 212.45	Apr 121.49 ppendix 11.26 Append 200.43	May 121.49 L, equat 8.42 dix L, eq 185.26	121.49 ion L9 or 7.11 uation L	121.49 r L9a), a 7.68 13 or L1 161.48	121.49 Iso see 9.98 3a), also	121.49 Table 5 13.4 see Ta 164.89	121.49 17.01 ble 5 176.9	121.49	121.49 21.17	(6	7)
(66)m= 121.49 Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85	121.49 (calcular 18.29 ins (calc 218.09	Mar 121.49 ted in Ap 14.88 ulated in 212.45	Apr 121.49 ppendix 11.26 Append 200.43	May 121.49 L, equat 8.42 dix L, eq 185.26	121.49 ion L9 or 7.11 uation L	121.49 r L9a), a 7.68 13 or L1 161.48	121.49 Iso see 9.98 3a), also	121.49 Table 5 13.4 see Ta 164.89	121.49 17.01 ble 5 176.9	121.49	121.49 21.17	(6	7)
Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains	121.49 (calcula 18.29 ins (calcula 218.09 (calcula 35.15	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in Ap 35.15	Apr 121.49 ppendix 11.26 Append 200.43 ppendix 35.15	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat	121.49 ion L9 or 7.11 uation L 171.01 tion L15	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a)	121.49 lso see 9.98 3a), also 159.24 , also se	121.49 Table 5 13.4 see Ta 164.89 ee Table	121.49 17.01 ble 5 176.9	121.49 19.86 192.07	121.49 21.17 206.33	(6	7)
(66)m= 121.49 Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15	121.49 (calcula 18.29 ins (calcula 218.09 (calcula 35.15	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in Ap 35.15	Apr 121.49 ppendix 11.26 Append 200.43 ppendix 35.15	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat	121.49 ion L9 or 7.11 uation L 171.01 tion L15	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a)	121.49 lso see 9.98 3a), also 159.24 , also se	121.49 Table 5 13.4 see Ta 164.89 ee Table	121.49 17.01 ble 5 176.9	121.49 19.86 192.07	121.49 21.17 206.33	(6	7) 8) 9)
Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15 Pumps and fa	121.49 (calcula 18.29 ins (calcula 218.09 (calcula 35.15 ns gains	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in Ap 35.15 (Table 5	Apr 121.49 ppendix 11.26 Append 200.43 ppendix 35.15 5a)	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat 35.15	121.49 ion L9 or 7.11 uation L 171.01 tion L15 35.15	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a) 35.15	121.49 lso see - 9.98 3a), also 159.24 , also se 35.15	121.49 Table 5 13.4 see Ta 164.89 ee Table 35.15	17.01 ble 5 176.9 5 35.15	19.86 192.07 35.15	21.17 206.33 35.15	(6)	7) 8) 9)
Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15 Pumps and fa (70)m= 3	121.49 (calcula 18.29 ins (calcula 218.09 (calcula 35.15 ns gains	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in Ap 35.15 (Table 5	Apr 121.49 ppendix 11.26 Append 200.43 ppendix 35.15 5a)	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat 35.15	121.49 ion L9 or 7.11 uation L 171.01 tion L15 35.15	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a) 35.15	121.49 lso see - 9.98 3a), also 159.24 , also se 35.15	121.49 Table 5 13.4 see Ta 164.89 ee Table 35.15	17.01 ble 5 176.9 5 35.15	19.86 192.07 35.15	21.17 206.33 35.15	(6)	7) 8) 9)
Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15 Pumps and fa (70)m= 3 Losses e.g. ev	121.49 (calcula 18.29 ins (calcula 218.09 c (calcula 35.15 ns gains 3 /aporatio -97.19	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in A 35.15 (Table 5 3 on (negate	Apr 121.49 ppendix 11.26 Appendix 200.43 ppendix 35.15 5a) 3	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat 35.15 3 es) (Tab	121.49 ion L9 or 7.11 uation L 171.01 tion L15 35.15 3 ble 5)	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a) 35.15	121.49 Iso see - 9.98 3a), also 159.24 , also se 35.15	121.49 Table 5 13.4 see Ta 164.89 ee Table 35.15	17.01 ble 5 176.9 5 35.15	19.86 192.07 35.15	21.17 206.33 35.15	(6) (6) (6) (7) (7)	7) 8) 9)
(66)m= 121.49 Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -97.19	121.49 (calcula 18.29 ins (calcula 218.09 c (calcula 35.15 ns gains 3 /aporatio -97.19	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in A 35.15 (Table 5 3 on (negate	Apr 121.49 ppendix 11.26 Appendix 200.43 ppendix 35.15 5a) 3	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat 35.15 3 es) (Tab	121.49 ion L9 or 7.11 uation L 171.01 tion L15 35.15 3 ble 5)	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a) 35.15	121.49 Iso see - 9.98 3a), also 159.24 , also se 35.15	121.49 Table 5 13.4 see Ta 164.89 ee Table 35.15	17.01 ble 5 176.9 5 35.15	19.86 192.07 35.15	21.17 206.33 35.15	(6) (6) (6) (7) (7)	7) 8) 9) 0)
Lighting gains (67)m= 20.6 Appliances ga (68)m= 215.85 Cooking gains (69)m= 35.15 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -97.19 Water heating	121.49 (calcula 18.29 ins (calcula 218.09 s (calcula 35.15 ns gains 3 /aporatio -97.19 gains (T 81.56 gains =	Mar 121.49 ted in Ap 14.88 ulated in 212.45 ted in Ap 35.15 (Table 5 3 in (negation -97.19 Table 5) 76.52	Apr 121.49 ppendix 11.26 Append 200.43 ppendix 35.15 5a) 3 tive valu	May 121.49 L, equat 8.42 dix L, eq 185.26 L, equat 35.15 3 es) (Tab	121.49 ion L9 or 7.11 uation L 171.01 tion L15 35.15 3 ole 5) -97.19	121.49 r L9a), a 7.68 13 or L1 161.48 or L15a) 35.15 3 -97.19	121.49 Iso see 9.98 3a), also 159.24 1, also see 35.15 3 -97.19	121.49 Table 5 13.4 see Ta 164.89 Table 35.15 3 -97.19	17.01 ble 5 176.9 5 35.15	121.49 19.86 192.07 35.15 3 -97.19	21.17 206.33 35.15 3 -97.19	(6) (6) (6) (7) (7) (7)	7) 8) 9) 0) 1)

Solar gains are	calculated u	sing solar	flux from	Table 6a	and a	ssociated equ	ations	to convert	to the a	applica	able orientat	ion.		
Orientation:	Access Fa	actor	Area m²			Flux Table 6a		g_ Table	6h	_	FF Table 6c		Gains	
N. a.					_		_			_			(W)	
Northeast 0.9x	<u> </u>	X	3.7	2	X	11.28	X	0.63	3	Χ	0.7	_ =	12.83	(75)
Northeast 0.9x		X	3.7	2	X	22.97	X	0.63	3	Х	0.7	=	26.11	(75)
Northeast 0.9x		X	3.7	2	x _	41.38	X	0.63	3	x [0.7	=	47.04	(75)
Northeast 0.9x	• • • • • • • • • • • • • • • • • • • •	X	3.7	2	x	67.96	X	0.63	3	x	0.7	=	77.26	(75)
Northeast 0.9x		X	3.7	2	x	91.35	X	0.63	3	x	0.7	=	103.85	(75)
Northeast 0.9x		X	3.7	2	x	97.38	X	0.63	3	x	0.7	=	110.71	(75)
Northeast 0.9x	• • • • • • • • • • • • • • • • • • • •	X	3.7	2	X	91.1	X	0.63	3	x	0.7	=	103.57	(75)
Northeast 0.9x		X	3.7	2	X	72.63	X	0.63	3	х	0.7	=	82.57	(75)
Northeast 0.9x	0.77	X	3.7	2	x	50.42	X	0.60	3	x	0.7	=	57.32	(75)
Northeast 0.9x	0.77	X	3.7	2	X	28.07	X	0.63	3	x	0.7	=	31.91	(75)
Northeast 0.9x	0.77	X	3.7	2	x	14.2	X	0.63	3	x	0.7	=	16.14	(75)
Northeast 0.9x	0.77	X	3.7	2	x	9.21	X	0.63	3	х [0.7	=	10.48	(75)
Southwest _{0.9x}	0.77	X	7.3	6	x	36.79		0.63	3	х	0.7	=	82.76	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	62.67		0.63	3	х	0.7	=	140.97	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	85.75	Ī	0.63	3	x	0.7	=	192.88	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	106.25	Ī	0.63	3	x [0.7	_ =	238.99	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	119.01	Ī	0.63	3	x	0.7	=	267.69	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	118.15	Ī	0.63	3	x	0.7	=	265.76	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	113.91	Ī	0.63	3	х	0.7	=	256.22	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	104.39	Ī	0.63	3	х	0.7	=	234.81	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	92.85	Ī	0.63	3	x	0.7	=	208.85	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	69.27	Ī	0.63	3	x	0.7	=	155.8	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	44.07	Ī	0.63	3	x	0.7	=	99.13	(79)
Southwest _{0.9x}	0.77	X	7.3	6	x	31.49	j	0.63	3	x [0.7	=	70.83	(79)
Solar gains in			i		1		T	n = Sum(74					1	(22)
(83)m= 95.59		239.93	316.25	371.54	376		317	7.37 266	.18 1	87.71	115.27	81.3		(83)
Total gains –			<u>`</u>	• •	·	<u> </u>	1		07 5		100.07	450.00	1	(0.4)
(84)m= 478.61	547.48	606.22	660.29	693.05	676	646.01	610).26 570	.87 5	14.87	468.07	453.26		(84)
7. Mean inte			`											
Temperature	•	•			•			, Th1 (°C	C)				21	(85)
Utilisation fa					Ò		$\overline{}$						1	
Jan	Feb	Mar	Apr	May	┿	ın Jul	+	 	ер	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.87	0.	7 0.53	0.	58 0.8	33	0.97	1	1		(86)
Mean intern	al tempera	ature in I	iving are	ea T1 (fe	ollow	steps 3 to	7 in	Table 9c))					
(87)m= 19.92	20.07	20.3	20.59	20.84	20.	97 20.99	20	.99 20.	91	20.6	20.21	19.9		(87)
Temperature	e during he	eating p	eriods ir	rest of	dwe	lling from T	able	9, Th2 (°	C)					
(88)m= 20.05		20.06	20.07	20.07	20.		_	.08 20.		20.07	20.07	20.06]	(88)
					•	•	•	-			•		•	

6. Solar gains:

Utilisatio	n factor for	nains for	rest of d	welling l	n2 m (se	e Table	9a)						
(89)m=	1 0.99	0.98	0.94	0.83	0.62	0.42	0.47	0.76	0.96	0.99	1		(89)
	ternal tempe	rature in	the rest	of dwelli	na T2 (fo	ollow ste	ens 3 to 7	L 7 in Tabl	le 9c)				
	8.61 18.83	19.16	19.59	19.91	20.06	20.08	20.08	20.01	19.6	19.04	18.58		(90)
		1	<u> </u>			<u> </u>	ļ	<u> </u>	fLA = Livin	g area ÷ (4	4) =	0.21	(91)
Mean int	ternal tempe	ratura (fo	r the wh	ola dwal	ling) – fl	ΙΔ ν Τ1	⊥ (1 _ fl	Δ) ~ T2			I		_
	8.89 19.09	19.4	19.8	20.1	20.25	20.27	20.27	20.2	19.81	19.28	18.86		(92)
	I ljustment to	_ 	ı internal	tempera	ature fro	ı m Table	4e. whe		L opriate				, ,
· · · · —	8.89 19.09	19.4	19.8	20.1	20.25	20.27	20.27	20.2	19.81	19.28	18.86		(93)
8. Space	e heating red	uirement											
	the mean ir		•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	n factor for	gains, hm):										
(94)m=	1 0.99	0.98	0.94	0.83	0.63	0.44	0.49	0.77	0.95	0.99	1		(94)
Useful g	ains, hmGm	, W = (9	4)m x (84	4)m								i	
(95)m= 47	76.59 542.49	592.84	618.77	576.16	428.13	286.35	300.03	437.95	490.91	463.82	451.81		(95)
	average ext	ernal tem	r i	from Ta	able 8							1	
()	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)
	s rate for me					-`` /-		<u>`</u>					(07)
` '	85.15 1149.28	1	868.17	667.65	443.29	288.07	303.03	480.73	731.99	973.22	1177.42	I	(97)
_	eating requi	334.03	179.57	10ntn, KV 68.07	/vn/mon	$\ln = 0.02$	24 X [(97))m – (95 0	179.36	366.77	539.85		
(90)111= 32	407.70	334.03	179.57	00.07	0		<u> </u>		(kWh/year		L	2602.58	(98)
Space h	eating requi	ement in	k\//h/m²	!/vear			Tota	ii pei yeai	(KVVII/yeai) = Sum(9)	O)15,912 =	33.24	」 ⁽³⁰⁾] ₍₉₉₎
•				•				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				33.24	
	y requireme	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space h	eating: of space he	at from s	econdar	//sunnle	mentary	system					ĺ	0	(201)
	of space he			• • •	mornary	•	(202) = 1 -	- (201) =				1	(202)
	of total heat		•	` '			(204) = (204)		(203)] =			1	(204)
	y of main sp	•	•				(=0.)	o=,[.	(200)]			93.4	(206)
	y of seconda		0 ,		n system	n %					[0	(208)
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
	eating requi					Jui	Aug	Оер	Oct	INOV	Dec	KVVII/ye	aı
· —	27.17 407.76	334.03	179.57	68.07	0	0	0	0	179.36	366.77	539.85		
 (211)m =	{[(98)m x (2	14)1 3 x 1	00 ÷ (20	L 16)		l			l .				(211)
` <i>'</i> —	64.42 436.58	357.63	192.26	72.88	0	0	0	0	192.03	392.68	578		(=)
		1				<u> </u>	Tota	l I (kWh/yea	ar) =Sum(2	211),,,,5,10,,,,12	=	2786.49	(211)
													1' '
Space h	eating fuel (s	secondar	v). kWh/	month							'		_
•	eating fuel (s x (201)] } x		• /	month									_
•	• ,		• /	month 0	0	0	0	0	0	0	0		_
= {[(98)m	x (201)] } x	100 ÷ (20	8)		0	0			0 ar) =Sum(2	_		0	(215)

Water heating Output from water heater (calculated above)								
	38.47 132.66	147.89	149.52	170.26	181.75	196.15		
Efficiency of water heater							80.3	(216)
(217)m= 87.37 87.1 86.55 85.3 83.11	80.3 80.3	80.3	80.3	85.18	86.78	87.47		(217)
Fuel for water heating, kWh/month								
(219) m = (64) m x $100 \div (217)$ m (219)m= 229.93 202.04 211.54 190.36 189.18 1	72.44 165.21	184.17	186.2	199.88	209.43	224.26		
	ļ.	Total	= Sum(2	19a) ₁₁₂ =	l	l	2364.64	(219)
Annual totals				k'	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1							2786.49	_
Water heating fuel used							2364.64	
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							363.74	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b)	=				5589.87	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	601.88	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	510.76	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1112.64	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
	(232) x			0.5	19	=	188.78] (268)
Electricity for lighting	• •			0.5	' - I		100.70	(200)

TER =

(273)

17.12