Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 Printed on 03 September 2021 at 09:26:24

Project Information:

Assessed By: Ben Tunningley (STRO027495) Building Type: Semi-detached House

Dwelling Details:

NEW DWELLING AS BUILT

Total Floor Area: 91.72m²

Site Reference: Albany Farm

Plot Reference: Plot 017

Address: 44 Buttercup Road, Bishops Waltham, SOUTHAMPTON, SO32 1RJ

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) 17.55 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.29 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.0 kWh/m²

OK

OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 4.76
Maximum 10.0

Maximum 10.0

4 Heating efficiency

Main Heating system: Database: (rev 482, 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		
Controls			
Space heating controls	Programmer, room therm	ostat and TRVs	OK
Hot water controls:	No cylinder thermostat		
B ::	No cylinder		014
Boiler interlock:	Yes		ОК
Low energy lights	Cut to the control of	400.007	
Percentage of fixed lights w	ith low-energy fittings	100.0%	OK
Minimum		75.0%	ОК
Mechanical ventilation			
Continuous extract system	(decentralised)		
Specific fan power:		0.16 0.18	- 11
Maximum		0.7	ОК
Summertime temperature			
Overheating risk (South Eng	gland):	Slight	OK
sed on:			
Overshading:		Very Little	
Windows facing: North East		4.49m²	
Windows facing: South Wes		7.92m²	
Windows facing: North Wes	t	0.47m²	
Ventilation rate:		4.00	
Blinds/curtains:		None	
) Key features			
Roofs U-value		0.11 W/m²K	
Party Walls U-value		0 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

Assessor Name: Ben Tunningley Stroma Number: STRO027495 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.4 Property Address: Plot 017 Address: 44 Buttercup Road, Bishops Waltham, SOUTHAMPTON, SO32 1RJ 1. Overall dwelling dimensions:	1
Address: 44 Buttercup Road, Bishops Waltham, SOUTHAMPTON, SO32 1RJ 1. Overall dwelling dimensions:	
1. Overall dwelling dimensions:	
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Araa/m²\ Ay Haight/m\ \/aluma	/m 3)
Ground floor	`
First floor 45.86 (1b) x 2.67 (2b) = 122.45	
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 91.72 (4)	
Dwelling volume $ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 232.51 $	(5)
2. Ventilation rate: main secondary other total m³ per h	our
heating heating heating heating	
	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	(6b)
Number of intermittent fans $0 x 10 = 0$	(7a)
Number of passive vents 0 x 10 = 0	(7b)
Number of flueless gas fires 0 x 40 = 0	(7c)
Air changes per	hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 $	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	(0)
Number of storeys in the dwelling (ns)	(9)
Additional infiltration $[(9)-1]x0.1 = 0$	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	(12)
If no draught lobby, enter 0.05, else enter 0	(13)
Percentage of windows and doors draught stripped 0	(14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.760000228	88184 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.24	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered	(40)
Number of sides sheltered $ (20) = 1 - [0.075 \times (19)] = 0.85 $ Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.85 $	(19)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.2$	(21)
Infiltration rate modified for monthly wind speed	(/
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(22)m=

Wind Factor (2	22a)m =	(22)m ∸	4									
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	
Adjusted infiltr	ation rat	e (allowi	na for st	helter an	nd wind s	sneed) -	· (21a) v	(22a)m				
0.26	0.25	0.25	0.22	0.22	0.19	0.19	0.19	0.2	0.22	0.23	0.24	
Calculate effe		_	rate for t	he appli	cable ca	ase				l		
If mechanica			andiv NI (C)2h) (22a	a) Fm. (oguation (I	NE\\ atha	muiaa (22h	·) (22a)			0.5 (23a)
If exhaust air h If balanced with		0		, ,	,	. `	,, .	`)) = (23a)			0.5 (23b)
		•	•	•		,		,	2h)m . (22h) v [1 (22a)	0 (23c)
a) If balance (24a)m= 0		o lical ve	0	0	0	T o	1 (24a	0	20)III + (1 0	23b) x [$\frac{1-(230)}{0}$	÷ 100]
b) If balance					heat red	covery (N	I <u> </u>	$\lim_{n \to \infty} \frac{1}{(2n)^n}$	2b)m + (23b)		,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole h	ı ıouse ex	tract ver	ntilation o	or positiv	ve input	ventilatio	on from o	utside	ļ.	<u> </u>	<u> </u>	
if (22b)r	n < 0.5 ×	(23b), t	hen (24	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0	.5 × (23b)		
(24c)m= 0.51	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 if (22b)r				•			on from I 0.5 + [(2		0.5]			
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24d)
Effective air	change	rate - er	nter (24a	n) or (24b	b) or (24	c) or (24	ld) in box	x (25)	•	•		
(25)m= 0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)
3. Heat losse	es and he	eat loss p	paramet	er:								
3. Heat losse	s and he Gros area	SS	oaramet Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²-ł	
	Gros	SS	Openin	ıgs								
ELEMENT	Gros	SS	Openin	ıgs	A ,r	m²	W/m2	2K	(W/I			K kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	ıgs	A ,r	m² x x	W/m2	eK = = =	(W/l			(kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	ıgs	A ,r	m ²	1.4 1.4	= = = = = = = = = = = = = = = = = = =	2.94 2.94			(kJ/K (26) (26)
Doors Type 1 Doors Type 2 Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 4.49	m ²	W/m2 1.4 1.4 /[1/(1.4)+	= 0.04] = 0.04] =	2.94 2.94 5.95			(kJ/K (26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 4.49 7.92	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] =	(W/l 2.94 2.94 5.95 10.5	K)		(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] =	2.94 2.94 5.95 10.5	K)	kJ/m²-ŀ	(kJ/K (26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area 1 2 2 3	ss (m²)	Openin m	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86	m² x x x1 x1 x1 66 x x 66 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446	K)	kJ/m²-ŀ	(kJ/K (26) (26) (27) (27) (27) (28)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area e 1 e 2 e 3 97.4 45.8	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	0.04] = 0.04] = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	kJ/m²-ŀ	(kJ/K (26) (26) (27) (27) (27) (27) (28) (4821.6 (29)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof	Gros area e 1 e 2 e 3 97.4 45.8	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	0.04] = 0.04] = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	kJ/m²-ŀ	(kJ/K (26) (26) (27) (27) (27) (27) (28) (4821.6 (29) 412.74 (30)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area e 1 e 2 e 3 97.4 45.8	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	75 60 9	(kJ/K (26) (26) (27) (27) (27) (27) (28) (4821.6 (29) (31)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area e 1 e 2 e 3 97.4 45.8 elements	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	75 60 9	(kJ/K (26) (26) (27) (27) (27) (27) (28) (4821.6 (29) 412.74 (30) (31) (2041.65 (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37	m² x x x1 x1 x1 66 x 66 x 67 x 7	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	75 60 9 45	(kJ/K (26) (26) (27) (27) (27) (27) (27) (28) (4821.6 (29) (412.74 (30) (31) (2041.65 (32) (32c) (32c)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87	m² x x x1 x1 66 x 66 x 67 x 7 15 66	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	75 60 9 45 9	(kJ/K (26) (26) (27) (27) (27) (27) (27) (28) (4821.6 (29) (412.74 (30) (31) (2041.65 (32) 286.848 (32c) (1138.061 (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area e 1 e 2 e 3 97.4 45.8 elements	ss (m²)	Openin	ngs n²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	75 60 9 45 9 9	(kJ/K (26) (26) (27) (27) (27) (27) (27) (28) (4821.6 (29) (412.74 (30) (31) (32) (286.848 (32c) (32c) (32c) (32c) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal wall ** Internal floor	Gros area e 1 e 2 e 3 97.4 45.8 elements	6S (m²) 14 36 36 3, m²	Openin m	ngs n² 8	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4 52.66 45.86 45.86 alue calcul	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = = = 0.04] = 0.04] = = = = = = = =	(W/l 2.94 2.94 5.95 10.5 0.62 5.0446 19.29 5.04	K)	75 60 9 45 9 75 18	(kJ/K (26) (26) (27) (27) (27) (27) (27) (27) (27) (3439.5 (28) 4821.6 (29) 412.74 (30) (31) (2041.65 (32) 286.848 (32c) 1138.061 (32c) 3949.2 (32c) 825.48 (32d) 412.74 (32e)

Heat capacity	/ Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17327.82	(34)
Thermal mas	s parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			188.92	(35)
For design asses	ssments wh	ere the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	100.02	
Thermal bridg				usina An	nendix I	K						8.21	(36)
if details of them	,	,			•							0.21	(30)
Total fabric h		are not kin	OWII (30) -	- 0.00 X (3	'')			(33) +	(36) =			60.54	(37)
Ventilation he	eat loss ca	alculated	l monthl	V				(38)m	= 0.33 × (25)m x (5)			」 ` ′
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 38.97	38.58	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36		(38)
Heat transfer	coefficier	nt W/K			<u> </u>	Į		(39)m	= (37) + (3			l	
(39)m= 99.52	99.13	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91		
` /		l .			l			,	Average =	Sum(39) ₁ ,	₁₂ /12=	98.98	(39)
Heat loss par	ameter (H	HLP), W/	′m²K					(40)m	$= (39)m \div$	(4)			
(40)m= 1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08		
						•		,	Average =	Sum(40) ₁ .	12 /12=	1.08	(40)
Number of da	`	`	<u> </u>				Α.	0	0.1	NI.		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	irement:								kWh/y	ear:	
Assumed occ if TFA > 13 if TFA £ 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		65		(42)
if TFA > 13 if TFA £ 13	.9, N = 1 .9, N = 1	+ 1.76 x							ΓFA -13.	9)] I	. ,
if TFA > 13	.9, N = 1 .9, N = 1 ge hot wa ual 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 t	(25 x N)	+ 36		9)	65]	(42)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	9, N = 1 9, N = 1 ge hot wa yal average 5 litres 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 thot and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	7.1]]	. ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual	9, N = 1 9, N = 1 ge hot way yal average 5 litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av dwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)			. ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12 Jan	.9, N = 1 .9, N = 1 ge hot wa ual average 5 litres 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 dwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9)	7.1]	. ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12 Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot wa ual average 5 litres per p	+ 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 rater use, I May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from	erage = designed id) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep 95.16	oe target o	9) 97 Nov 102.93	7.1 Dec	1165.23	. ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12 Jan Hot water usage	.9, N = 1 .9, N = 1 ge hot way and average 5 litres per	+ 1.76 x ater usage hot water person per Mar day for ear 99.04	ge in litre usage by day (all w Apr ach month 95.16	es per da 5% if the d vater use, I May Vd,m = fa 91.28	ay Vd,av Iwelling is hot and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep	Oct 99.04 Fotal = Sur	9) Nov 102.93 m(44) ₁₁₂ =	7.1 Dec	1165.23	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12 Jan Hot water usage (44)m= 106.81	.9, N = 1 .9, N = 1 ge hot way and average 5 litres per	+ 1.76 x ater usage hot water person per Mar day for ear 99.04	ge in litre usage by day (all w Apr ach month 95.16	es per da 5% if the d vater use, I May Vd,m = fa 91.28	ay Vd,av Iwelling is hot and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep	Oct 99.04 Fotal = Sur	9) Nov 102.93 m(44) ₁₁₂ =	7.1 Dec	1165.23	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12 Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4	.9, N = 1 .9, N = 1 ge hot way all average 5 litres per	+ 1.76 x ater usag hot water person per Mar r day for ea 99.04 used - calc 142.96	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the da 5% if th	ay Vd,av liwelling is that and co Jun ctor from 1 87.39 190 x Vd,r 103.2	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73	+ 36 a water us Sep 95.16 b kWh/mon	Oct 99.04 Fotal = Suith (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1 141.26	7.1 Dec 106.81 c, 1d) 153.4	1165.23	(43)
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⊔ot w														
	ater stora	-			le 2 (kW	h/litre/da	ıy)					0		(51)
	munity he	•		on 4.3									•	
	e factor f erature fa			2h							-	0		(52)
•								(47) (54)	· · · (5 0) · · · ((FO)		0		(53)
٠.	y lost fror (50) or (5		_	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	-	0		(54) (55)
	storage	, ,	•	for each	month			((56)m = (55) v (41)	m		0		(55)
							1	,, ,	, , ,				1	(50)
(56)m=	0 er contains	0 dedicate	0 d solar sto	0	0 = (56)m	0 (50) – (0 H11\1 ∴ (5	0	0 7)m = (56)	0 m where (0 H11) is fro	m Append	iv H	(56)
•						-`	,- ·	`	, , ,	· ·	· ·			(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	ry circuit	`	,									0		(58)
	ry circuit				,	•	` '	, ,		u 4la a uaa a				
(mo (59)m=	dified by	0	om rab	le H5 lf t	nere is s	olar wat	er neatii	ng and a	cylinae	r tnermo	stat)	0		(59)
	<u> </u>				<u> </u>				U			U		(33)
	loss cal			·	<u>` </u>	`	· ` `			1	1	i	ı	
(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					r			<u> </u>		` 	` 	`	(59)m + (61)m	
(62)m=	172.16	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		(62)
	HW input c									r contribut	ion to wate	er heating)		
•	dditional			1	r		·			ı	1		i	
(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	t from wa					r	_							
(64)m =	172.16													
	172.10	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		7
					I		ļ	Outp	out from w	ater heate	I r (annual)₁	12	1689.78	(64)
_	gains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	Outr + (61)m	out from w	ater heate	r (annual) ₁ + (57)m	+ (59)m		1
(65)m=	gains fron	n water 49.17	heating, 50.97	kWh/mo	onth 0.29	5 ´ [0.85 37.64	× (45)m	Outp + (61)m 39.93	out from w n] + 0.8 3 40.25	ater heate x [(46)m 46.47	r (annual) ₁ + (57)m 50.3	+ (59)m 54.45]	(64) (65)
(65)m=	gains fron	n water 49.17	heating, 50.97	kWh/mo	onth 0.29	5 ´ [0.85 37.64	× (45)m	Outp + (61)m 39.93	out from w n] + 0.8 3 40.25	ater heate x [(46)m 46.47	r (annual) ₁ + (57)m 50.3	+ (59)m 54.45]	1
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(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m=	gains fron 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calc	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 Appendix 1 Appendix 1 Appendix	onth 0.29 43.2 only if co): May 158.91 L, equat 22.78 dix L, eq 310.27	Jun 158.91 ion L9 o 19.23 uation L	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7	Sep 158.91 Table 5 36.25 see Ta	ater heate x [(46)m 46.47 vater is fr Oct 158.91 46.03 ble 5 296.27	r (annual) ₁ + (57)m 50.3 rom com Nov 158.91	+ (59)m 54.45 munity h Dec 158.91]	(65) (66) (67)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m=	gains fron 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain 361.5	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calc	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 Appendix 1 Appendix 1 Appendix	onth 0.29 43.2 only if co): May 158.91 L, equat 22.78 dix L, eq 310.27	Jun 158.91 ion L9 o 19.23 uation L	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7	Sep 158.91 Table 5 36.25 see Ta	ater heate x [(46)m 46.47 vater is fr Oct 158.91 46.03 ble 5 296.27	r (annual) ₁ + (57)m 50.3 rom com Nov 158.91	+ (59)m 54.45 munity h Dec 158.91]	(65) (66) (67)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	gains from 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain 361.5	n water 49.17 n in calc ins (see S (Table Feb 158.91 (calcula 49.49 ns (calc 365.25 (calcula 53.54	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8 ted in A 53.54	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 n Append 335.68 opendix 53.54	onth 0.29 43.2 only if co May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat	Jun 158.91 ion L9 o 19.23 uation L 286.4	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7	Sep 158.91 Table 5 36.25 See Table 276.15	ater heate x [(46)m 46.47 rater is fr Oct 158.91 46.03 ble 5 296.27	r (annual) + (57)m 50.3 rom com Nov 158.91 53.72	+ (59)m 54.45 munity h Dec 158.91 57.27]	(65) (66) (67) (68)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	gains fron 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain 361.5 ng gains	n water 49.17 n in calc ins (see S (Table Feb 158.91 (calcula 49.49 ns (calc 365.25 (calcula 53.54	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8 ted in A 53.54	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 n Append 335.68 opendix 53.54	onth 0.29 43.2 only if co May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat	Jun 158.91 ion L9 o 19.23 uation L 286.4	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7	Sep 158.91 Table 5 36.25 See Table 276.15	ater heate x [(46)m 46.47 rater is fr Oct 158.91 46.03 ble 5 296.27	r (annual) + (57)m 50.3 rom com Nov 158.91 53.72	+ (59)m 54.45 munity h Dec 158.91 57.27]	(65) (66) (67) (68)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	gains from 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain 361.5 ng gains 53.54	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calc 365.25 (calcula 53.54 as gains	heating, 50.97 culation of the Table 5 a 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8 ted in Ap 53.54 (Table 5	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 Appendix 335.68 opendix 53.54 5a) 3	onth 0.29 43.2 only if co May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat 53.54	Jun 158.91 ion L9 o 19.23 uation L 286.4 ion L15	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a 53.54	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7 , also se 53.54	Sep 158.91 Table 5 36.25 see Ta 276.15 ee Table 53.54	Acceptable Acc	r (annual), + (57)m 50.3 rom com Nov 158.91 53.72 321.68	+ (59)m 54.45 munity h Dec 158.91 57.27 345.55]	(65) (66) (67) (68) (69)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	gains from 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nnces gain 361.5 ng gains 53.54 s and fan	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calc 365.25 (calcula 53.54 as gains 3	heating, 50.97 culation of the Table 5 a 5), Wat Mar 158.91 ted in Ap 40.25 ulated in 355.8 ted in Ap 53.54 (Table 5	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 Appendix 335.68 opendix 53.54 5a) 3	onth 0.29 43.2 only if co May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat 53.54	Jun 158.91 ion L9 o 19.23 uation L 286.4 ion L15	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a 53.54	Outp + (61)m 39.93 dwelling Aug 158.91 lso see 27.01 3a), also 266.7 , also se 53.54	Sep 158.91 Table 5 36.25 see Ta 276.15 ee Table 53.54	Acceptable Acc	r (annual), + (57)m 50.3 rom com Nov 158.91 53.72 321.68	+ (59)m 54.45 munity h Dec 158.91 57.27 345.55]	(65) (66) (67) (68) (69)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	gains from 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nces gain 361.5 ng gains 53.54 s and fan 3 s e.g. eva	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calcula 53.54 is gains 3 aporatic -105.94	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in Ap 53.54 (Table 5 3 on (negation)	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 n Append 335.68 opendix 53.54 5a) 3 tive valu	onth 0.29 43.2 only if co): May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat 53.54	Jun 158.91 ion L9 or 19.23 uation L 286.4 cion L15 53.54	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a 53.54	Aug 158.91 Iso see 27.01 3a), also 266.7 , also se 53.54	Sep 158.91 Table 5 36.25 o see Ta 276.15 ee Table 53.54	ater heate x [(46)m 46.47 rater is fr Oct 158.91 46.03 ble 5 296.27 25 53.54	r (annual) ₁ + (57)m 50.3 rom com Nov 158.91 53.72 321.68	+ (59)m 54.45 munity h Dec 158.91 57.27 345.55]	(65) (66) (67) (68) (69) (70)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	gains from 56.11 ude (57)n ternal ga olic gains Jan 158.91 ng gains (55.72 nnces gain 361.5 ng gains 53.54 s and fan 3 s e.g. eva	n water 49.17 n in calc ins (see s (Table Feb 158.91 (calcula 49.49 ns (calcula 53.54 is gains 3 aporatic -105.94	heating, 50.97 culation of Table 5 5), Wat Mar 158.91 ted in Ap 40.25 ulated in Ap 53.54 (Table 5 3 on (negation)	kWh/me 44.77 of (65)m 5 and 5a ts Apr 158.91 opendix 30.47 n Append 335.68 opendix 53.54 5a) 3 tive valu	onth 0.29 43.2 only if co): May 158.91 L, equat 22.78 dix L, eq 310.27 L, equat 53.54	Jun 158.91 ion L9 or 19.23 uation L 286.4 cion L15 53.54	x (45)m 35.24 s in the o Jul 158.91 r L9a), a 20.78 13 or L1 270.45 or L15a 53.54	Aug 158.91 Iso see 27.01 3a), also 266.7 , also se 53.54	Sep 158.91 Table 5 36.25 o see Ta 276.15 ee Table 53.54	ater heate x [(46)m 46.47 rater is fr Oct 158.91 46.03 ble 5 296.27 25 53.54	r (annual) ₁ + (57)m 50.3 rom com Nov 158.91 53.72 321.68	+ (59)m 54.45 munity h Dec 158.91 57.27 345.55]	(65) (66) (67) (68) (69) (70)

Total internal	gains =				(66)m + (67)m	n + (68	3)m + (69)m + (70)m +	(71)m + (72)	m		
(73)m= 602.15	597.43 574	.07	537.84 500.6	3 4	67.42 448.1	456	.88 477.81	514.27	7 554.77	585.51		(73)
6. Solar gains	S:		•									
Solar gains are o	alculated using	solar	flux from Table 6	a and	d associated equa	itions	to convert to the	e applic	able orientati	ion.		
	Access Facto able 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	1	x	4.49	X	11.28	x	0.45	x	1.11	_	22.8	(75)
Northeast 0.9x	1	x	4.49	x	22.97	x	0.45	x	1.11	=	46.4	(75)
Northeast _{0.9x}	1	x	4.49	X	41.38	x	0.45	x	1.11	=	83.61	(75)
Northeast _{0.9x}	1	X	4.49	X	67.96	x	0.45	x	1.11	=	137.3	(75)
Northeast _{0.9x}	1	x	4.49	x	91.35	x	0.45	x	1.11	=	184.56	(75)
Northeast _{0.9x}	1	x	4.49	x	97.38	x	0.45	x	1.11	=	196.77	(75)
Northeast _{0.9x}	1	X	4.49	X	91.1	x	0.45	x	1.11	=	184.07	(75)
Northeast _{0.9x}	1	X	4.49	x	72.63	x	0.45	X	1.11	=	146.74	(75)
Northeast _{0.9x}	1	X	4.49	X	50.42	x	0.45	x	1.11	=	101.87	(75)
Northeast _{0.9x}	1	X	4.49	X	28.07	x	0.45	x	1.11	=	56.71	(75)
Northeast _{0.9x}	1	X	4.49	X	14.2	x	0.45	X	1.11	=	28.68	(75)
Northeast _{0.9x}	1	X	4.49	X	9.21	x	0.45	X	1.11	=	18.62	(75)
Southwest _{0.9x}	1	X	7.92	X	36.79]	0.45	x	1.11	=	131.13	(79)
Southwest _{0.9x}	1	x	7.92	x	62.67]	0.45	X	1.11	_	223.37	(79)
Southwest _{0.9x}	1	x	7.92	x	85.75]	0.45	X	1.11	=	305.62	(79)
Southwest _{0.9x}	1	X	7.92	x	106.25]	0.45	X	1.11	=	378.68	(79)
Southwest _{0.9x}	1	x	7.92	x	119.01]	0.45	X	1.11	_	424.15	(79)
Southwest _{0.9x}	1	x	7.92	x	118.15]	0.45	X	1.11	=	421.09	(79)
Southwest _{0.9x}	1	X	7.92	X	113.91]	0.45	x	1.11	=	405.97	(79)
Southwest _{0.9x}	1	x	7.92	X	104.39]	0.45	x	1.11	=	372.05	(79)
Southwest _{0.9x}	1	X	7.92	X	92.85]	0.45	x	1.11	=	330.92	(79)
Southwest _{0.9x}	1	X	7.92	x	69.27]	0.45	x	1.11	=	246.87	(79)
Southwest _{0.9x}	1	x	7.92	x	44.07]	0.45	X	1.11	_	157.07	(79)
Southwest _{0.9x}	1	x	7.92	x	31.49]	0.45	x	1.11	=	112.22	(79)
Northwest 0.9x	1	x	0.47	x	11.28	x	0.45	X	1.11	=	2.39	(81)
Northwest _{0.9x}	1	x	0.47	x	22.97	x	0.45	x	1.11		4.86	(81)
Northwest _{0.9x}	1	x	0.47	x	41.38	x	0.45	x	1.11		8.75	(81)
Northwest 0.9x	1	x	0.47	x	67.96	x	0.45	x	1.11		14.37	(81)
Northwest _{0.9x}	1	x	0.47	x	91.35	x	0.45	x	1.11	<u> </u>	19.32	(81)
Northwest _{0.9x}	1	x	0.47	x	97.38	x	0.45	x	1.11		20.6	(81)
Northwest _{0.9x}	1	x	0.47	x	91.1	x	0.45	×	1.11	=	19.27	(81)
Northwest _{0.9x}	1	x	0.47	x	72.63	x	0.45	x	1.11	=	15.36	(81)
Northwest _{0.9x}	1	x	0.47	×	50.42	x	0.45	×	1.11	=	10.66	(81)
		ī .		;		;		=		=		=

28.07

0.45

1.11

Northwest 0.9x

5.94

(81)

Northwest 0.9x
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 156.32 274.63 397.98 530.36 628.04 638.45 609.31 534.15 443.46 309.52 188.75 132.79 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 758.47 872.06 972.05 1068.2 1128.67 1105.87 1057.41 991.03 921.28 823.79 743.52 718.3 (84)m = Total temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
(83)m=
(83)m=
(83)m=
(84)m= 758.47 872.06 972.05 1068.2 1128.67 1105.87 1057.41 991.03 921.28 823.79 743.52 718.3 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (86 Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.97 20.99 20.99 20.92 20.62 20.15 19.77
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(86)m= 0.98 0.96 0.93 0.85 0.72 0.55 0.41 0.45 0.67 0.89 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77
(87)m= 19.82 20.03 20.31 20.63 20.86 20.97 20.99 20.99 20.92 20.62 20.15 19.77 (87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(88)m= 20.01 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 (88)m= 20.01 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02 20.02
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)
(89)m= 0.98 0.96 0.91 0.82 0.67 0.47 0.32 0.36 0.6 0.86 0.96 0.98
Man internal temperature in the rest of dualling T2 (follow stone 2 to 7 in Table 0a)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.95 19.16 19.44 19.73 19.93 20 20.02 20.01 19.97 19.73 19.29 18.91 (90)m= 18.95 19.16 19.44 19.73 19.93 20 20.02 20.01 19.97 19.73 19.29 18.91
$fLA = Living area \div (4) = 0.14$ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$
(92)m= 19.08 19.28 19.57 19.86 20.06 20.14 20.16 20.15 20.11 19.85 19.41 19.03 (92)m=
(92)m= 19.08 19.28 19.57 19.86 20.06 20.14 20.16 20.15 20.11 19.85 19.41 19.03 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 (94)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm, W = (94)m x (84)m
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm, W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm, W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm , W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm , W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m— (96)m]
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm, W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = [(39)m x [(93)m - (96)m] (97)m= 1455.57 1410.95 1277.39 1069.26 812.06 533.17 336.97 356.55 579.65 900.48 1202.85 1452.17
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm, W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m) 1 (97)m= 1455.57 1410.95 1277.39 1069.26 812.06 533.17 336.97 356.55 579.65 900.48 1202.85 1452.17 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.93 19.13 19.42 19.71 19.91 19.99 20.01 20 19.96 19.7 19.26 18.88 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.97 0.95 0.9 0.81 0.66 0.47 0.32 0.36 0.59 0.84 0.95 0.97 Useful gains, hmGm , W = (94)m x (84)m (95)m= 734.54 824.9 876.32 864.94 743.55 520.41 335.17 353.56 546.66 694.88 703.45 699.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m] (97)m= 1455.57 1410.95 1277.39 1069.26 812.06 533.17 336.97 356.55 579.65 900.48 1202.85 1452.17 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 536.44 393.82 298.4 147.11 50.97 0 0 0 0 0 152.97 359.57 559.96 Total per year (kWh/year) = Sum(98)912 2499.25 (95)

Fraction of space he	at from n	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heat	ing from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of main sp	ace heat	ting syste	em 1								90.5	(206)
Efficiency of second	ary/suppl	ementar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requi	1 ·	1		1				450.07	050.57	T 550.00	1	
536.44 393.82		147.11	50.97	0	0	0	0	152.97	359.57	559.96		(044)
$(211)m = \{[(98)m \times (25)] \\ 592.76 435.16 $		162.55	56.33	0	0	0	0	169.03	397.31	618.74	1	(211)
[332]	1								211) _{15,1012}		2761.6	(211)
Space heating fuel (secondar	y), kWh/	month									_
$= \{[(98)m \times (201)]\} \times$	100 ÷ (20	08)								,	-	
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		٦
						lota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water heating Output from water hea	ater (calc	ulated a	hove)									
172.16 150.96		137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16]	
Efficiency of water he	ater										87.3	(216)
(217)m= 89.7 89.59	89.37	88.92	88.16	87.3	87.3	87.3	87.3	88.92	89.51	89.74		(217)
Fuel for water heating $(219)m = (64)m \times 10^{-1}$												
(219)m= 191.92 168.5	175.35	155.13	151.25	133.46	125.3	141.46	142.45	161	172.68	186.26]	
					ı	Tota	I = Sum(2	19a) ₁₁₂ =			1904.77	(219)
Annual totals								k'	Wh/yeaı	r	kWh/year	- -
Space heating fuel us	•	system	1								2761.6	
Water heating fuel us	ed										1904.77	
Electricity for pumps,	fans and	electric	keep-ho	t								
mechanical ventilation	n - balar	nced, ext	ract or p	ositive ii	nput fron	n outside	Э			61.39		(230a
central heating pump) :									30		(2300
boiler with a fan-ass	sted flue									45		(230e
Total electricity for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =	:		136.39	(231)
Electricity for lighting											393.64	(232)
Electricity generated I	oy PVs										-553.98] (233)
Total delivered energy	•	ses (211)(221)	+ (231)	+ (232).	(237b)	=				4642.43] (338)
10a. Fuel costs - ind		<u> </u>		(- /	(-)	()						J` ′
Tod. Fact ocoto	Madairic	samig sy	otomo.	Fu	el			Fuel P	rice		Fuel Cost	
				kW	/h/year			(Table	12)		£/year	
Space heating - main	system 1	1		(21	1) x			3.4	18	x 0.01 =	96.1	(240)
Space heating - main	system 2	2		(213	3) x			0		x 0.01 =	0	(241)
Space heating - secon	ndary			(21	5) x			13.	19	x 0.01 =	0] (242)
	•											」 ` ′

Water heating cost (other fuel)	(219)	3.48 x 0.01 =	66.29 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	17.99 (249)
(if off-peak tariff, list each of (230a) to (230g) se			
Energy for lighting	(232)	13.19 X 0.01 =	51.92 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-73.07 (252)
Appendix Q items: repeat lines (253) and (254)			
3,	247) + (250)(254) =		279.23 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)	(0-0)1		0.42 (256)
,	(256)] ÷ $[(4) + 45.0]$ =		0.86 (257)
SAP rating (Section 12)	one in all discounting CUD		88.03 (258)
12a. CO2 emissions – Individual heating syste	ems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	596.51 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	411.43 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1007.94 (265)
Electricity for pumps, fans and electric keep-ho	t (231) x	0.519 =	70.79 (267)
Electricity for lighting	(232) x	0.519 =	204.3 (268)
Energy saving/generation technologies Item 1		0.519 =	-287.51 (269)
Total CO2, kg/year	su	m of (265)(271) =	995.51 (272)
CO2 emissions per m ²	(21	72) ÷ (4) =	10.85 (273)
EI rating (section 14)			90 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	3369.15 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2323.82 (264)
Space and water heating	(261) + (262) + (263) + (264) =		5692.97 (265)
Electricity for pumps, fans and electric keep-ho	t (231) x	3.07	418.73 (267)
Electricity for lighting	(232) x	0 =	1208.47 (268)
Energy saving/generation technologies Item 1		3.07	-1700.7 (269)

 'Total Primary Energy
 sum of (265)...(271) = 5619.47 (272)

 Primary energy kWh/m²/year
 $(272) \div (4) =$ 61.27 (273)

		User Details:		
Assessor Name:	Ben Tunningley	Stroma Nur	mber: STR	0027495
Software Name:	Stroma FSAP 2012	Software Vo	ersion: Vers	sion: 1.0.5.41
	Pro	operty Address: Plot 0	17	
Address :	44 Buttercup Road, Bishops \	Waltham, SOUTHAMI	PTON, SO32 1RJ	
1. Overall dwelling dime	ensions:			
		Area(m²)	Av. Height(m)	Volume(m³)
Ground floor		45.86 (1a) x	2.4 (2a) =	= 110.06 (3a)
First floor		45.86 (1b) x	2.67 (2b) =	= 122.45 (3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	91.72 (4)		
Dwelling volume		(3a)+(3	(3c)+(3c)+(3d)+(3e)+(3n) =	232.51 (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 fa	ns		0 x 10 =	0 (7a)
Number of passive vents			0 x 10 =	0 (7b)
Number of flueless gas fi	res		0 x 40 =	0 (7c)
			Air	changes per hour
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$)+(7b)+(7c) =		
	peen carried out or is intended, proceed		0	0 (8)
Number of storeys in t		, , ,		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 cons	struction	0 (11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding to t nas): if equal user 0.35	he greater wall area (after		
=	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter ()	0 (12)
If no draught lobby, en	ter 0.05, else enter 0			0 (13)
Percentage of window	s and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷	- 100] =	0 (15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0 (16)
•	q50, expressed in cubic metres		metre of envelope area	4.76000022888184 (17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)		0.24 (18)
	es if a pressurisation test has been done	or a degree air permeabili	ty is being used	
Number of sides sheltere	ed	(20) = 1 - [0.075 x	(10)] -	2 (19)
Shelter factor	line oboltov footov			0.85 (20)
Infiltration rate incorporat	_	$(21) = (18) \times (20) =$	-	0.2 (21)
Infiltration rate modified f		lul A	Oot New De	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	']
Monthly average wind sp	eed from Table 7			_

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

=		()	_									
Wind Factor (2: (22a)m= 1.27	2a)m = 1.25	(22)m ÷	1.1	1.08	0.95	0.95	0.92	<u> </u>	1.08	1.12	1.18	
(224)111- 1.21	1.20	1.23	1.1	1.00	0.93	0.95	0.92		1.00	1.12	1.10	I
Adjusted infiltra	ation rat	e (allowi		nelter an	d wind s	speed) =	(21a) x	(22a)m	,		1	•
0.26 Calculate effec	0.25	0.25	0.22	0.22	0.19	0.19	0.19	0.2	0.22	0.23	0.24	
If mechanica		•	ate for t	пс арри	cabic ca	30						0.5 (23a)
If exhaust air he	at pump	using Appe	endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0.5 (23b)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0 (23c)
a) If balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24a)
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	MV) (24b	o)m = (2	2b)m + (23b)		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole ho if (22b)m				•	•				5 x (23h)		
(24c)m= 0.51	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 v	/entilatio	on or wh	ole hous	e positiv	re input	ventilatio	on from	loft		<u> </u>		1
if (22b)m				•	•				0.5]	_		
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24d)
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)	•		•	•
(25)m= 0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)
			l .	l	l .				<u> </u>	L		
3. Heat losses	s and he	eat loss p	paramet	er:								
3. Heat losses	s and he Gros area	SS	parameto Openin m	gs	Net Ar A ,r		U-val W/m2	ue	A X U		k-value kJ/m²-ŀ	
	Gros	SS	Openin	gs			U-val	ue			k-value	
ELEMENT	Gros	SS	Openin	gs	A ,r	m²	U-val W/m2	ue 2K	(W/		k-value	K kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	gs	A ,r	m² x x	U-val W/m2	ue 2K	(W/ 2.94		k-value	K kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	gs	A ,r	m² x x x1	U-val W/m2 1.4	ue 2K = = = = = = = = = = = = = = = = = = =	2.94 2.94		k-value	(26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Type	Gros area 1 2	SS	Openin	gs	A ,r 2.1 2.1 4.49	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+	ue 2K = = = = = = = = = = = = = = = = = = =	2.94 2.94 5.95		k-value	(26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area 1 2	SS	Openin	gs	A ,r 2.1 2.1 4.49 7.92	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+	ue 2K = = = = = = = = = = = = = = = = = = =	2.94 2.94 5.95 10.5	K)	k-value	(26) (26) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area 1 2	ss (m²)	Openin	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	ue 2K = = 0.04] = 0.04] = 0.04] =	2.94 2.94 5.95 10.5	K)	k-value kJ/m²-ł	(26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11	ue 2K = = = = = = = = = = = = = = = = = = =	2.94 2.94 5.95 10.5 0.62 5.0446	K)	k-value kJ/m²-k	(26) (26) (27) (27) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = = 0.04] = 0.04] = 0.04] = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-k	(26) (26) (27) (27) (27) (27) (27) (28) (28) (4821.6) (29)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	x x x x x x x x x x x x x x x x x x x	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = = 0.04] = 0.04] = 0.04] = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-k	(26) (26) (27) (27) (27) (27) (27) (27) (28) (28) (4821.6) (29) (412.74) (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of elements	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-ł 75 60	(26) (26) (27) (27) (27) (27) (27) (3439.5 (28) (4821.6 (29) (412.74 (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of ele Party wall	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	x x x1	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-h 75 60 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (4821.6 (29) (412.74 (30) (31) (2041.65 (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of el Party wall Internal wall **	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-k 75 60 9	(26) (26) (27) (27) (27) (27) (27) (3439.5) (28) (4821.6) (29) (412.74) (30) (31) (2041.65) (32) (286.848) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of el Party wall Internal wall ** Internal wall **	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-h 75 60 9 45 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (28) (4821.6 (29) (412.74 (30) (31) (2041.65 (32) (286.848 (32c) (1138.061 (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of el Party wall Internal wall ** Internal wall **	Gros area 1 2 3	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87 126.4	m ²	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	ue 2K = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	K)	k-value kJ/m²-h 75 60 9 45 9 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (28) (28) (29) (412.74) (30) (31) (2041.65) (32) (286.848) (32c) (1138.061) (32c) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of el Party wall Internal wall ** Internal wall ** Internal wall ** Internal floor	Gros area 1 2 3 97.4 45.8 lements	ss (m²) 14 36 ., m²	Openin m	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4 52.66 45.86 45.86 alue calcul	x1 x	U-val W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	ue 2K = 0.04] = 0.04	(W// 2.94 2.94 5.95 10.5 0.62 5.0446 19.29 5.04	K)	k-value kJ/m²-h 75 60 9 45 9 9 75 18	(26) (26) (27) (27) (27) (27) (27) (27) (27) (27

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

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

52.33

(33)

Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	.(32e) =	17327.82	(34)
Thermal mass	s parame	ter (TMF	o = Cm +	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			188.92	(35)
For design asses	•	`		,			ecisely the	indicative	values of	TMP in Ta	ble 1f		(3.2)
can be used inst	ead of a de	tailed calcu	ulation.										_
Thermal bridg	jes : S (L	x Y) cal	culated (using Ap	pendix I	K						8.21	(36)
if details of therm	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(00)	(0.0)				¬
Total fabric he								(33) +	` '	05) (5)		60.54	(37)
Ventilation he	1									25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(20)
(38)m= 38.97	38.58	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36]	(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		-	
(39)m= 99.52	99.13	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91		_
Heat loss par	ameter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	.12 /12=	98.98	(39)
(40)m= 1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08]	
, ,		<u> </u>		<u> </u>	<u> </u>	ļ			Average =	Sum(40) ₁ .	.12 /12=	1.08	(40)
Number of da	ys in moi	nth (Tab	le 1a)									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					-	-							
4. Water hea	ating ene	rgy requi	irement:								kWh/y	ear:	
												7	
Assumed occ			[1 - exp	/-0 0003	849 v (TF	-Δ -13 Q	12)] + 0 ()013 x <i>(</i> 1	Γ F Δ -13		65]	(42)
Assumed occ if TFA > 13 if TFA £ 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	013 x (⊺	ΓFA -13.		65]	(42)
if TFA > 13 if TFA £ 13 Annual avera	.9, N = 1 .9, N = 1 ge hot wa	+ 1.76 x ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)]	(42)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu	.9, N = 1 .9, N = 1 ge hot wa yal average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)]	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres 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 thot and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	e target o	9) 97	7.1]	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres per l	+ 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 welling is not and co	erage = designed to	(25 x N) to achieve	+ 36		9)]	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12: Jan Hot water usage	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per per Feb in litres per	+ 1.76 x ater usag hot water person per Mar r 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	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed to lid) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target o	9) 97 Nov	7.1]]	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per per Feb in litres per	+ 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 welling is not and co	erage = designed to	(25 x N) to achieve	+ 36 a water us Sep 95.16	Oct	9) 97 Nov 102.93	Dec 106.81	1165.23	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12: Jan Hot water usage	9, N = 1 9, N = 1 ge hot water and average 5 litres per	+ 1.76 x ater usage hot water person per Mar r day for ear 99.04	ge in litre usage by day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fa 91.28	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed to ld) Jul Table 1c x 87.39	(25 x N) o achieve Aug (43) 91.28	+ 36 a water us Sep 95.16	Oct 99.04 Total = Sur	9) Nov 102.93 m(44)12 =	Dec 106.81	1165.23	, ,
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12: Jan Hot water usage (44)m= 106.81	9, N = 1 9, N = 1 ge hot wa all average 5 litres per p Feb in litres per	+ 1.76 x ater usage hot water person per Mar r day for ear 99.04	ge in litre usage by day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fa 91.28	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed to ld) Jul Table 1c x 87.39	(25 x N) o achieve Aug (43) 91.28	+ 36 a water us Sep 95.16	Oct 99.04 Total = Sur	9) Nov 102.93 m(44)12 =	Dec 106.81	1165.23	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12: Jan Hot water usage (44)m= 106.81	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar r day for ear 99.04	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the or vater use, I May $Vd,m = fa$ 91.28	ay Vd,av Iwelling is not and co Jun ctor from 87.39	erage = designed to ld) Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep 95.16 0 kWh/mon	Oct 99.04 Fotal = Sur th (see Ta	9) Nov 102.93 m(44) ₁₁₂ = ables 1b, 1	7.1 Dec 106.81 c, 1d) 153.4	1165.23	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annu not more that 12: Jan Hot water usage (44)m= 106.81	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 99.04 used - calc 142.96	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 a a a a a a a	ay Vd,av lwelling is not and co Jun ctor from 7 87.39 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 91.28 97m / 3600 109.73	+ 36 a water us Sep 95.16 0 kWh/mon 111.04	Oct 99.04 Fotal = Sur th (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1126	7.1 Dec 106.81 c, 1d) 153.4		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 99.04 used - calc 142.96	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 a a a a a a a	ay Vd,av lwelling is not and co Jun ctor from 7 87.39 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 91.28 97m / 3600 109.73	+ 36 a water us Sep 95.16 0 kWh/mon 111.04	Oct 99.04 Fotal = Sur th (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1126	7.1 Dec 106.81 c, 1d) 153.4		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	+ 1.76 x ater usage hot water person per Mar aday for each general g	ge in litre usage by day (all w Apr ach month 95.16 culated me 124.64 for use (no	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 0 119.59 0 hot water 17.94	ay Vd,av lwelling is not and co Jun ctor from 1 87.39 190 x Vd,r 103.2	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34	(25 x N) o achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 1 to (61) 16.66	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 119.41	9) Nov 102.93 m(44) ₁₁₂ = ables 1b, 1 141.26 m(45) ₁₁₂ =	7.1 Dec 106.81 c, 1d) 153.4		(43) (44) (45)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volumes	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar reday for each 142.96 and at point 21.44 including the control of the control	ge in litre usage by day (all w Apr ach month 95.16 124.64 of use (no	es per da 5% if the orater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 olar or W	ay Vd,av Iwelling is not and co Jun ctor from 1 87.39 190 x Vd,r 103.2 storage),	erage = designed to designed t	(25 x N) o achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 1 to (61) 16.66	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 119.41	9) Nov 102.93 m(44) ₁₁₂ = ables 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4		(43) (44) (45)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volum If community	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	+ 1.76 x ater usage hot water person per Mar aday for each general g	ge in litre usage by day (all w Apr ach month 95.16 culated mo 124.64 for use (no 18.7 and any so ank in dw	es per da 5% if the of rater use, I May Vd,m = fa 91.28 onthly = 4. 119.59 o hot water 17.94 colar or Waterling, e	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage) litres in	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = sbles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volum If community Otherwise if notes in the storage in the storag	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar aday for each general g	ge in litre usage by day (all w Apr ach month 95.16 culated mo 124.64 for use (no 18.7 and any so ank in dw	es per da 5% if the of rater use, I May Vd,m = fa 91.28 onthly = 4. 119.59 o hot water 17.94 colar or Waterling, e	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage) litres in	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = sbles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual average Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volum If community Otherwise if manual contents of the community	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	+ 1.76 x ater usage hot water person per Mar reday for early 142.96 142.96 142.96 142.44 1 including and no tally hot water and hot water person per Mar reday for early fo	ge in litre usage by day (all w Apr ach month 95.16 124.64 18.7 19 any so ank in dw er (this in	es per da 5% if the orater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 olar or Welling, encludes i	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = sbles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 23.01		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual average Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volumed the storage volumed to the storage of the water storage a) If manufaction if Tenergy content of the storage of the storage of the water storage a) If manufaction if Tenergy content of the storage of the storage of the water storage a) If manufaction if Tenergy content of the storage of the stora	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	+ 1.76 x ater usage hot water person per Mar 99.04 used - calc 142.96 ng at point 21.44 including and no talchot water eclared le	ge in litre usage by day (all w Apr ach month 95.16 124.64 18.7 ag any so ank in dw er (this in	es per da 5% if the orater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 olar or Welling, encludes i	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = 12bles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 23.01		(43) (44) (45) (46) (47)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volum If community Otherwise if now water storage a) If manufact Temperature	9, N = 1 9, N = 1 ge hot water solutions per	ater usage hot water person per Mar 99.04 used - calc 142.96 ng at point 21.44 including and no talc hot water eclared learn Table	ge in litre usage by day (all w Apr ach month 95.16 124.64 18.7 19 any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fact 91.28 onthly = 4. 119.59 o hot water 17.94 color or Water velling, each or is known is kno	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa (47) mbi boil	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess ers) ente	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = ables 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46) (47) (48) (49)
if TFA > 13 if TFA £ 13 Annual average Reduce the annual not more that 12: Jan Hot water usage (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous (46)m= 23.76 Water storage Storage volumed the storage volumed to the storage of the water storage a) If manufaction if Tenergy and the storage of the water storage a) If manufaction if Tenergy and the storage of the water storage a) If manufaction if Tenergy and the storage of the water storage a) If manufaction if Tenergy and the storage of the stora	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	the trust of trust of the trust	ge in litre usage by day (all w Apr ach month 95.16 124.64 18.7 19.7	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 onthly = 4. 119.59 o hot water 17.94 olar or W velling, e a cludes i or is knowear	ay Vd,av Iwelling is not and co Jun ctor from 1 87.39 190 x Vd,r 103.2 r storage), 15.48 IWHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mon 111.04 16.66 ame vess ers) ente	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 19.41 Sel	9) Nov 102.93 m(44) ₁₁₂ = ables 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 23.01		(43) (44) (45) (46) (47)

Hot wa														
	ater storaç				e 2 (kWl	h/litre/da	ıy)					0		(51)
	munity he	•		on 4.3									ı	
	e factor fr erature fac			2h							-	0		(52)
•								(47) (54)	(50) ((FO)		0		(53)
_	y lost from (50) or (5		_	, KVVN/ye	ear			(47) x (51)	X (52) X (53) =	-	0		(54) (55)
	storage lo	, ,	•	or each	month			((56)m = (55) v (41)	m		0		(55)
							1	· · ·	, , ,				I	(50)
(56)m=	er contains of	0 dedicate	0	0 rage (57):	0 = (56)m	0	0 H11\1 ∴ (5	0) else (5)	0 7)m = (56)	0 m where (0 H11) is fro	m Append	iv H	(56)
•					` '	-`	,- ·			· ·	· ·			(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	ry circuit lo	,	,									0		(58)
	ry circuit lo				•	•	` '	` '		u 4la a uaa a				
(mo (59)m=	dified by fa	actor fr	om rab	e H5 II t	nere is s	olar wat	er neatii	ng and a	cylinde	r tnermo	stat)	0		(59)
								l	0			U		(33)
	i loss calc					ì <i>i</i>	· ` `			ı	ī	I	I	(2.1)
(61)m=		12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
								`		` 	` 	`	(59)m + (61)m	
(62)m=		150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		(62)
	HW input cal									r contribut	ion to wate	er heating)		
•	idditional I						·	i		Г	I		I	(22)
(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)
•	t from wat					1	I			·	,			
(64)m=	172.16													
	172.10	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		7,00
							ļ	Outp	out from w	ater heate	I r (annual)₁	12	1689.78	(64)
_	gains from	water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	Outr + (61)m	out from w	ater heate	r (annual) ₁ + (57)m	+ (59)m		1
(65)m=	gains from	water 49.17	heating, 50.97	kWh/mo	onth 0.29	5 ´ [0.85	× (45)m	Outp + (61)m 39.93	out from w n] + 0.8 3 40.25	ater heate x [(46)m 46.47	r (annual) ₁ + (57)m 50.3	+ (59)m 54.45	1	(64) (65)
(65)m= inclu	gains from 56.11 ude (57)m	water 49.17 in calc	heating, 50.97 culation o	kWh/mo 44.77 of (65)m	onth 0.25 43.2 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 39.93	out from w n] + 0.8 3 40.25	ater heate x [(46)m 46.47	r (annual) ₁ + (57)m 50.3	+ (59)m 54.45	1	1
(65)m= inclu	gains from	water 49.17 in calc	heating, 50.97 culation o	kWh/mo 44.77 of (65)m	onth 0.25 43.2 only if c	5 ´ [0.85	× (45)m	Outp + (61)m 39.93	out from w n] + 0.8 3 40.25	ater heate x [(46)m 46.47	r (annual) ₁ + (57)m 50.3	+ (59)m 54.45	1	1
(65)m= inclu 5. In	gains from 56.11 ude (57)m ternal gain	water 49.17 in calcons (see	heating, 50.97 culation of Table 5	kWh/mo 44.77 of (65)m 5 and 5a	onth 0.29 43.2 only if c	5 ´ [0.85 37.64 ylinder is	× (45)m 35.24 s in the o	Outp + (61)m 39.93 dwelling	out from w a] + 0.8 x 40.25 or hot w	ater heate x [(46)m 46.47 vater is fr	+ (57)m 50.3	+ (59)m 54.45 munity h	1	1
inclu 5. In	gains from 56.11 ude (57)m ternal gair olic gains Jan	water 49.17 in calc ns (see (Table Feb	heating, 50.97 culation of Table 5 5), Wat Mar	kWh/mo 44.77 of (65)m 5 and 5a ts Apr	onth 0.29 43.2 only if c	5 ´ [0.85 37.64 ylinder is	× (45)m 35.24 s in the o	Outp + (61)m 39.93 dwelling	out from w 1] + 0.8 3 40.25 or hot w	ater heate x [(46)m 46.47 vater is fr	+ (57)m 50.3 rom com	+ (59)m 54.45 munity h	1	(65)
(65)m= inclu 5. In Metab	gains from 56.11 ude (57)m ternal gair olic gains Jan 132.43	water 49.17 in calc ns (see (Table Feb 132.43	heating, 50.97 culation of Table 5 5), Wat Mar 132.43	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43	onth 0.29 43.2 only if constant of the constan	5 ´ [0.85 37.64 ylinder is Jun 132.43	x (45)m 35.24 s in the o	Outp 1 + (61)m 39.93 dwelling Aug 132.43	out from w 1] + 0.8 3 40.25 or hot w Sep 132.43	ater heate x [(46)m 46.47 vater is fr	+ (57)m 50.3	+ (59)m 54.45 munity h	1	1
(65)m= inclu 5. In Metab (66)m= Lightin	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43	water 49.17 in calc ns (see (Table Feb 132.43	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43	onth 0.29 43.2 only if c May 132.43 L, equati	5 ´ [0.85 37.64 ylinder is Jun 132.43 ion L9 o	x (45)m 35.24 s in the o Jul 132.43 r L9a), a	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see	Sep 132.43	ater heate x [(46)m 46.47 vater is fr Oct 132.43	+ (57)m 50.3 rom com Nov 132.43	+ (59)m 54.45 munity h Dec 132.43	1	(65)
(65)m= inclu 5. In Metab	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43	water 49.17 in calc ns (see (Table Feb 132.43	heating, 50.97 culation of Table 5 5), Wat Mar 132.43	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43	onth 0.29 43.2 only if constant of the constan	5 ´ [0.85 37.64 ylinder is Jun 132.43	x (45)m 35.24 s in the o	Outp 1 + (61)m 39.93 dwelling Aug 132.43	out from w 1] + 0.8 3 40.25 or hot w Sep 132.43	ater heate x [(46)m 46.47 vater is fr	+ (57)m 50.3 rom com	+ (59)m 54.45 munity h	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain	water 49.17 in calc ns (see (Table Feb 132.43 calculat 20.56 s (calculate)	heating, 50.97 culation of the Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in	kWh/mo 44.77 of (65)m and 5a ts Apr 132.43 opendix 12.66	onth 0.29 43.2 only if c May 132.43 L, equati 9.46 dix L, equ	5 ´ [0.85 37.64 ylinder is Jun 132.43 ion L9 or 7.99 uation L	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see	Sep 132.43 Table 5	ater heate x [(46)m 46.47 vater is fr Oct 132.43	+ (57)m 50.3 rom com Nov 132.43	+ (59)m 54.45 munity h Dec 132.43	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nces gain	water 49.17 in calc ns (see (Table Feb 132.43 calculat	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap	kWh/mo 44.77 of (65)m 6 and 5a ts Apr 132.43 opendix 12.66	onth 0.29 43.2 only if c May 132.43 L, equati 9.46	5 ´ [0.85 37.64 ylinder is Jun 132.43 ion L9 of	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see	Sep 132.43 Table 5	ater heate x [(46)m 46.47 vater is fr Oct 132.43	+ (57)m 50.3 rom com Nov 132.43	+ (59)m 54.45 munity h Dec 132.43	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain	water 49.17 in calc 1s (see (Table Feb 132.43 calculat 20.56 s (calc 244.72	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 Appendix 224.9	May 132.43 L, equati 9.46 dix L, eq 207.88	Jun 132.43 ion L9 or 191.89	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69	Sep 132.43 Table 5 15.06 see Ta	ater heate x [(46)m 46.47 vater is fr Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43	+ (59)m 54.45 munity h Dec 132.43	1	(65) (66) (67)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ang gains (c	water 49.17 in calc 1s (see (Table Feb 132.43 calculat 20.56 s (calc 244.72	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 Appendix 224.9	May 132.43 L, equati 9.46 dix L, eq 207.88	Jun 132.43 ion L9 or 191.89	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69	Sep 132.43 Table 5 15.06 see Ta	ater heate x [(46)m 46.47 vater is fr Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43	+ (59)m 54.45 munity h Dec 132.43	1	(65) (66) (67)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ang gains (c	water 49.17 in calc ns (see (Table Feb 132.43 calculat 20.56 s (calc 244.72 calcula 36.24	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 Appendix 224.9 opendix 36.24	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equati 207.88 L, equat	Jun 132.43 ion L9 or 191.89 ion L15	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69), also se	Sep 132.43 Fable 5 185.02 ee Table	ater heate x [(46)m 46.47 rater is fr Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43 22.32	+ (59)m 54.45 munity h Dec 132.43 23.79	1	(65) (66) (67) (68)
inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ng gains (c 36.24 s and fans	water 49.17 in calc ns (see (Table Feb 132.43 calculat 20.56 s (calc 244.72 calcula 36.24	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 Appendix 224.9 opendix 36.24	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equati 207.88 L, equat	Jun 132.43 ion L9 or 191.89 ion L15	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69), also se	Sep 132.43 Fable 5 185.02 ee Table	ater heate x [(46)m 46.47 rater is fr Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43 22.32	+ (59)m 54.45 munity h Dec 132.43 23.79	1	(65) (66) (67) (68)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ng gains (c 36.24 s and fans	water 49.17 in calc ns (see (Table Feb 132.43 20.56 s (calc 244.72 calcula 36.24 s gains 3	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24 (Table 5	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 a Appendix 224.9 opendix 36.24 5a)	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equat 207.88 L, equat 36.24	Jun 132.43 ion L9 or 7.99 uation L15 36.24	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp 1 + (61)m 39.93 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24	r (annual), + (57)m 50.3 rom com Nov 132.43 22.32 215.52	+ (59)m 54.45 munity h Dec 132.43 23.79 231.52	1	(65) (66) (67) (68) (69)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losse	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ng gains (c 36.24 s and fans	water 49.17 in calc 1s (see (Table Feb 132.43 calculat 20.56 s (calculat 244.72 calcula 36.24 s gains 3	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24 (Table 5	kWh/mo 44.77 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 a Appendix 224.9 opendix 36.24 5a)	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equat 207.88 L, equat 36.24	Jun 132.43 ion L9 or 7.99 uation L15 36.24	x (45)m 35.24 s in the o Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp 1 + (61)m 39.93 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24	r (annual), + (57)m 50.3 rom com Nov 132.43 22.32 215.52	+ (59)m 54.45 munity h Dec 132.43 23.79 231.52	1	(65) (66) (67) (68) (69)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losse (71)m=	gains from 56.11 ude (57)m ternal gain olic gains Jan 132.43 ng gains (c 23.15 nnces gain 242.21 ang gains (c 36.24 s and fans s e.g. eval	water 49.17 in calc 18 (see Teb 132.43 calculat 20.56 s (calculat 244.72 calculat 36.24 s gains 3 poratio 105.94	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24 (Table 5 3 n (negat	kWh/mo 44.77 of (65)m and 5a ts Apr 132.43 opendix 12.66 a Append 224.9 opendix 36.24 5a) 3 tive value	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equati 207.88 L, equati 36.24 3 es) (Tab	Jun 132.43 ion L9 or 7.99 uation L 191.89 ion L15 36.24	x (45)m 35.24 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24 3	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43 22.32 215.52 36.24	+ (59)m 54.45 munity h Dec 132.43 23.79 231.52 36.24	1	(65) (66) (67) (68) (69) (70)
(65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losse (71)m=	gains from 56.11 ude (57)m ternal gair olic gains Jan 132.43 ng gains (c 23.15 nces gain 242.21 ang gains (c 36.24 s and fans s e.g. eval heating gains gains gains heating gains gains	water 49.17 in calc 18 (see Teb 132.43 calculat 20.56 s (calculat 244.72 calculat 36.24 s gains 3 poratio 105.94	heating, 50.97 culation of Table 5 5), Wat Mar 132.43 ted in Ap 16.72 ulated in 238.39 ted in Ap 36.24 (Table 5 3 n (negat	kWh/mo 44.77 of (65)m and 5a ts Apr 132.43 opendix 12.66 a Append 224.9 opendix 36.24 5a) 3 tive value	onth 0.29 43.2 only if co May 132.43 L, equati 9.46 dix L, equati 207.88 L, equati 36.24 3 es) (Tab	Jun 132.43 ion L9 or 7.99 uation L 191.89 ion L15 36.24	x (45)m 35.24 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp 1 + (61)m 39.93 dwelling Aug 132.43 Iso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24 3	r (annual) ₁ + (57)m 50.3 rom com Nov 132.43 22.32 215.52 36.24	+ (59)m 54.45 munity h Dec 132.43 23.79 231.52 36.24	1	(65) (66) (67) (68) (69) (70)

Total interna	al gains =				(66	6)m + (67)n	า + (68	3)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m= 406.5	404.18	389.35	365.47	341.14	317.88	302.92	309	0.3 321.71	345.8	1 373.43	394.22		(73)
6. Solar gai	ns:				•	•		•		•			
Solar gains are	e calculated	using solar	flux from	Table 6a	and asso	ciated equa	tions	to convert to th	ne applic	able orientat	ion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	4.4	19	x	11.28	x	0.45	×	1.11	=	17.55	(75)
Northeast 0.9x	0.77	X	4.4	19	x	22.97	x	0.45	X	1.11	=	35.73	(75)
Northeast 0.9x	0.77	X	4.4	19	X	41.38	x	0.45	X	1.11	=	64.38	(75)
Northeast 0.9x	0.77	X	4.4	19	X	67.96	X	0.45	X	1.11	=	105.72	(75)
Northeast 0.9x	0.77	X	4.4	19	X	91.35	x	0.45	X	1.11	=	142.11	(75)
Northeast 0.9x	0.77	X	4.4	19	X	97.38	X	0.45	X	1.11	=	151.51	(75)
Northeast 0.9x	0.77	X	4.4	19	x	91.1	X	0.45	X	1.11	=	141.73	(75)
Northeast 0.9x	0.77	X	4.4	19	X	72.63	x	0.45	X	1.11	=	112.99	(75)
Northeast 0.9x	0.77	X	4.4	19	X	50.42	X	0.45	X	1.11	=	78.44	(75)
Northeast 0.9x	0.77	X	4.4	19	X	28.07	X	0.45	X	1.11	=	43.67	(75)
Northeast 0.9x	0.77	X	4.4	19	X	14.2	x	0.45	X	1.11	=	22.09	(75)
Northeast 0.9x	0.77	X	4.4	19	X	9.21	X	0.45	X	1.11	=	14.34	(75)
Southwest _{0.9x}	0.77	X	7.9	92	X	36.79]	0.45	X	1.11	=	100.97	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	62.67]	0.45	X	1.11	=	171.99	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	85.75		0.45	X	1.11	=	235.33	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	106.25]	0.45	X	1.11	=	291.58	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	119.01]	0.45	X	1.11	= [326.6	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	118.15]	0.45	X	1.11	=	324.24	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	113.91]	0.45	X	1.11	=	312.6	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	104.39]	0.45	X	1.11	=	286.48	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	92.85]	0.45	X	1.11	=	254.81	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	69.27]	0.45	X	1.11	=	190.09	(79)
Southwest _{0.9x}	0.77	X	7.9	92	x	44.07		0.45	X	1.11	=	120.94	(79)
Southwest _{0.9x}	0.77	X	7.9	92	X	31.49]	0.45	X	1.11	=	86.41	(79)
Northwest 0.9x	0.77	X	0.4	17	x	11.28	x	0.45	X	1.11	=	1.84	(81)
Northwest 0.9x	0.77	X	0.4	17	x	22.97	x	0.45	X	1.11	=	3.74	(81)
Northwest 0.9x	0.77	X	0.4	17	x	41.38	x	0.45	x	1.11	=	6.74	(81)
Northwest 0.9x	0.77	X	0.4	17	x	67.96	x	0.45	X	1.11	=	11.07	(81)
Northwest 0.9x	0.77	X	0.4	17	x	91.35	x	0.45	x	1.11	=	14.88	(81)
Northwest 0.9x	0.77	X	0.4	17	x	97.38	x	0.45	x	1.11	=	15.86	(81)
Northwest 0.9x	0.77	X	0.4	17	x	91.1	x	0.45	x	1.11	=	14.84	(81)
Northwest 0.9x	0.77	X	0.4	17	x	72.63	x	0.45	x	1.11	=	11.83	(81)
Northwest 0.9x	0.77	X	0.4	17	x	50.42	x	0.45	x	1.11	=	8.21	(81)
Northwest 0.9x	0.77	X	0.4	17	x	28.07	x	0.45	×	1.11	=	4.57	(81)

Northwest _{0.9x}	0.77	X	0.4	47	x	14.2	x	0.45	x	1.11	=	2.31	(81)
Northwest 0.9x	0.77	X	0.4	47	x	9.21	x	0.45	x [1.11	=	1.5	(81)
Solar gains in	1			ì	i e	1	<u>` </u>	Sum(74)m .	· · ·	l		1	(00)
(83)m= 120.36 Total gains – i	ļ	306.44	408.38	483.59	491.61	469.17	411.3	341.47	238.33	145.34	102.25	J	(83)
(84)m= 526.86	615.64	695.79	773.85	824.73	809.49	772.09	720.59	663.18	584.14	518.77	496.47	1	(84)
` '						112.00	720.00	000.10	304.14	310.77	430.47	l	(01)
7. Mean inter	•		,		<i>'</i>	from Tol	hia O. Th	1 (90)					7(05)
Temperature	•	٠.			•		bie 9, Tr	II (C)				21	(85)
Utilisation fac	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m= 0.99	0.99	0.98	0.94	0.85	0.7	0.54	0.6	0.82	0.96	0.99	1	<u> </u> 	(86)
` ′	<u> </u>					<u>ļ</u>	ļ	Į				l	, ,
Mean interna (87)m= 19.53	19.73	20.03	20.39	20.72	20.91	20.98	20.97	20.82	20.4	19.89	19.49	1	(87)
` ′	Į			<u> </u>	<u>!</u>	<u>!</u>	ļ	ļ	20.4	10.00	10.40	J	()
Temperature (88)m= 20.01	20.02	eating p	eriods ir	20.02	dwelling	20.02	able 9, 1	h2 (°C) 20.02	20.02	20.02	20.02	1	(88)
. ,				<u> </u>		<u> </u>	<u> </u>	20.02	20.02	20.02	20.02	J	(00)
Utilisation fac					· `	1		0.70		0.00	0.00	1	(90)
(89)m= 0.99	0.99	0.97	0.92	0.81	0.62	0.43	0.48	0.76	0.94	0.99	0.99	J	(89)
Mean interna		1		ı —	, 	1	i e	1		i	1	1	(0.0)
(90)m= 18.67	18.87	19.16	19.52	19.82	19.97	20.01	20.01	19.91	19.53	19.03	18.64		(90)
								!	ILA = LIVIII	ig area ÷ (+) =	0.14	(91)
Mean interna	'	· `		i e		1		'	1			1	
(92)m= 18.8	18.99	19.29	19.65	19.95	20.11	20.15	20.14	20.04	19.65	19.15	18.76		(92)
Apply adjustr	ment to t	he mean 19.14	interna 19.5	19.8	ature fro	om Table	4e, who	ere appro	opriate 19.5	19	18.61	1	(93)
8. Space hea			19.5	19.0	19.90	20	19.99	19.09	19.5	19	10.01		(50)
Set Ti to the			mperatu	re obtair	ned at st	ep 11 of	Table 9	b. so tha	nt Ti.m=(76)m an	d re-calo	culate	
the utilisation												•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		· ·				1						1	(0.4)
(94)m= 0.99	0.98	0.96	0.91	0.8	0.61	0.43	0.48	0.75	0.93	0.98	0.99	J	(94)
Useful gains, (95)m= 521.91	604.38	0.000	703.64	657.52	495.97	330.67	346.33	494.63	545.16	509.7	492.77	1	(95)
Monthly aver	<u> </u>					000.07	0 10.00	10 1.00	0 10.10	000.7	102.77	J	(,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al temp	erature,	Lm , W	=[(39)m	x [(93)m	i– (96)m]	!	Į.	ı	
(97)m= 1427.78	1381.99	1249.97	1047.93	800.86	529.97	336.32	355.54	572.81	880.57	1177.44	1425.35		(97)
Space heating	ng 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= 673.97	522.55	432.33	247.89	106.65	0	0	0	0	249.54	480.78	693.84		
							Tota	al per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	3407.55	(98)
Space heating	ng require	ement in	kWh/m²	²/year								37.15	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating s	ystems	including	g micro-(CHP)					
Space heati	•												
Fraction of sp	pace hea	at from s	econdar	y/supple	mentary	y system						0	(201)

For the of several particular	-1(-)			(202) = 1 -	(204)			ĺ		7(000)
Fraction of space heat from m	• ,			(202) = 1	, ,	(202)] _			1	(202)
Fraction of total heating from r	•			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of main space heati	• •		- 0/						90.5	(206)
Efficiency of secondary/supple	.	- -			_			_	0	(208)
Jan Feb Mar Space heating requirement (ca	Apr May		Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
673.97 522.55 432.33	247.89 106.65	- i	0	0	0	249.54	480.78	693.84		
$(211)m = \{[(98)m \times (204)] \} \times 10^{-1}$	00 ÷ (206)	_								(211)
744.72 577.41 477.71	273.91 117.85	0	0	0	0	275.74	531.25	766.67		` ,
			•	Tota	l (kWh/yea	ar) =Sum(2	211)	=	3765.25	(211)
Space heating fuel (secondary	y), kWh/month							!		_
$= \{[(98)\text{m x } (201)]\} \times 100 \div (208)$	1	1 .		_					I	
(215)m = 0 0 0	0 0	0	0	0 Tota	0 I (kWh/yea	0 ar) =Sum(3	0	0		(215)
Water heating				rota	i (kwii) you	ar) =0am(2	- 10/15,1012		0	(213)
Output from water heater (calcu	ulated above)									
172.16 150.96 156.72	137.95 133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		_
Efficiency of water heater								•	87.3	(216)
(217)m= 89.83 89.76 89.63	89.33 88.69	87.3	87.3	87.3	87.3	89.31	89.7	89.86		(217)
Fuel for water heating, kWh/mo $(219)m = (64)m \times 100 \div (217)r$										
$ \frac{(219)m}{(219)m} = \frac{(34)m}{191.65} \frac{(34)m}{168.18} \frac{(217)m}{174.86} $	154.43 150.35	133.46	125.3	141.46	142.45	160.31	172.33	186.02		
	•		•	Tota	I = Sum(2	19a) ₁₁₂ =			1900.77	(219)
Annual totals						k\	Wh/year		kWh/year	_ ¬
Space heating fuel used, main	system 1								3765.25	_
Water heating fuel used									1900.77	
Electricity for pumps, fans and	electric keep-h	ot								
mechanical ventilation - balance	ced, extract or	positive i	nput fron	n outside	e			61.39		(230a)
central heating pump:								30		(230c)
boiler with a fan-assisted flue								45		(230e)
Total electricity for the above, k	:Wh/year			sum	of (230a).	(230g) =			136.39	(231)
Electricity for lighting									408.83	(232)
Electricity generated by PVs									-553.98	(233)
Total delivered energy for all us	ses (211)(221) + (231)	+ (232).	(237b)	=				5657.28	(338)
12a. CO2 emissions – Individu	. , ,		` ′	` ′					333.125	
12a. 002 cmissions mainac	dar ricating 3y3		J							
			ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)		(21	1) x			0.2	16	=	813.29	(261)
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)
Water heating		(21	9) x			0.2	16	=	410.57	(264)

Space and water heating	(261) + (262) + (263) + (264)	=	1223.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	70.79	(267)
Electricity for lighting	(232) x	0.519 =	212.18	(268)
Energy saving/generation technologies Item 1		0.519 =	-287.51	(269)
Total CO2, kg/year	SI	um of (265)(271) =	1219.32	(272)
Dwelling CO2 Emission Rate	(2	272) ÷ (4) =	13.29	(273)
EI rating (section 14)			88	(274)

		User D	etails:					
Assessor Name:	Ben Tunningley			a Num			027495	
Software Name:	Stroma FSAP 2012			are Ve		Versio	n: 1.0.5.41	
		Property A						
Address :	44 Buttercup Road, Bishop	s Walthar	m, SOU	THAMP	TON, SO32	1RJ		
Overall dwelling dimens	nsions:		(a)			44)	W 1 (2)	
Ground floor		Area 4	5.86	(1a) x	Av. Heigh	(2a) =	110.06) (3a)
First floor		4:	5.86	(1b) x	2.67	(2b) =	122.45	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	In) g	1.72	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3	Be)+(3n) =	232.51	(5)
2. Ventilation rate:								
	main seconda heating heating		other		total		m³ per hou	r
Number of chimneys	0 + 0	+	0	= [0	x 40 =	0	(6a)
Number of open flues	0 + 0	+	0	= [0	x 20 =	0	(6b)
Number of intermittent far	าร				3	x 10 =	30	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fir	res				0	x 40 =	0	(7c)
						Air ch	anges per ho	ur
Infiltration due to chimney	rs, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+(7	7c) =	Γ	30	÷ (5) =	0.13	(8)
	een carried out or is intended, proce	ed to (17), o	otherwise (continue fi	rom (9) to (16)			<u> </u>
Number of storeys in th	e dwelling (ns)						0	(9)
Additional infiltration	05(, , , , , , , ,	0.05 ($[(9)-1]\times 0.1 =$	0	(10)
	25 for steel or timber frame of esent, use the value corresponding as): if equal user 0.35			-	ruction	l	0	(11)
•	oor, enter 0.2 (unsealed) or (0.1 (seale	d), 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					Ī	0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	00] =	Ī	0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13) + (1	5) =	0	(16)
Air permeability value, o	q50, expressed in cubic metr	es per ho	ur per s	quare m	etre of enve	elope area	5	(17)
If based on air permeabili	ty value, then $(18) = [(17) \div 20] +$	-(8), otherwis	se (18) =	(16)			0.38	(18)
	s if a pressurisation test has been do	one or a deg	ree air pe	rmeability	is being used	-		_
Number of sides sheltered	d		(20) 1	[0.07E v./	10)]		2	(19)
Shelter factor			, ,	[0.075 x (19)] =		0.85	(20)
Infiltration rate incorporati	_		(21) = (18) x (20) =			0.32	(21)
Infiltration rate modified fo		1 1		<u> </u>		. -		
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov Dec		
Monthly average wind spe	eed from Table 7							

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltr	ation rat	o (allowi	na for el	ooltor an	d wind s	rnood) –	(21a) v	(22a)m	•				
0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
Calculate effe		•	rate for t	he appli	cable ca	ise		<u> </u>					
If mechanica			l: N (6		\ - /		NEV (1	. (00)	\ (00.)			0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced with		•	•	•		,		,	Ola \	005) [4	(00-)	0 . 4001	(23c)
a) If balance (24a)m= 0	ea mech	anicai ve	entilation 0	with nea	at recov	ery (MV)	$\frac{HR}{0}$ (248	$\frac{1}{0} = \frac{2}{2}$	2b)m + (0	23b) × [*	1 – (23c) 0	÷ 100] 	(24a)
b) If balance			<u> </u>	<u> </u>									(214)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>					, ,
,		(23b), t		•					.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural				•	•				•			•	
<u> </u>		en (24d)	<u> </u>		`		- `	'		ı	ı	ı	
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air			- `-	``	ŕ	´`		` 	0.50	0.57	0.57	I	(25)
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
3. Heat losse	s and he	eat loss p	oaramet	er:									
3. Heat losse	s and he Gros area	SS	oaramet Openin m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/l	≺)	k-value kJ/m²-l		A X k kJ/K
	Gros	SS	Openin	ıgs						<) 			
ELEMENT	Gros	SS	Openin	ıgs	A ,r	m²	W/m2	2K	(W/I	<) 			kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	ıgs	A ,r	m² x x	W/m2	2K = =	(W/l	<) 			kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	ıgs	A ,r	m ²	W/m2 1	2K = = = • 0.04] =	2.1 2.1	<) 			kJ/K (26) (26)
Doors Type 1 Doors Type 2 Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 4.49	m ²	W/m2 1 1 /[1/(1.4)+	= = = = = = = = = = = = = = = = = = =	2.1 2.1 5.95	<) 			kJ/K (26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 4.49 7.92	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+	= = = = = = = = = = = = = = = = = = =	2.1 2.1 5.95 10.5				kJ/K (26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	2.1 2.1 5.95 10.5 0.62				kJ/K (26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area	ss (m²)	Openin m	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = = = = = = = = = = = = = = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618				kJ/K (26) (26) (27) (27) (27) (28)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area 1 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	x1 x	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	eK = = = = = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46				kJ/K (26) (26) (27) (27) (27) (28)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof	Gros area 1 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	x x x1 x1 x1 x1 x1 x2 x2 x2 x1 x2 x2 x3 x4	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	eK = = = = = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46				kJ/K (26) (26) (27) (27) (27) (28) (29)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area 1 2 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	eK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96				kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area 1 2 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	eK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96				kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ***	Gros area 1 2 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	eK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96				kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31) (32)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area 1 2 2 3 97.4 45.8	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	eK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96				kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area 1 2 3 97.4 45.8 elements	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4 52.66	m ²	W/m2 1 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	eK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96				kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall ** Internal wall ** Internal floor	Gros area 1 1 2 2 3 3 97.4 45.8 elements	14 36 5, m ²	Openin m	gs ₁ ²	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 126.4 52.66 45.86 45.86 alue calcul	m ²	W/m2 1 (1/(1.4)+ /(1/(1.4)+ /(1/(1.4)+ 0.13 0.18 0.13	EK = = = = = =	(W/l 2.1 2.1 5.95 10.5 0.62 5.9618 14.46 5.96		kJ/m²-l		kJ/K (26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32d)

Heat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17327.82	(34)
Thermal mass	,	•	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess	sments wh	ere the de	tails of the	•			ecisely the	indicative	values of	TMP in Ta	able 1f	200	
Thermal bridge				using Ap	pendix I	K						9.91	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(00)	(0.0)				-
Total fabric hea								(33) +		05) (5)		57.57	(37)
Ventilation hea	i i		· ·		1	11	A		= 0.33 × (
(38)m= 44.84	Feb 44.59	Mar 44.34	Apr 43.18	May 42.97	Jun 41.96	Jul 41.96	Aug 41.77	Sep 42.35	Oct 42.97	Nov 43.4	Dec 43.86		(38)
` '			43.10	42.97	41.30	41.30	41.77				43.00		(00)
Heat transfer o	102.16		100.76	100.54	00.52	99.53	00.25		= (37) + (3		101.44		
(39)m= 102.41	102.16	101.91	100.76	100.54	99.53	99.53	99.35	99.92	100.54 Average =	100.98	101.44	100.76	(39)
Heat loss para	meter (H	HLP), W/	m²K						= (39)m ÷		12 / 12-	100.70	(00)
(40)m= 1.12	1.11	1.11	1.1	1.1	1.09	1.09	1.08	1.09	1.1	1.1	1.11		
Number of day	s in mor	nth (Tab	le 1a)			•		,	Average =	Sum(40) _{1.}	12 /12=	1.1	(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	ting ener	gy requi	rement:								kWh/ye	ear:	
Λ Ι													
Assumed occur if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annua not more that 125	9, N = 1 9, N = 1 e hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)	7.1		(42)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual	9, N = 1 9, N = 1 e hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d rater use, I	ay Vd,av Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us		9)			, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125	9, N = 1 9, N = 1 le hot wa al average litres 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 t ld) Jul	(25 x N) to achieve	+ 36	se target o	9) 97	7.1		, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan	9, N = 1 9, N = 1 le hot wa al average litres 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 t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 97	7.1		, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in	9, N = 1 9, N = 1 le hot wa la average litres per p Feb n 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 95.16	es per da 5% if the day vater use, I May Vd,m = fac 91.28	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed in display Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep 95.16	Oct 99.04 Fotal = Sui	9) Nov 102.93 m(44)12 =	7.1 Dec	1165.23	, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 106.81	9, N = 1 9, N = 1 le hot wa la average litres per p Feb n 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 95.16	es per da 5% if the day vater use, I May Vd,m = fac 91.28	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed in display Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep 95.16	Oct 99.04 Fotal = Sui	9) Nov 102.93 m(44)12 =	7.1 Dec	1165.23	(43)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of	9, N = 1 9, N = 1 le hot wa la average litres per p Feb n litres per 102.93	+ 1.76 x ater usag hot water person per Mar day for ea 99.04 used - cale	ge in litre usage by day (all w Apr ach month 95.16	es per da 5% if the or vater use, I May $Vd, m = fa$ 91.28	ay Vd,av lwelling is not and co Jun ctor from 1 87.39	erage = designed in display Jul Table 1c x 87.39	(25 x N) to achieve Aug (43) 91.28	+ 36 a water us Sep 95.16 0 kWh/mon	Oct 99.04 Fotal = Suith (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1 141.26	7.1 Dec 106.81 c, 1d) 153.4	1165.23 1527.8	(43)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of	9, N = 1 de hot wa hal average litres per proper litres per proper litres per litres per lo2.93 hot water la38.54	+ 1.76 x ater usag hot water person per Mar day for ea 99.04 used - calc 142.96	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the a vater use, b May b b b d	ay Vd,av lwelling is not and co Jun ctor from 1 87.39 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73	+ 36 a water us Sep 95.16 0 kWh/mon	Oct 99.04 Fotal = Sur th (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1 141.26	7.1 Dec 106.81 c, 1d) 153.4		(43)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annua not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76	9, N = 1 de hot wa al average litres per proper litres per proper l'itres per 102.93 de l'attente de l'attente l'att	+ 1.76 x ater usag hot water person per Mar day for ea 99.04 used - calc 142.96	ge in litre usage by day (all w Apr ach month 95.16 culated me	es per da 5% if the a vater use, b May b b b d	ay Vd,av lwelling is not and co Jun ctor from 1 87.39 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 97m / 3600 109.73	+ 36 a water us Sep 95.16 0 kWh/mon	Oct 99.04 Fotal = Sur th (see Ta	9) Nov 102.93 m(44) ₁₁₂ = 1bles 1b, 1 141.26	7.1 Dec 106.81 c, 1d) 153.4		(43)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage	9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per 102.93 hot water 138.54 vater heatir 20.78	ter usage hot water person per Mar day for ear 99.04 used - calculated at point 21.44	ge in litre usage by a day (all w Apr ach month 95.16 culated mo 124.64 of use (no	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 I 119.59 I I I I I I I I	ay Vd,av lwelling is not and co Jun ctor from 1 87.39 190 x Vd,r 103.2	erage = designed of ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46	+ 36 a water us Sep 95.16 0 kWh/more 111.04 16.66	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 119.41	9) Nov 102.93 m(44) ₁₁₂ = 2bles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annua not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage Storage volum	P, N = 1 - 1 - 1 - 2 - 1 - 2 - 1 - 2 - 2 - 2 -	+ 1.76 x ater usag hot water person per Mar day for ea 99.04 used - calc 142.96 ag at point 21.44 including	ge in litre usage by day (all w Apr ach month 95.16 124.64 of use (no	es per da 5% if the orater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 olar or W	ay Vd,av lwelling is not and co Jun ctor from 7 87.39 190 x Vd,r 103.2 storage), 15.48	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa	+ 36 a water us Sep 95.16 0 kWh/more 111.04 16.66	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 119.41	9) Nov 102.93 m(44) ₁₁₂ = 2bles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4		(43)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage	9, N = 1 de hot was al average litres per proper litres per proper l'itres per proper l'itres per l'itres per l'itres per l'itres per proper l'itres per	ter usage hot water person per Mar day for ear 99.04 used - calculated at point 21.44 including and no talculated at the calculated at point 21.44	ge in litre usage by day (all w Apr ach month 95.16 culated mo 124.64 of use (no 18.7	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 onthly = 4. 119.59 o hot water 17.94 olar or Welling, e	ay Vd,av lwelling is not and co Jun ctor from 1 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage Ditres in	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/more 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 129.41 Fotal = Sur 19.41	9) Nov 102.93 m(44) ₁₁₂ = sbles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annua not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage Storage volum If community h Otherwise if no	P, N = 1 - 1 - 1 - 2 - 1 - 1 - 2 - 1 - 2 - 1 - 2 - 2	+ 1.76 x ater usage hot water person per Mar day for ear 99.04 used - calcate 142.96 and at point 21.44 including and no talcate hot water sales.	ge in litre usage by day (all w Apr ach month 95.16 124.64 of use (no 18.7 ag any so ank in dw er (this in	es per da 5% if the o rater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 color or W relling, e	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/more 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 129.41 Fotal = Sur 19.41	9) Nov 102.93 m(44) ₁₁₂ = bles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 c 23.01		(43) (44) (45) (46)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annua not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage Storage volum If community h Otherwise if no	9, N = 1 de hot was al average litres per proper litres per proper l'itres per proper l'itres per l'itres per proper l'itres per l'itres	+ 1.76 x ater usage hot water person per Mar day for ear 99.04 used - calc 142.96 and at point 21.44 including and no talc hot water eclared leared lear	ge in litre usage by day (all w Apr ach month 95.16 124.64 of use (no 18.7 ag any so ank in dw er (this in	es per da 5% if the o rater use, I May Vd,m = far 91.28 onthly = 4. 119.59 o hot water 17.94 color or W relling, e	ay Vd,av lwelling is not and co Jun ctor from 87.39 190 x Vd,r 103.2 storage), 15.48 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/more 111.04 16.66 ame vess	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 129.41 Fotal = Sur 19.41	9) Nov 102.93 m(44)12 = sbles 1b, 1 141.26 m(45)12 = 21.19	7.1 Dec 106.81 c, 1d) 153.4 23.01		(43) (44) (45) (46) (47)
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annua not more that 125 Jan Hot water usage in (44)m= 106.81 Energy content of (45)m= 158.4 If instantaneous w (46)m= 23.76 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact	9, N = 1 de hot was al average litres per proper litres per proper l'acceptant	ter usage hot water person per Mar day for ear 99.04 142.96 142.96 142.96 including at point and no tale hot water water eclared lear to a storage	ge in litre usage by day (all w Apr ach month 95.16 124.64 of use (no 18.7 ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the a vater use, I May $Vd,m = fa$ 91.28 0 and 0 hot water 17.94 plar or Water 17.94 or is known is known ear	ay Vd,av lwelling is not and co Jun ctor from 187.39 190 x Vd,r 103.2 r storage), 15.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 87.39 m x nm x E 95.63 enter 0 in 14.34 storage 0 litres in neous con/day):	(25 x N) to achieve Aug (43) 91.28 07m / 3600 109.73 boxes (46) 16.46 within sa (47)	+ 36 a water us Sep 95.16 0 kWh/mor 111.04 16.66 ame vess ers) ente	Oct 99.04 Fotal = Sur 129.41 Fotal = Sur 129.41 Fotal = Sur 19.41	9) Nov 102.93 m(44) ₁₁₂ = sbles 1b, 1 141.26 m(45) ₁₁₂ = 21.19	7.1 Dec 106.81 c, 1d) 153.4 23.01		(43) (44) (45) (46) (47)

Hot water storage los			le 2 (kW	h/litre/da	ıy)					0		(51)
If community heating		on 4.3									1	
Volume factor from Tampereture feater fr		2h								0		(52)
Temperature factor fr							<i>,</i> ,			0		(53)
Energy lost from water	_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54) in (•					((50)	==> (44)			0		(55)
Water storage loss ca	lculated 1	or each	month			((56)m = (55) × (41)	m •			•	
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicat	ed solar sto	rage, (57)ı	m = (56)m 	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H -	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (a	nnual) fro	om Table	e 3							0		(58)
Primary circuit loss ca	lculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m = 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated	I for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 50.96 46.03	50.47	46.93	46.51	43.1	44.53	46.51	46.93	50.47	49.32	50.96		(61)
Total heat required fo	r 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= 209.36 184.57	193.43	171.56	166.1	146.3	140.16	156.25	157.97	179.88	190.58	204.36		(62)
Solar DHW input calculated	d usina App	endix G o	r Appendix	L : H (negati	ı ve quantitv	L	' if no sola	r contribut	ion to wate	r heating)	l	
(add additional lines i										3,		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 0 0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output from water he	-	-	-	-	-	-	-		-	•		, , , ,
		171.56	166.1	146.3	140.16	156.25	157.97	179.88	190.58	204.36		
(64)m= 209.36 184.57		171.56	166.1	146.3	140.16	156.25 Outr	157.97 out from w	179.88	190.58	204.36	2100.53	1 (64)
(64)m= 209.36 184.57	193.43	<u> </u>	<u> </u>			Outp	out from w	ater heate	I r (annual)₁	12		(64)
(64)m= 209.36 184.57 Heat gains from wate	193.43	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	Outr + (61)m	out from w	ater heate	I r (annual)₁ + (57)m	+ (59)m		1
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57	193.43 r heating, 60.15	kWh/mo	onth 0.29	5 ´ [0.85 45.09	× (45)m	Outp + (61)m 48.11	out from w n] + 0.8 3 48.65	ater heate x [(46)m 55.65	+ (57)m 59.3	+ (59)m]	(64) (65)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca	r heating, 60.15	kWh/mo 53.17 of (65)m	onth 0.29 51.39 only if c	5 ´ [0.85 45.09	× (45)m	Outp + (61)m 48.11	out from w n] + 0.8 3 48.65	ater heate x [(46)m 55.65	+ (57)m 59.3	+ (59)m]	1
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (se	193.43 r heating, 60.15 culation of	kWh/mo 53.17 of (65)m 5 and 5a	onth 0.29 51.39 only if c	5 ´ [0.85 45.09	× (45)m	Outp + (61)m 48.11	out from w n] + 0.8 3 48.65	ater heate x [(46)m 55.65	+ (57)m 59.3	+ (59)m]	1
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table	r heating, 60.15 culation of Table 5 e Table 5	kWh/mo 53.17 of (65)m 5 and 5a	onth 0.29 51.39 only if c	5 ´ [0.85 45.09 ylinder is	× (45)m 42.93 s in the o	Outp + (61)m 48.11 dwelling	ut from w n] + 0.8 : 48.65 or hot w	ater heate x [(46)m 55.65 vater is fr	+ (57)m 59.3	+ (59)m 63.75 munity h]	1
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb	r heating, 60.15 culation of Table 5 e 5), Wat Mar	65)m 53.17 of (65)m 5 and 5a ts Apr	onth 0.29 51.39 only if constant of the consta	5 ´ [0.85 45.09 ylinder is	× (45)m 42.93 s in the o	Outp + (61)m 48.11 dwelling	out from w 1] + 0.8 3 48.65 or hot w	ater heate x [(46)m 55.65 vater is fr	+ (57)m 59.3 com com	+ (59)m 63.75 munity h]	(65)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43	r heating, 60.15 culation of Table 5 e 5), Wat Mar 132.43	53.17 of (65)m 5 and 5a ts Apr 132.43	onth 0.29 51.39 only if co): May	5 ´ [0.85 45.09 sylinder is Jun 132.43	× (45)m 42.93 s in the o	Outp + (61)m 48.11 dwelling Aug 132.43	out from w 1] + 0.8 2 48.65 or hot w Sep 132.43	ater heate x [(46)m 55.65 vater is fr	+ (57)m 59.3	+ (59)m 63.75 munity h]	1
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation)	r heating, 60.15 culation of the Table 5 e 5), Wat Mar 132.43 ated in Ap	53.17 of (65)m 5 and 5a ts Apr 132.43	onth 0.29 51.39 only if co : May 132.43 L, equat	5 ´ [0.85 45.09 ylinder is Jun 132.43 ion L9 o	× (45)m 42.93 s in the o Jul 132.43 r L9a), a	Outp + (61)m 48.11 dwelling Aug 132.43 lso see	Sep 132.43	ater heate x [(46)m 55.65 vater is fr Oct 132.43	+ (57)m 59.3 rom com Nov 132.43	+ (59)m 63.75 munity h Dec 132.43]	(65)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation) 23.15 20.56	r heating, 60.15 culation of the Table 5 e 5), Wat Mar 132.43 ated in Ap 16.72	53.17 of (65)m 5 and 5a tts Apr 132.43 opendix 12.66	onth 0.29 51.39 only if co : May 132.43 L, equat 9.46	5 ´ [0.85 45.09 ylinder is Jun 132.43 ion L9 o	x (45)m 42.93 s in the o Jul 132.43 r L9a), a 8.63	Outp + (61)m 48.11 dwelling Aug 132.43 lso see	sep 132.43 Table 5	ater heate x [(46)m 55.65 vater is fr Oct 132.43	+ (57)m 59.3 com com	+ (59)m 63.75 munity h]	(65)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (se Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation) (67)m= 23.15 20.56 Appliances gains (calculation)	r heating, 60.15 culation of the Table 5 mar 132.43 ated in Apr 16.72 culated in	53.17 of (65)m and 5a ts Apr 132.43 opendix 12.66 n Append	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq	Jun 132.43 ion L9 o 7.99 uation L	x (45)m 42.93 s in the o Jul 132.43 r L9a), a 8.63	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also	Sep 132.43 Table 5 15.06	ater heate x [(46)m 55.65 rater is fr Oct 132.43 19.12 ble 5	r (annual) ₁ + (57)m 59.3 com com Nov 132.43	+ (59)m 63.75 munity h Dec 132.43]	(65) (66) (67)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation) 23.15 20.56	r heating, 60.15 culation of the Table 5 mar 132.43 ated in Apr 16.72 culated in	53.17 of (65)m 5 and 5a tts Apr 132.43 opendix 12.66	onth 0.29 51.39 only if co : May 132.43 L, equat 9.46	5 ´ [0.85 45.09 ylinder is Jun 132.43 ion L9 o	x (45)m 42.93 s in the o Jul 132.43 r L9a), a 8.63	Outp + (61)m 48.11 dwelling Aug 132.43 lso see	sep 132.43 Table 5	ater heate x [(46)m 55.65 vater is fr Oct 132.43	+ (57)m 59.3 rom com Nov 132.43	+ (59)m 63.75 munity h Dec 132.43]	(65)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (se Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation) (67)m= 23.15 20.56 Appliances gains (calculation)	r heating, 60.15 culation of Table 5 Mar 132.43 ated in Ap 16.72 culated ir 238.39	53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88	Jun 132.43 ion L9 of 7.99 uation L	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69	Sep 132.43 Table 5 15.06 see Ta	Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 59.3 com com Nov 132.43	+ (59)m 63.75 munity h Dec 132.43]	(65) (66) (67)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43 Lighting gains (calculation (67)m= 23.15 20.56 Appliances gains (calculation (68)m= 242.21 244.72	r heating, 60.15 culation of Table 5 Mar 132.43 ated in Ap 16.72 culated ir 238.39	53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88	Jun 132.43 ion L9 of 7.99 uation L	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69	Sep 132.43 Table 5 15.06 see Ta	Oct 132.43 19.12 ble 5 198.5	r (annual) ₁ + (57)m 59.3 com com Nov 132.43	+ (59)m 63.75 munity h Dec 132.43]	(65) (66) (67)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculated) 23.15 20.56 Appliances gains (calculated) 242.21 244.72 Cooking gains (calculated) 242.21 244.72	r heating, 60.15 culation of the Table 5 e Table 5 mar 132.43 ated in April 16.72 culated in 238.39 ated in April 238.39 ated in April 238.39 ated in April 238.39 ated in April 238.39	kWh/mo 53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat	Jun 132.43 ion L9 o 7.99 uation L 191.89	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69 , also se	Sep 132.43 Table 5 15.06 See Table 185.02	ater heate x [(46)m 55.65 rater is fr Oct 132.43 19.12 ble 5 198.5	(annual) + (57)m 59.3 com com Nov 132.43 22.32	+ (59)m 63.75 munity h Dec 132.43 23.79]	(65) (66) (67) (68)
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43 Lighting gains (calculate) (67)m= 23.15 20.56 Appliances gains (calculate) (68)m= 242.21 244.72 Cooking gains (calculate) (69)m= 36.24 36.24	r heating, 60.15 culation of the Table 5 e Table 5 mar 132.43 ated in April 16.72 culated in 238.39 ated in April 238.39 ated in April 238.39 ated in April 238.39 ated in April 238.39	kWh/mo 53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat	Jun 132.43 ion L9 o 7.99 uation L 191.89	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69 , also se	Sep 132.43 Table 5 15.06 See Table 185.02	ater heate x [(46)m 55.65 rater is fr Oct 132.43 19.12 ble 5 198.5	(annual) + (57)m 59.3 com com Nov 132.43 22.32	+ (59)m 63.75 munity h Dec 132.43 23.79]	(65) (66) (67) (68)
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43 Lighting gains (calculate) (67)m= 23.15 20.56 Appliances gains (calculate) (68)m= 242.21 244.72 Cooking gains (calculate) (69)m= 36.24 36.24 Pumps and fans gain	r heating, 60.15 culation of e Table 5 e 5), Wat Mar 132.43 ated in Ap 16.72 culated ir 238.39 ated in A 36.24 s (Table 5	53.17 of (65)m 5 and 5a tts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24 5a) 3	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat 36.24	Jun 132.43 ion L9 o 7.99 uation L 191.89 tion L15 36.24	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24	r (annual) ₁ + (57)m 59.3 rom com Nov 132.43 22.32 215.52	+ (59)m 63.75 munity h Dec 132.43 23.79 231.52]	(65) (66) (67) (68) (69)
(64)m= 209.36 184.57 Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 132.43 132.43 Lighting gains (calculated) (67)m= 23.15 20.56 Appliances gains (calculated) (68)m= 242.21 244.72 Cooking gains (calculated) (69)m= 36.24 36.24 Pumps and fans gain (70)m= 3 3	r heating, 60.15 culation of e Table 5 e 5), Wat Mar 132.43 ated in Ap 16.72 culated in 238.39 ated in A 36.24 s (Table 5 3 on (negar	53.17 of (65)m 5 and 5a tts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24 5a) 3	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat 36.24	Jun 132.43 ion L9 o 7.99 uation L 191.89 tion L15 36.24	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a 36.24	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 see Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24	r (annual) ₁ + (57)m 59.3 rom com Nov 132.43 22.32 215.52	+ (59)m 63.75 munity h Dec 132.43 23.79 231.52]	(65) (66) (67) (68) (69)
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43 Lighting gains (calculate) (67)m= 23.15 20.56 Appliances gains (calculate) (68)m= 242.21 244.72 Cooking gains (calculate) (69)m= 36.24 36.24 Pumps and fans gain (70)m= 3 3 Losses e.g. evaporati (71)m= -105.94 -105.94	r heating, 60.15 culation of e Table 5 e 5), Wat Mar 132.43 ated in Ap 16.72 culated in 238.39 ated in A 36.24 s (Table 5 3 on (negar	kWh/mo 53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24 5a) 3	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat 36.24	Jun 132.43 ion L9 o 7.99 uation L 191.89 tion L15 36.24	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a; 36.24	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 See Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24 3	r (annual) ₁ + (57)m 59.3 rom com Nov 132.43 22.32 215.52 36.24	+ (59)m 63.75 munity h Dec 132.43 23.79 231.52 36.24]	(65) (66) (67) (68) (69) (70)
Heat gains from wate (65)m= 65.41 57.57 include (57)m in ca 5. Internal gains (see Metabolic gains (Tabl Jan Feb (66)m= 132.43 132.43 Lighting gains (calculate) (67)m= 23.15 20.56 Appliances gains (calculate) (68)m= 242.21 244.72 Cooking gains (calculate) (69)m= 36.24 36.24 Pumps and fans gain (70)m= 3 3 Losses e.g. evaporati	r heating, 60.15 culation of e Table 5 e 5), Wat Mar 132.43 ated in Ap 16.72 culated in 238.39 ated in A 36.24 s (Table 5 3 on (negar	kWh/mo 53.17 of (65)m 5 and 5a ts Apr 132.43 opendix 12.66 n Append 224.9 ppendix 36.24 5a) 3	onth 0.29 51.39 only if co): May 132.43 L, equat 9.46 dix L, eq 207.88 L, equat 36.24	Jun 132.43 ion L9 o 7.99 uation L 191.89 tion L15 36.24	x (45)m 42.93 s in the of Jul 132.43 r L9a), a 8.63 13 or L1 181.2 or L15a; 36.24	Outp + (61)m 48.11 dwelling Aug 132.43 lso see 11.22 3a), also 178.69), also se 36.24	Sep 132.43 Table 5 15.06 See Ta 185.02 ee Table 36.24	Oct 132.43 19.12 ble 5 198.5 36.24 3	r (annual) ₁ + (57)m 59.3 rom com Nov 132.43 22.32 215.52 36.24	+ (59)m 63.75 munity h Dec 132.43 23.79 231.52 36.24]	(65) (66) (67) (68) (69) (70)

Total i	nternal	gains =				(60	6)m + (67)m	n + (68	3)m +	+ (69)m + (1	70)m +	(71)m + (72)	m		
(73)m=	419	416.68	401.69	377.14	352.15	328.22	313.26	320	.31	333.38	358.15	385.93	406.72		(73)
6. Sol	ar gains	s:													
Solar g	ains are	calculated u	using sola	r flux from	Table 6a	and asso	ciated equa	tions	to co	nvert to the	e applic	able orientat	ion.		
Orienta		Access F	actor	Area			ux		_	g_ 		FF		Gains	
	_	Table 6d		m²		1	able 6a	_		able 6b	_	Table 6c		(W)	
Northea	ıst _{0.9x}	0.77	X	4.4	19	X	11.28	X		0.63	x	0.7	=	15.48	(75)
Northea		0.77	X	4.4	19	X	22.97	X		0.63	X	0.7	=	31.52	(75)
Northea	L	0.77	X	4.4	19	X	41.38	X		0.63	x	0.7	=	56.78	(75)
Northea	ıst _{0.9x}	0.77	X	4.4	19	x	67.96	X		0.63	x	0.7	=	93.25	(75)
Northea	<u>L</u>	0.77	X	4.4	19	x	91.35	X		0.63	X	0.7	=	125.35	(75)
Northea	L	0.77	X	4.4	19	x	97.38	X		0.63	x	0.7	=	133.63	(75)
Northea	<u>_</u>	0.77	X	4.4	19	x	91.1	X		0.63	x	0.7	=	125.01	(75)
Northea	<u>L</u>	0.77	X	4.4	19	х	72.63	X		0.63	x	0.7	=	99.66	(75)
Northea	L	0.77	X	4.4	19	x	50.42	X		0.63	x	0.7	=	69.19	(75)
Northea	<u> </u>	0.77	X	4.4	19	x	28.07	X		0.63	x	0.7	=	38.51	(75)
Northea	<u>L</u>	0.77	X	4.4	19	X	14.2	X		0.63	X	0.7	=	19.48	(75)
Northea	L	0.77	X	4.4	19	x	9.21	X		0.63	x	0.7	=	12.64	(75)
Southw	est _{0.9x}	0.77	X	7.9	92	x	36.79]		0.63	x	0.7	=	89.06	(79)
Southw	L	0.77	X	7.9	92	X	62.67	<u> </u>		0.63	X	0.7	=	151.7	(79)
Southw	est _{0.9x}	0.77	X	7.9	92	x	85.75	<u> </u>		0.63	x	0.7	=	207.56	(79)
Southw	est _{0.9x}	0.77	X	7.9	92	X	106.25	<u> </u>		0.63	X	0.7	=	257.18	(79)
Southw	L	0.77	X	7.9	92	X	119.01	<u> </u>		0.63	X	0.7	=	288.06	(79)
Southw	est _{0.9x}	0.77	X	7.9	92	x	118.15	<u> </u>		0.63	x	0.7	=	285.98	(79)
Southw	<u>L</u>	0.77	X	7.9	92	X	113.91]		0.63	X	0.7	=	275.71	(79)
Southw	<u>L</u>	0.77	X	7.9	92	X	104.39	<u> </u>		0.63	X	0.7	=	252.67	(79)
Southw	L	0.77	X	7.9	92	x	92.85]		0.63	x	0.7	=	224.74	(79)
Southw	L	0.77	X	7.9	92	X	69.27]		0.63	X	0.7	=	167.66	(79)
Southw	<u>L</u>	0.77	X	7.9	92	x	44.07	<u> </u>		0.63	x	0.7	=	106.67	(79)
Southw	<u> </u>	0.77	X	7.9	92	x	31.49]		0.63	x	0.7	=	76.21	(79)
Northwe	L	0.77	X	0.4	17	x	11.28	X		0.63	x	0.7	=	1.62	(81)
Northwe	<u>L</u>	0.77	X	0.4	17	x	22.97	X		0.63	x	0.7	=	3.3	(81)
Northwe	est _{0.9x}	0.77	X	0.4	17	X	41.38	X		0.63	X	0.7	=	5.94	(81)
Northwe	L	0.77	X	0.4	17	x	67.96	X		0.63	x	0.7	=	9.76	(81)
Northwe	L	0.77	X	0.4	17	X	91.35	X		0.63	X	0.7	=	13.12	(81)
Northwe	<u>L</u>	0.77	X	0.4	17	X	97.38	X		0.63	x	0.7	=	13.99	(81)
Northwe	<u> </u>	0.77	X	0.4	17	x	91.1	X		0.63	x	0.7	=	13.09	(81)
Northwe	L	0.77	X	0.4	17	x	72.63	x		0.63	x	0.7	=	10.43	(81)
Northwe	<u>L</u>	0.77	X	0.4	47	х	50.42	x		0.63	x	0.7	=	7.24	(81)
Northwe	est _{0.9x}	0.77	X	0.4	17	x	28.07	X		0.63	x	0.7	=	4.03	(81)

Northwest 0.9x	0.77	х	0.4	17	х	14.2	х	0.63	x	0.7	=	2.04	(81)
Northwest 0.9x	0.77	х	0.4	17	х	9.21	x	0.63	_ x [0.7	=	1.32	(81)
_													
Solar gains in	watts, ca	alculated	for eac	h month			(83)m = 9	Sum(74)m .	(82)m			•	
(83)m= 106.16	186.51	270.28	360.19	426.53	433.6	413.81	362.76	301.17	210.2	128.19	90.18		(83)
Total gains – i				<u> </u>	<u> </u>			,				1	
(84)m= 525.16	603.19	671.97	737.33	778.68	761.82	727.07	683.07	634.56	568.35	514.12	496.9		(84)
7. Mean inter	nal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ir	n the livi	ng area	from Tal	ble 9, Th	11 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)			,	,		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ļ	
(86)m= 1	1	0.99	0.97	0.91	0.76	0.59	0.64	0.87	0.98	1	1]	(86)
Mean interna	l temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tab	le 9c)				_	
(87)m= 19.78	19.92	20.16	20.48	20.76	20.94	20.99	20.98	20.86	20.5	20.08	19.75		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	g from Ta	able 9, T	h2 (°C)					
(88)m= 19.99	19.99	19.99	20	20	20.01	20.01	20.01	20.01	20	20	20		(88)
Utilisation fac	tor for a	ains for i	rest of d	welling.	h2.m (s	ee Table	9a)	•	•	•		'	
(89)m= 1	1	0.99	0.96	0.87	0.67	0.46	0.52	0.81	0.97	1	1]	(89)
Mean interna	l I tamnar	ature in	tha rast	of dwelli	na T2 (f	follow eta	one 3 to	7 in Tahl	<u> </u> a 0c	<u>!</u>	<u>Į</u>	1	
(90)m= 18.35	18.57	18.92	19.38	19.76	19.97	20.01	20.01	19.89	19.41	18.8	18.32]	(90)
(60)						1		<u> </u>	Į	g area ÷ (4	<u> </u>	0.14	(91)
Mana into wa			41	-ll	II: a.\	11 A T4	. /4 - 41	. A) T O				3111	 _` ′
Mean interna (92)m= 18.56	18.76	19.1	19.54	19.91	20.11	20.15	20.15	20.03	19.56	18.99	18.53	1	(92)
Apply adjustr	l			l	l	l .	l	l .		10.00	10.00	l	(02)
(93)m= 18.56	18.76	19.1	19.54	19.91	20.11	20.15	20.15	20.03	19.56	18.99	18.53]	(93)
8. Space hea	iting requ	uirement											
Set Ti to the	mean int	ternal ter	nperatu	re obtair	ed at st	ep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-cald	culate	
the utilisation											1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	· ·		0.00	0.60	0.48	0.52	0.01	0.00	0.00		1	(94)
(94)m= 1 Useful gains,		0.98	0.95	0.86	0.68	0.46	0.53	0.81	0.96	0.99	1	j	(94)
(95)m= 523.41	598.93	660.46	701.05	671.67	517.15	349.14	365.12	513.98	548.33	510.54	495.65	1	(95)
Monthly aver				L		0 10.11	1 000.12	0.0.00	0 10.00	010.01	100.00	J	(,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat loss rate	e for mea	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	ı— (96)m]			ı	
(97)m= 1460.31	i	1283.76		825.06	548.32	353.24	372.16	592.66	901.29	1200.34	1453.55	1	(97)
Space heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	')m – (95	5)m] x (4	1)m		ı	
(98)m= 697.05	549.31	463.73	266.88	114.12	0	0	0	0	262.6	496.65	712.68		
							Tota	al per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3563.03	(98)
Space heatin	g require	ement in	kWh/m²	²/year								38.85	(99)
9a. Energy red	quir <u>emer</u>	nts – Indi	vid <u>ual h</u>	eating s	vstems	including	micro-(CHP)					
Space heating													
Fraction of sp	•	at from se	econdar	y/supple	mentary	y system						0	(201)

Eraction of appear heat from main system(a)		(202) – 1 – (201) -					(202)
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $ Fraction of total heating from main system 1 $ (204) = (202) \times [1 - (203)] = $						1	(204)
Efficiency of main space heating system 1						93.4	(206)
Efficiency of secondary/supplementary heating s	system %					0	(208)
Jan Feb Mar Apr May	Jun Jul	Aug Sep	Oct	Nov	Dec	kWh/yea	
Space heating requirement (calculated above)	Juli Juli	Aug Ocp	001	1407	Dec] Kvvii/yCd	<i>λ</i> 1
697.05 549.31 463.73 266.88 114.12	0 0	0 0	262.6	496.65	712.68		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$				-		_	(211)
746.31 588.12 496.5 285.74 122.19	0 0	0 0	281.15	531.75	763.04		_
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)		Total (kWh/y	ear) =Sum(2	211) _{15,101}	₂ =	3814.81	(211)
(215)m= 0 0 0 0 0	0 0	0 0	0	0	0		7
		Total (kWh/y	ear) =Sum(2	215) _{15,1012}	2=	0	(215)
Water heating Output from water heater (calculated above)							
	146.3 140.16	156.25 157.97	179.88	190.58	204.36]	
Efficiency of water heater	•		•		•	80.3	(216)
(217)m= 87.85 87.63 87.17 86.16 84.13	80.3 80.3	80.3 80.3	86	87.35	87.94		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							
	82.19 174.55	194.58 196.73	209.16	218.17	232.4]	
	<u>'</u>	Total = Sum	(219a) ₁₁₂ =			2475.18	(219)
Annual totals kWh/year						kWh/year	_ ¬
Space heating fuel used, main system 1						3814.81	_
Water heating fuel used						2475.18	╛
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						408.83	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)	(237b) =				6773.82	(338)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP					
	Energy kWh/year	Emission factor kg CO2/kWh			Emissions kg CO2/yea		
Space heating (main system 1)	(211) x		0.2	16	=	824	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	534.64	(264)
Space and water heating	(004) + (000)	. (202) . (204)					٦ ٦,,,,,,,
Opace and water neating	(261) + (262)	+ (263) + (264) =				1358.64	(265)
Electricity for pumps, fans and electric keep-hot	(261) + (262) (231) x	+ (263) + (264) =	0.5	19	=	1358.64 38.93	(267)

Electricity for lighting (232) x 0.519 = 212.18 (268)

Total CO2, kg/year sum of (265)...(271) = 1609.75 (272)

TER = 17.55 (273)