Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 Printed on 26 August 2021 at 08:51:51

Project Information:

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

Dwelling Details:

NEW DWELLING AS BUILT

Total Floor Area: 97.06m²

Site Reference: Albany Farm

Plot Reference: Plot 047

Address: 56 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) 17.78 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.68 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.2 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 4.36
Maximum 10.0

4 Heating efficiency

Main Heating system: Database: (rev 481, 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	nostat and TRVs	OK
Hot water controls:	No cylinder thermostat		
Dailes interleals	No cylinder		OV
Boiler interlock: Low energy lights	Yes		ОК
	ith law anargy fittings	100.0%	
Percentage of fixed lights w Minimum	itti low-energy littings	75.0%	ОК
Mechanical ventilation		73.070	OK
Continuous extract system ((docontrolicod)		
Specific fan power:	(decentralised)	0.16 0.18	
Maximum		0.7	ок
Summertime temperature			
Overheating risk (South Eng	aland):	Slight	ОК
sed on:	· · · · · · · · · · · · · · · · · · ·		
Overshading:		Very Little	
Windows facing: North East		5m²	
Windows facing: South Wes	st	8.52m²	
Windows facing: South Eas	t	1.42m²	
Ventilation rate:		4.00	
Blinds/curtains:		None	
Key features			
Roofs U-value		0.11 W/m²K	
Party Walls U-value		0 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

		User Details:			
Assessor Name: Software Name:	Ben Tunningley Stroma FSAP 2012	Stroma Nu Software V		RO027495 rsion: 1.0.5.41	
		roperty Address: Plot (
Address :	56 Buttercup Road , Bishop	s Waltham, SOUTHAN	MPTON, SO32 1RJ		
Overall dwelling dime	ensions:	A roo(m²)	Av. Hojaht/m)	Valuma/m3	
Ground floor		Area(m²) 48.53 (1a) x	Av. Height(m) 2.4 (2a)	Volume(m³) = 116.47	(3a)
First floor					(3b)
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	48.53 (1b) x	2.67 (2b)	= 129.58	(30)
Total floor area TFA = (1)	a)+(1b)+(1c)+(1d)+(1e)+(1r	1) 97.06 (4)			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+(3n)	= 246.05	(5)
2. Ventilation rate:					
	main secondar heating heating	ry 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	ins		0 x 10 =	0	(7a)
Number of passive vents	;		0 x 10 =	0	(7b)
Number of flueless gas fi	ires		0 x 40 =	0	(7c)
					()
			Ai	r changes per hour	•
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$	7a)+(7b)+(7c) =	0 ÷ (5) =	= 0	(8)
If a pressurisation test has b	peen carried out or is intended, procee			0	(8)
If a pressurisation test has b Number of storeys in the	peen carried out or is intended, procee		e from (9) to (16)	0	(9)
If a pressurisation test has be Number of storeys in the Additional infiltration	neen carried out or is intended, procee the dwelling (ns)	d to (17), otherwise continue	e from (9) to (16) [(9)-1]x0.	1 = 0	(9) (10)
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0	neen carried out or is intended, procee the dwelling (ns) 1.25 for steel or timber frame or	d to (17), otherwise continue	e from (9) to (16) [(9)-1]x0. struction	1 = 0	(9)
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0	neen carried out or is intended, procee the dwelling (ns) .25 for steel or timber frame or resent, use the value corresponding to	d to (17), otherwise continue	e from (9) to (16) [(9)-1]x0. struction	1 = 0	(9) (10)
If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: 0 if both types of wall are pure deducting areas of opening of the Number of Suspended wooden for Suspended wooden for the Number of Suspended wooden for the Number of Suspended wooden for the Number of Suspended wooden for	neen carried out or is intended, procee the dwelling (ns) 25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	d to (17), otherwise continue 0.35 for masonry cons the greater wall area (after	e from (9) to (16) [(9)-1]x0. struction	1 = 0 0	(9) (10)
If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: 0 if both types of wall are prededucting areas of opening. If suspended wooden for the su	neen carried out or is intended, procee the dwelling (ns) 25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0	d to (17), otherwise continue 0.35 for masonry cons the greater wall area (after	e from (9) to (16) [(9)-1]x0. struction	1 = 0 0 0	(9) (10) (11) (12) (13)
If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: One of both types of wall are pure deducting areas of opening of the suspended wooden of the If no draught lobby, energial in the Percentage of windows.	neen carried out or is intended, procee the dwelling (ns) 25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	to (17), otherwise continued to (17), otherwise continued to 0.35 for masonry constitution of the greater wall area (after 1.1 (sealed), else enter	e from (9) to (16) [(9)-1]x0. struction	1 = 0 0 0	(9) (10) (11) (12) (13) (14)
If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: One of both types of wall are producting areas of opening of the suspended wooden of the following areas of windows. Window infiltration.	neen carried out or is intended, procee the dwelling (ns) 25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0	to (17), otherwise continues 0.35 for masonry constitute of the greater wall area (after 1.1 (sealed), else enter	e from (9) to (16) [(9)-1]x0. struction 0 ÷ 100] =	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(9) (10) (11) (12) (13) (14) (15)
If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: One of the both types of wall are producting areas of opening of the suspended wooden for the following of the precentage of windows: Window infiltration.	neen carried out or is intended, procee the dwelling (ns) 1.25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped	to (17), otherwise continues 0.35 for masonry constitute greater wall area (after 1.1 (sealed), else enter 0.25 - [0.2 x (14) + (8) + (10) + (11)	$[(9)-1] \times 0.$ Exercision $[(9)-1] \times 0.$ $[(9)-1] $	1 = 0 0 0 0 0	(9) (10) (11) (12) (13) (14) (15) (16)
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If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: One of both types of wall are prededucting areas of opening of the suspended wooden of the	neen carried out or is intended, procee the dwelling (ns) 2.25 for steel or timber frame or resent, use the value corresponding to ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped q50, expressed in cubic metre lity value, then (18) = [(17) ÷ 20]+(18) if a pressurisation test has been dored	of to (17), otherwise continued to (17), otherwise continued to (17), otherwise continued to (17), otherwise masonry constitution of the greater wall area (after 1.1 (sealed), else enter 1.1 (sealed), else enter 1.2 (sealed), else enter 1.2 (sealed), else enter 1.3 (sealed), else enter 1.4 (sealed), else enter 1.5 (seal	[(9)-1]x0. [(9)-1]x0. struction 0 ÷ 100] = - (12) + (13) + (15) = metre of envelope area ity is being used ((19)] =	0 0 0 0 0 0 0 0 0 4.3600001335144 0.22	(9) (10) (11) (12) (13) (14) (15) (16) (17) (18)
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If a pressurisation test has be Number of storeys in the Additional infiltration. Structural infiltration: One of both types of wall are producting areas of opening. If suspended wooden for the su	neen carried out or is intended, procee the dwelling (ns) 1.25 for steel or timber frame or resent, use the value corresponding to the ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped 1.25 for steel or timber frame or resent, use the value corresponding to the ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped 1.25 for steel or timber frame or resent, use the value corresponding to the ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped 1.26 for steel or timber frame or resent, use the value corresponding to the ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0 s and doors draught stripped 1.27 floor, expressed in cubic metre of the ngs	of to (17), otherwise continued to (17), otherwise continued to (17), otherwise continued to (17), otherwise masonry constitutes the greater wall area (after a constitute of the greater wall area (after a constitute of (18) + (10) + (11) + (11) + (11) + (11) + (12) + (13) + (14) + (14) + (15) + (15) + (16) +	[(9)-1]x0. [(9)-1]x0. struction 0 ÷ 100] = - (12) + (13) + (15) = metre of envelope area ity is being used ((19)] = =	0 0 0 0 0 0 0 0 0 4.3600001335144 0.22	(9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(22)m=

Wind Factor (2	220\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	
. ,		<u> </u>	<u> </u>		ļ							1
Adjusted infiltra		<u> </u>		1		i ´	`´	ì		0.04		I
0.24 Calculate effec	0.23 Ctive air	0.23 change i	0.2 rate for t	0.2 he appli	0.18 cable ca	0.18 ise	0.17	0.19	0.2	0.21	0.22	
If mechanica	al ventila	ition:									[0.5 (23a)
If exhaust air he	eat pump (using Appe	endix N, (2	(3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b	o) = (23a)			0.5 (23b)
If balanced with	heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0 (23c)
a) If balance	d mecha		entilation	with he	·	ery (MV	HR) (24a	í `	 		1 – (23c)	·
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24a)
b) If balance				i		 	- ^ ` ` - 	ŕ	 			(0.41)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0	(24b)
c) If whole he if (22b)m				•	•				.5 × (23b)		
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)
d) If natural v				•					0.51			
(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	ld) in box	x (25)				,
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)
3. Heat losses	s and he	eat loss p	paramet	er:								
3. Heat losses	s and he Gros area	SS	oarameto Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	〈)	k-value kJ/m²-k	
	Gros	SS	Openin	gs						<) 		
ELEMENT	Gros	SS	Openin	gs	A ,r	m²	W/m2	2K	(W/I	<) 		K kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K = = =	(W/l 2.94	<) 		K kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	gs	A ,r	m ²	1.4 1.4	2K = = = = = = = = = = = = = = = = = = =	2.94 2.94	<) 		(26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Type	Gros area	SS	Openin	gs	A ,r 2.1 2.1 5	m ²	W/m2 1.4 1.4 /[1/(1.4)+	= = = 0.04] = = 0.04] =	2.94 2.94 6.63	<) 		(26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	SS	Openin	gs	A ,r 2.1 2.1 5 8.52	m ²	W/m2 1.4 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	= = = 0.04] = = 0.04] =	(W/F 2.94 2.94 6.63 11.3			(26) (26) (27) (27)
ELEMENT 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 5 8.52 1.42	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = 0.04] =	2.94 2.94 6.63 11.3		kJ/m²-ŀ	(26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area 1 2 2	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	eK = = = = = = = = = = = = = = = = = = =	2.94 2.94 6.63 11.3 1.88 5.3383		kJ/m²-ŀ	(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 2 3 101.:	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	x1 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = = = = = = = = = = = = = = = = = = =	(W/H 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	(26) (26) (27) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Roof	Gros area 1 2 2 3 101.:	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53	x1 x1 x1 3 x x5 x x5	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = = = = = = = = = = = = = = = = = = =	(W/H 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	(26) (26) (27) (27) (27) (27) (27) (28) (29) (29) (436.77) (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Walls Roof Total area of e	Gros area 1 2 3 101.: 48.5 lements	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53	x1 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	(26) (26) (27) (27) (27) (27) (27) (3639.75) (28) (4929) (29) (436.77) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of elements	Gros area	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.63 198.3	x1 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	(26) (26) (27) (27) (27) (27) (27) (3639.75) (28) (4929) (29) (436.77) (30) (31) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Toor Walls Roof Total area of elements Party wall Internal wall **	Gros area	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.63 498.3 42.63	x1 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	eK = = = = = = = = = = = = = = = = = = =	(W/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45	(26) (26) (27) (27) (27) (27) (27) (3639.75) (28) (4929) (29) (436.77) (30) (31) (31) (1918.35) (32) (395.28) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Toor Walls Roof Total area of elements Party wall Internal wall ** Internal wall **	Gros area	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53 198.3 42.63 43.92 132	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/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (29) (4929 (29) (436.77 (30) (31) (31) (1918.35 (32) (32c) (1188.043 (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Walls Roof Total area of elements Party wall Internal wall ** Internal wall **	Gros area 1 1 2 2 3 101.:	ss (m²)	Openin m	gs ₁ 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 43.92 132 39.17	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/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31) (31) (1918.35 (32) (395.28 (32c) (1188.043 (32c) (2937.6 (32c)
ELEMENT Doors Type 1 Doors Type 2 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 3 101.: 48.5 Iements	29 33 , m ²	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53 198.3 42.63 43.92 132 39.17 47.96 47.96 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 = = = = = = = = = = = = = = = = = = =	(W/N 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 75 18	(26) (26) (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (31) (31) (1918.35 (32) (32) (395.28 (32c) (1188.043 (32c) (2937.6 (32c) (32d) (431.64 (32e)

Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16739.71	(34)
Thermal mass	,	,	P = Cm ÷	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			172.47	(35)
For design asses	sments wh	ere the de	tails of the	,			ecisely the	` '		TMP in Ta	able 1f	172.47	(00)
can be used inste				مدام مدادها	ايناممم	,							7(00)
Thermal bridg	•	•			•	`						10.63	(36)
if details of therm Total fabric he	0 0	are not kn	own (36) =	= 0.05 X (3	1)			(33) +	(36) =			66.71	(37)
Ventilation he	at loss ca	alculated	l monthly	V				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6		(38)
Heat transfer	coefficier	nt, W/K		•				(39)m	= (37) + (3	38)m		ı	
(39)m= 107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31		
Heat loss para	ameter (H	HLP), W/	m²K						Average = = (39)m ÷		12 /12=	107.31	(39)
(40)m= 1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11		
Number of da	vs in mor	nth (Tabl	le 1a)		!			,	Average =	Sum(40) ₁ .	12 /12=	1.11	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		ļ		<u> </u>	<u> </u>	ļ						1	
4. Water hea	ating ener	rgy requi	rement:								kWh/y	ear:	
	_												
Assumed occ	unancy I	N									74	l	(42)
Assumed occ if TFA > 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (⁻	ΓFA -13.		71		(42)
	.9, N = 1 .9, N = 1	+ 1.76 x							ΓFA -13.	9)] I	(42)
if TFA > 13. if TFA £ 13.	.9, N = 1 .9, N = 1 ge hot wa yal 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)	.58]	, ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125	.9, N = 1 .9, N = 1 ge hot wa yal average	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is thot and co	erage = designed t	(25 x N) o achieve	+ 36 a water us	se target o	9)	.58]	, ,
if TFA > 13 if TFA £ 13. Annual average Reduce the annual	.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 s day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 98			, ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 98	.58		, ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 108.43	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 92.66	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) o achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sur	9) Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	, ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 92.66	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) o achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sur	9) Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 108.43	9, N = 1 9, N = 1 ge hot wa lal average 5 litres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 92.66	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) o achieve Aug (43) 92.66	+ 36 a water us Sep 96.61 0 kWh/mor 112.73	Oct 100.55 Total = Sur 131.38	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 123. Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8	9, N = 1 9, N = 1 ge hot was all average 5 litres per proper litres per proper litres per litres pe	+ 1.76 x ater usag hot water person per Mar r day for ea 100.55 used - calc 145.13	ge in litre usage by a day (all w Apr ach month 96.61 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08	(25 x N) to achieve Aug (43) 92.66 97m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mor 112.73	Oct 100.55 Total = Suith (see Ta	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73	1182.92	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8	9, N = 1 9, N = 1 ge hot water sper properties per	+ 1.76 x ater usag hot water person per Mar day for ea 100.55 used - calc 145.13	Apr Apr ach month 96.61 126.53	es per da 5% if the orater use, I May $Vd,m = fa$ 92.66 $onthly = 4$.	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76	erage = designed to ld) Jul Table 1c x 88.72 m x nm x D 97.08 enter 0 in	(25 x N) to achieve Aug (43) 92.66 97m / 3600 111.4 boxes (46)	+ 36 a water us Sep 96.61 0 kWh/mor 112.73 1 to (61)	Oct 100.55 Total = Sun th (see Ta 131.38	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ =	.58 Dec 108.43 c, 1d) 155.73		(43) (44) (45)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 123. Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8	9, N = 1 9, N = 1 ge hot was all average 5 litres per proper litres per proper litres per litres pe	+ 1.76 x ater usag hot water person per Mar r day for ea 100.55 used - calc 145.13	ge in litre usage by a day (all w Apr ach month 96.61 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08	(25 x N) to achieve Aug (43) 92.66 97m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mor 112.73	Oct 100.55 Total = Sur 131.38	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 123. Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous (46)m= 24.12	9, N = 1 9, N = 1 ge hot water sper production of hot water heating the little control of the little control of hot water heating the loss:	the trust of trust	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (no	es per da 5% if the of the fater use, I May Vd,m = fat 92.66	ay Vd,av lwelling is not and co Jun ctor from 1 88.72 190 x Vd,r 104.76	erage = designed to Id) Jul Table 1c x 88.72 m x nm x D 97.08 enter 0 in 14.56	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91	Oct 100.55 Total = Sunth (see Tall 131.38) Total = Sunth 19.71	9) Nov 104.49 m(44) ₁₁₂ = 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73		(43) (44) (45)
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if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous (46)m= 24.12 Water storage Storage volume If community of the co	9, N = 1 9, N = 1 ge hot water ser per per per per per per per per per p	the table and the table and the table and tabl	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not 18.98 ag any so	es per da 5% if the of rater use, I May Vd,m = fa 92.66 onthly = 4. 121.41 o hot water 18.21 olar or W velling, e	ay Vd,av welling is not and co Jun ctor from 1 88.72 190 x Vd,r 104.76 r storage), 15.71 /WHRS	erage = designed to ld) Jul Table 1c x 88.72 97.08 enter 0 in 14.56 storage	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91 ame ves	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth (see Tail 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous (46)m= 24.12 Water storage Storage volumed If community of the water usage if making the storage water	9, N = 1 9, N = 1 ge hot water set of litres per	+ 1.76 x ater usag hot water person per Mar 100.55 used - calc 145.13 ang at point 21.77 includin and no ta hot water	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not 18.98 ag any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fact 92.66 onthly = 4. 121.41 o hot water 18.21 olar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 15.71 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 88.72 97.08 enter 0 in 14.56 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91 ame ves	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth (see Tail 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46) (47)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous of (46)m= 24.12 Water storage Storage volume If community of the water storage a) If manuface and If manuface and If manuface and If manuface and If TFA £ 13. If TFA ≥ 12.	9, N = 1 9, N = 1 ge hot water set in litres per	+ 1.76 x ater usage hot water person per Mar 100.55 used - calce 145.13 ang at point 21.77 includination to talce hot water seclared less that water seclared less than water seclared less	Apr Apr Ach month 96.61 126.53 of use (not) 18.98 ag any so ank in dwar (this in oss factors)	es per da 5% if the of water use, I May Vd,m = fact 92.66 onthly = 4. 121.41 o hot water 18.21 olar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 15.71 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 88.72 97.08 enter 0 in 14.56 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91 ame ves	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth (see Tail 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46) (47)
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if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous of (46)m= 24.12 Water storage Storage volume If community of the water storage a) If manuface and If manuface and If manuface and If manuface and If TFA £ 13. If TFA ≥ 12.	9, N = 1 9, N = 1 ge hot water set in litres per	ater usage hot water person per Mar 100.55 used - calc 145.13 ang at point 21.77 including and no tale hot water eclared lem Table storage	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not) 18.98 ag any so ank in dw er (this in) oss facto 2b , kWh/ye	es per da 5% if the orater use, I May $Vd,m = fa$ 92.66	ay Vd,av Iwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 storage), 15.71 IWHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 88.72 97.08 enter 0 in 14.56 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91 ame vess ers) ente	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth (see Tail 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46) (47)

	ater stora	•			e 2 (kW	h/litre/da	ıy)					0		(51)
	munity h	•		on 4.3									•	
	ne factor erature fa			2h							-	0		(52)
								(47) (54)	(50) (F0)		0		(53)
_	y lost fro (50) or (_	, KVVN/ye	ear			(47) x (51)	X (52) X (53) =		0		(54) (55)
	storage	, ,	•	for each	month			((56)m = (55) v (41)	m		U		(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	0 m Append	iv H	(56)
				- · ·	1		1							(EZ)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	ry circuit	`	,									0		(58)
	ry circuit				,	•	` '	, ,			a4a4\			
(mo (59)m=	dified by	0	om rab	le H5 lf t	nere is s	olar wat	er neatii	ng and a	cylinde	r tnermo	stat)	0		(59)
									0	0	U	U		(55)
	i loss cal			·	<u> </u>	,							1	4
(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								<u> </u>		<u> </u>		<u> </u>	(59)m + (61)m	
(62)m=	174.56	153.07	158.89	139.84	135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		(62)
	HW input o									r contributi	on to wate	er heating)		
•	dditional			1	1		·		•				Ī	(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 wa			<u> </u>	<u> </u>		<u> </u>			1			ı	
(64)m=	174.56	153.07	158.89	139.84	135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49] _{(0,0}
										ater heater			1712.97	(64)
-	gains from			i	i		``			-`` /]	(05)
(65)m=		49.87	51.69	45.4	43.81	38.16	35.72	40.48	40.81	47.12	51.01	55.22		(65)
	ude (57)r			` ,		ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain												I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	162.64	162.64												
			162.64	162.64	162.64	162.64	162.64	162.64	162.64	162.64	162.64	162.64		(66)
Ū	ng gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Γable 5	162.64				
Lightin (67)m=	<u> </u>			<u> </u>	<u> </u>		<u> </u>				162.64 54.94	162.64 58.57		(66) (67)
(67)m=	56.99	(calcula 50.61 ins (calc	ted in Ap 41.16 ulated in	opendix 31.16 Append	L, equat 23.29 dix L, eq	ion L9 o 19.67 uation L	r L9a), a 21.25 13 or L1	lso see 27.62	7able 5 37.07	162.64 47.07				
(67)m=	56.99	(calcula 50.61	ted in Ap 41.16	opendix 31.16	L, equat 23.29	ion L9 o	r L9a), a	lso see 27.62	7able 5 37.07	162.64 47.07				
(67)m= Applia (68)m=	56.99	(calcula 50.61 ins (calc 379.25	ted in Ap 41.16 ulated in 369.43	31.16 Appendix 348.54	23.29 dix L, eq	19.67 uation L	r L9a), a 21.25 13 or L1 280.81	27.62 3a), also	Table 5 37.07 see Ta 286.73	162.64 47.07 ble 5 307.62	54.94	58.57		(67)
(67)m= Applia (68)m=	56.99 Inces gai 375.35 Ing gains	(calcula 50.61 ins (calc 379.25	ted in Ap 41.16 ulated in 369.43	31.16 Appendix 348.54	23.29 dix L, eq	19.67 uation L	r L9a), a 21.25 13 or L1 280.81	27.62 3a), also	Table 5 37.07 see Ta 286.73	162.64 47.07 ble 5 307.62	54.94	58.57		(67)
(67)m= Applia (68)m= Cookii (69)m=	56.99 Inces gai 375.35 Ing gains	(calcula 50.61 ins (calc 379.25 (calcula 53.97	ted in Ap 41.16 ulated in 369.43 ted in A 53.97	31.16 Appendix 348.54 ppendix 53.97	23.29 dix L, eq 322.16 L, equat	19.67 uation L 297.37	r L9a), a 21.25 13 or L1 280.81 or L15a)	27.62 3a), also 276.91	Table 5 37.07 see Ta 286.73 ee Table	162.64 47.07 ble 5 307.62	54.94	58.57 358.79		(67) (68)
(67)m= Applia (68)m= Cookii (69)m=	56.99 Inces gai 375.35 Ing gains 53.97 Is and far	(calcula 50.61 ins (calc 379.25 (calcula 53.97	ted in Ap 41.16 ulated in 369.43 ted in A 53.97	31.16 Appendix 348.54 ppendix 53.97	23.29 dix L, eq 322.16 L, equat	19.67 uation L 297.37	r L9a), a 21.25 13 or L1 280.81 or L15a)	27.62 3a), also 276.91	Table 5 37.07 see Ta 286.73 ee Table	162.64 47.07 ble 5 307.62	54.94	58.57 358.79		(67) (68)
(67)m= Applia (68)m= Cookii (69)m= Pumps (70)m=	56.99 Inces gai 375.35 Ing gains 53.97 Is and far	(calcula 50.61 ins (calcula 379.25 (calcula 53.97 ins gains	ted in Ap 41.16 ulated in 369.43 ted in Ap 53.97 (Table 5	31.16 Appendix 348.54 ppendix 53.97 5a)	23.29 dix L, eq 322.16 L, equat 53.97	19.67 uation L 297.37 ion L15 53.97	r L9a), a 21.25 13 or L1 280.81 or L15a) 53.97	27.62 27.62 3a), also 276.91 , also se 53.97	Table 5 37.07 see Ta 286.73 ee Table 53.97	162.64 47.07 ble 5 307.62 55 53.97	54.94 334 53.97	58.57 358.79 53.97		(67) (68) (69)
(67)m= Applia (68)m= Cookii (69)m= Pumps (70)m= Losse	56.99 Inces gai 375.35 Ing gains 53.97 Is and far	(calcula 50.61 ins (calcula 379.25 (calcula 53.97 ns gains 3	ted in Ap 41.16 ulated in 369.43 ted in Ap 53.97 (Table 5	31.16 Appendix 348.54 ppendix 53.97 5a)	23.29 dix L, eq 322.16 L, equat 53.97	19.67 uation L 297.37 ion L15 53.97	r L9a), a 21.25 13 or L1 280.81 or L15a) 53.97	27.62 27.62 3a), also 276.91 , also se 53.97	Table 5 37.07 see Ta 286.73 ee Table 53.97	162.64 47.07 ble 5 307.62 55 53.97	54.94 334 53.97	58.57 358.79 53.97		(67) (68) (69)
(67)m= Applia (68)m= Cookii (69)m= Pumps (70)m= Losse (71)m=	56.99 Inces gai 375.35 Ing gains 53.97 Is and far 3 Is e.g. ev	(calcula 50.61 ins (calcula 379.25 (calcula 53.97 ns gains 3 aporatic	ted in Ap 41.16 ulated in 369.43 ted in Ap 53.97 (Table 5 3 in (negat	31.16 Appendix 348.54 Appendix 53.97 Sa) 3 tive valu	L, equat 23.29 dix L, eq 322.16 L, equat 53.97 3 es) (Tab	19.67 uation L 297.37 ion L15 53.97 3 le 5)	r L9a), a 21.25 13 or L1 280.81 or L15a) 53.97	27.62 3a), also 276.91 , also se 53.97	Table 5 37.07 see Ta 286.73 ee Table 53.97	162.64 47.07 ble 5 307.62 5 53.97	54.94 334 53.97	58.57 358.79 53.97		(67) (68) (69) (70)
(67)m= Applia (68)m= Cookii (69)m= Pumps (70)m= Losse (71)m=	56.99 Inces gai 375.35 Ing gains 53.97 Is and far 3 Is e.g. ev -108.42	(calcula 50.61 ins (calcula 379.25 (calcula 53.97 ns gains 3 aporatic	ted in Ap 41.16 ulated in 369.43 ted in Ap 53.97 (Table 5 3 in (negat	31.16 Appendix 348.54 ppendix 53.97 5a) 3 tive valu	L, equat 23.29 dix L, eq 322.16 L, equat 53.97 3 es) (Tab	19.67 uation L 297.37 ion L15 53.97 3 le 5)	r L9a), a 21.25 13 or L1 280.81 or L15a) 53.97	27.62 3a), also 276.91 , also se 53.97	Table 5 37.07 see Ta 286.73 ee Table 53.97	162.64 47.07 ble 5 307.62 5 53.97	54.94 334 53.97	58.57 358.79 53.97		(67) (68) (69) (70)

Total internal	gains =				((66)m + (67)m	n + (68))m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m= 620.01	615.26	591.26	553.94	515.52	481.2	2 461.25	470.	13 491.67	529.2	2 570.98	602.77		(73)
6. Solar gains	S:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and ass	ociated equa	itions to	o convert to t	ne applic	able orientat	ion.		
Orientation: A	Access F Fable 6d		Area m²			lux able 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	1	x		. 1	x	11.28] _× [0.45	×	1.11		25.39	(75)
Northeast 0.9x	<u>'</u> 1	x			x	22.97] ^	0.45	= ^	1.11	_	51.68	(75)
Northeast _{0.9x}	<u>'</u> 1	x			x	41.38]	0.45	i x	1.11	_	93.1	(75)
Northeast _{0.9x}	<u>'</u> 1	x			x	67.96]	0.45		1.11	=	152.9	(75)
Northeast _{0.9x}	<u>·</u> 1	x			x	91.35]	0.45	×	1.11	= =	205.53	(75)
Northeast 0.9x	1	х	-	5	x	97.38) 	0.45	X	1.11		219.12	(75)
Northeast _{0.9x}	1	х		5	x	91.1	X	0.45	×	1.11		204.98	(75)
Northeast _{0.9x}	1	x		5	x	72.63	x	0.45	x	1.11	-	163.41	(75)
Northeast _{0.9x}	1	х		5	x	50.42	x	0.45	x	1.11		113.45	(75)
Northeast _{0.9x}	1	х	Ę	5	x	28.07	x	0.45	x	1.11	=	63.15	(75)
Northeast _{0.9x}	1	х		5	x	14.2	x	0.45	x	1.11		31.94	(75)
Northeast _{0.9x}	1	х		5	x	9.21	x	0.45	X	1.11	_	20.73	(75)
Southeast _{0.9x}	1	х	1.4	42	x	36.79	x	0.45	X	1.11	=	23.51	(77)
Southeast 0.9x	1	х	1.4	42	x	62.67	x	0.45	X	1.11	=	40.05	(77)
Southeast _{0.9x}	1	х	1.4	42	x	85.75	x	0.45	X	1.11	=	54.8	(77)
Southeast 0.9x	1	X	1.4	42	x	106.25	x	0.45	X	1.11	=	67.89	(77)
Southeast 0.9x	1	X	1.4	42	x	119.01	x	0.45	X	1.11		76.05	(77)
Southeast 0.9x	1	X	1.4	42	x	118.15	x	0.45	X	1.11	=	75.5	(77)
Southeast 0.9x	1	X	1.4	42	x	113.91	x	0.45	X	1.11	=	72.79	(77)
Southeast 0.9x	1	X	1.4	42	x	104.39	x	0.45	X	1.11	=	66.71	(77)
Southeast 0.9x	1	X	1.4	42	X	92.85	x	0.45	X	1.11	=	59.33	(77)
Southeast 0.9x	1	X	1.4	42	x	69.27	x	0.45	X	1.11	=	44.26	(77)
Southeast 0.9x	1	X	1.4	42	x	44.07	x	0.45	X	1.11	=	28.16	(77)
Southeast 0.9x	1	Х	1.4	42	x	31.49	x	0.45	X	1.11	=	20.12	(77)
Southwest _{0.9x}	1	X	8.8	52	x	36.79] [0.45	X	1.11		141.07	(79)
Southwest _{0.9x}	1	Х	8.8	52	x	62.67] [0.45	х	1.11	=	240.29	(79)
Southwest _{0.9x}	1	X	8.8	52	x	85.75] [0.45	X	1.11	=	328.78	(79)
Southwest _{0.9x}	1	X	8.8	52	x	106.25] [0.45	X	1.11	=	407.37	(79)
Southwest _{0.9x}	1	X	8.8	52	x	119.01] [0.45	X	1.11	=	456.29	(79)
Southwest _{0.9x}	1	X	8.8	52	x	118.15] [0.45	X	1.11	=	452.99	(79)
Southwest _{0.9x}	1	х	8.5	52	x	113.91] [0.45	x	1.11	=	436.73	(79)
Southwest _{0.9x}	1	Х	8.5	52	x	104.39] [0.45	X	1.11	=	400.23	(79)
Southwest _{0.9x}	1	X	8.8	52	x	92.85	[0.45	X	1.11		355.99	(79)
Southwest _{0.9x}	1	Х	8.8	52	х	69.27] [0.45	X	1.11	=	265.57	(79)

Southwest _{0.9x}	1	х	8.5	52	x Z	14.07		0.45	x	1.11	=	168.97	(79)
Southwest _{0.9x}	1	Х	8.5	52	x (31.49		0.45	x	1.11	=	120.72	(79)
_													_
Solar gains in						i	<u> </u>	um(74)m .	`	1		1	
(83)m= 189.97	332.01	476.67	628.16	737.86	747.6	714.49	630.35	528.77	372.99	229.07	161.58		(83)
Total gains – i							l			T	l	1	(0.1)
(84)m= 809.98	947.27	1067.94	1182.1	1253.38	1228.82	1175.74	1100.48	1020.44	902.2	800.05	764.34]	(84)
7. Mean inter	nal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for I			(see Ta	able 9a)			1			1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		<i>(</i>)
(86)m= 0.97	0.95	0.91	0.83	0.7	0.53	0.39	0.44	0.65	0.87	0.96	0.98		(86)
Mean interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m= 19.7	19.93	20.25	20.59	20.84	20.96	20.99	20.98	20.9	20.57	20.06	19.63		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m= 20	20	20	20	20	20	20	20	20	20	20	20		(88)
Utilisation fac	ctor for g	ains for i	rest of d	welling,	h2,m (se	ee Table	9a)	-	-		-		
(89)m= 0.97	0.94	0.9	0.8	0.64	0.46	0.31	0.35	0.58	0.84	0.95	0.97	1	(89)
Mean interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to	r in Tabl	e 9c)	!	ļ.	ı	
(90)m= 18.83	19.06	19.36	19.68	19.89	19.97	19.99	19.99	19.94	19.67	19.18	18.77	1	(90)
	<u> </u>	!			<u> </u>	<u> </u>	<u> </u>	f	L LA = Livin	ng area ÷ (4	4) =	0.16	(91)
Mean interna	l temner	atura (fo	r the wh	ole dwe	lling) – f	ΙΔ ν Τ1	⊥ /1 _ fl	Δ) ~ T2					
(92)m= 18.97	19.2	19.5	19.82	20.04	20.13	20.15	20.15	20.1	19.82	19.33	18.91]	(92)
Apply adjustr	nent to t	he mean	interna	L I temper	ature fro	m Table	4e, whe	ere appro	L opriate	1		J	
(93)m= 18.82	19.05	19.35	19.67	19.89	19.98	20	20	19.95	19.67	19.18	18.76	1	(93)
8. Space hea	iting requ	uirement				•				•			
Set Ti to the					ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-cald	culate	
the utilisation										<u> </u>		1	
Jan Utilisation fac	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.96	0.93	0.88	0.79	0.64	0.46	0.31	0.35	0.58	0.82	0.94	0.97	1	(94)
Useful gains,	Į			l	0.10	1 0.01	0.00	0.00	0.02	1 0.01	0.07	J	(-)
(95)m= 778.15	884.09	943.06	929.79	798.83	561.08	362.69	382.24	587.4	743.66	748.22	739.35]	(95)
Monthly aver	age exte	rnal tem	perature	e from Ta	able 8			<u> </u>			ļ.	ı	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]		•	' -	
(97)m= 1558.33	1518.26	1379.36	1156.21	879.07	577.76	365.37	386.55	627.63	972.76	1295.87	1562		(97)
Space heating	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	ī	1	
(98)m= 580.46	426.17	324.61	163.03	59.7	0	0	0	0	170.46	394.31	612.05		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2730.76	(98)
Space heating	g require	ement in	kWh/m²	² /year								28.13	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heati	ng:												
Fraction of sp	oace hea	at from se	econdar	y/supple	mentary	system						0	(201)

Fraction of space heat f	from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating	g from r	main sys	stem 1			(204) = (20	02) x [1 –	(203)] =			1	(204)
Efficiency of main space	e heati	ng syste	em 1								90.5	(206)
Efficiency of secondary	/supple	ementar	y heating	g system	ı, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirem	<u>`</u> _							470.40			1	
	324.61	163.03	59.7	0	0	0	0	170.46	394.31	612.05]	(5.4.1)
$(211)m = \{[(98)m \times (204)] $ $641.39 470.9 3$)] } x 10 358.68	00 ÷ (20 180.14	65.97	0	0	0	0	188.35	435.7	676.3	1	(211)
041.33 470.3	330.00	100.14	03.91	U	0			ar) =Sum(2			3017.42	(211)
Space heating fuel (sec	condary	/) kWh/	month					, ,	7 15, 101.	2	0017.42	
$= \{[(98) \text{m x } (201)]\} \text{ x } 100$	•	•										
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	I (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water heating	, ,		,									
Output from water heate	r (calcu	<u>139.84</u>	oove) 135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49	1	
Efficiency of water heate	er								<u> </u>		87.3	(216)
	89.42	88.99	88.26	87.3	87.3	87.3	87.3	89	89.57	89.79		(217)
Fuel for water heating, k	Wh/mo	nth									4	
(219) m = (64) m x $100 \div (219)$ m= 194.52 170.77 1	: (217)r 177.68	m 157.13	153.15	135.25	126.96	143.36	144.38	163.07	174.98	188.77	1	
(219)111-1194.32 170.77	177.00	137.13	100.10	100.20	120.90		I = Sum(2		174.90	100.77	1930.02	(219)
Annual totals									Wh/yea	r	kWh/year	
Space heating fuel used	, main :	system	1						•		3017.42	
Water heating fuel used											1930.02	Ī
Electricity for pumps, fan	ns and e	electric	keep-hot	t								_
mechanical ventilation -	- balan	ced, ext	ract or p	ositive ir	nput fror	n outside	9			64.97	1	(230a)
central heating pump:			·							30]	(230c)
boiler with a fan-assiste	ad flua									45]]	(230e)
Total electricity for the at		\\\h\\\	-			sum	of (230a)	(230g) =		45	400.07	_
•	oove, k	wii/yea	I			Sum	or (200a).	(2309) =			139.97	(231)
Electricity for lighting											402.56	(232)
Electricity generated by I	PVs										-481.92	(233)
Total delivered energy for	or all us	ses (211)(221)	+ (231)	+ (232).	(237b)	=				5008.05	(338)
10a. Fuel costs - individ	dual he	ating sy	stems:									
				Fu	el			Fuel P	rice		Fuel Cost	
					/h/year			(Table			£/year	
Space heating - main sys	stem 1			(211) x			3.4	8	x 0.01 =	105.01	(240)
				(046	n)					x 0.01 =		_ 7 ₍₂₄₄₎
Space heating - main sys	stem 2			(213	3) x			0		X 0.01 -	0	(241)
Space heating - main sys					5) X 5) X			13.		x 0.01 =	0	$\int_{(242)}^{(241)}$

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	67.16 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	18.46 (249)
(if off-peak tariff, list each of (230a) to (230g) sep	parately as applicable and app	004	
Energy for lighting	(202)	13.19 X 0.01 =	53.1 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-63.57 (252)
Appendix Q items: repeat lines (253) and (254) a			(055)
Total energy cost (245)(2 11a. SAP rating - individual heating systems	47) + (250)(254) =		300.17 (255)
Energy cost deflator (Table 12)	250)] - ((4) - 45 0]		0.42 (256)
=1.0.g)	256)] ÷ [(4) + 45.0] =		0.89 (257)
SAP rating (Section 12)	no including micro CUD		87.62 (258)
12a. CO2 emissions – Individual heating syster	ns including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	651.76 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	416.88 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1068.65 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	72.64 (267)
Electricity for lighting	(232) x	0.519 =	208.93 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year	sum	n of (265)(271) =	1100.1 (272)
CO2 emissions per m²	(27)	2) ÷ (4) =	11.33 (273)
El 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	3681.25 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	2354.63 (264)
Space and water heating	(261) + (262) + (263) + (264) =		6035.88 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	429.7 (267)
Electricity for lighting	(232) x	0 =	1235.85 (268)
Energy saving/generation technologies Item 1		3.07 =	-1479.49 (269)

 'Total Primary Energy
 sum of (265)...(271) = 6221.94 (272)

 Primary energy kWh/m²/year
 $(272) \div (4) =$ 64.1 (273)

		User Details:				
Access to Name	Dan Tunais star			OTDO	007405	
Assessor Name:	Ben Tunningley Stroma FSAP 2012	Stroma Nur			027495 on: 1.0.5.41	
Software Name:		Software Veroperty Address: Plot 0		versic	л. т.о.э.4 г	
Address :	56 Buttercup Road , Bishops	<u> </u>		2 1		
1. Overall dwelling dime		s Waltham, 500 m Aw	F 10N , 3032 11	\ J		
The Cremain amounting aims	noiene.	Area(m²)	Av. Height(m)		Volume(m³)	
Ground floor		48.53 (1a) x	2.4	(2a) =	116.47	(3a)
First floor		48.53 (1b) x	2.67	(2b) =	129.58	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n	97.06 (4)				
Dwelling volume		(3a)+(3	(b)+(3c)+(3d)+(3e)+	(3n) =	246.05	(5)
2. Ventilation rate:						J
	main secondar heating heating	y other	total		m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x	40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x	20 =	0	(6b)
Number of intermittent far	ns		0 ×	10 =	0	(7a)
Number of passive vents			0 x	10 =	0	(7b)
Number of flueless gas fin	res		0 x	40 =	0	(7c)
		'			_	•
				Air ch	nanges per hou	
•	ys, flues and fans = (6a)+(6b)+(7 een carried out or is intended, proceed		0 from (0) to (16)	÷ (5) =	0	(8)
Number of storeys in the	•	tio (17), otherwise continue	110111 (9) 10 (10)		0	(9)
Additional infiltration	io amoning (rio)		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or	0.35 for masonry cons		, -	0	(11)
	resent, use the value corresponding to	•], ,
	loor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter 0)		0	(12)
If no draught lobby, ent	ter 0.05, else enter 0				0	(13)
Percentage of windows	and doors draught stripped				0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =		0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	s per hour per square r	metre of envelop	e area	4.3600001335144	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (8)$	3), otherwise $(18) = (16)$			0.22	(18)
Air permeability value applies	s if a pressurisation test has been don	e or a degree air permeabilit	y is being used			_
Number of sides sheltere	d	(-0)	44.535		2	(19)
Shelter factor		(20) = 1 - [0.075 x]			0.85	(20)
Infiltration rate incorporati		(21) = (18) x (20) =	=		0.19	(21)
Infiltration rate modified for		, , , , , , , , , , , , , , , , , , ,		_	1	
Jan Feb	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	e (allowi	na for st	nelter an	d wind s	:need) =	(21a) x	(22a)m				•
0.24	0.23	0.23	0.2	0.2	0.18	0.18	0.17	0.19	0.2	0.21	0.22]
Calculate effe		_	rate for t	he appli	cable ca	ise	<u> </u>		<u> </u>	<u> </u>	<u> </u>	l
If mechanic			on die N. (O) (00 -		((MEW - de-) (00-)			0.5 (23a)
If exhaust air h		•	,	, ,	,	•	,,	•)) = (23a)			0.5 (23b)
If balanced with		-	-	_					Oh)m ı (22h) [1 (22a)	0 (23c)
a) If balance (24a)m= 0		anicai ve	0	o with nea	0		nk) (248	$\frac{a)m = (2.1)}{10}$	2b)m + (230) x [$\frac{1-(230)}{1}$	(24a)
b) If balance				<u> </u>								(= 15)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole h	nouse ex	tract ven	tilation o	r positiv	re input v	ventilatio	on from (utside		<u> </u>	ļ	
,		< (23b), t			•				.5 × (23b	o)		
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)
d) If natural				•	•							
	1	en (24d)	· ` `	ŕ	<u> </u>	 		- 		Γ.	Τ ,	(24d)
(24d)m= 0	0	0	0	0	0	0	0	0 (25)	0	0	0	(24u)
Effective air	cnange 0.5	0.5	1ter (24a 0.5	0.5	0) or (24)	c) or (24	0.5	X (25) 1 0.5	0.5	0.5	0.5	(25)
(20)111- 0.0	0.0	0.0	0.0	0.0	0.0	0.0	1 0.0	1 0.0	1 0.0	1 0.0	0.0	(=0)
								•				
3. Heat losse		·			N 1 4 A				A 3/11			A V.I
3. Heat losse ELEMENT	es and he Gros area	SS	oarameto Openin m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-	
	Gros	SS	Openin	ıgs								
ELEMENT	Gros	SS	Openin	ıgs	A ,r	m²	W/m2	2K	(W/			K kJ/K
ELEMENT Doors Type 1	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K = =	(W/ 2.94			K kJ/K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	ıgs	A ,r	m ²	1.4 1.4	2K = = - 0.04] =	(W/ 2.94 2.94			K kJ/K (26) (26)
Doors Type 1 Doors Type 2 Windows Type	Gros area e 1 e 2	SS	Openin	ıgs	A ,r 2.1 2.1	m ²	W/m2 1.4 1.4 /[1/(1.4)+	2K = = = = -0.04] = -0.04] = = -0.04	(W/ 2.94 2.94 6.63			(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area e 1 e 2	SS	Openin	ıgs	A ,r 2.1 2.1 5 8.52	m ²	W/m2 1.4 1.4 (1/(1.4)+ /[1/(1.4)+	2K = = = = -0.04] = -0.04] = = -0.04	(W/ 2.94 2.94 6.63 11.3	K)		(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area e 1 e 2	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3	K)	kJ/m²-	K kJ/K (26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53	m ²	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383	K)	kJ/m²-\	(26) (26) (27) (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 3 101.	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	x x x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72	K)	kJ/m²-\	K kJ/K (26) (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof	Gros area e 1 e 2 e 3 101.	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53	x x1 x1 x1 3 x x5 x x5	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72	K)	kJ/m²-\	(26) (26) (27) (27) (27) (27) (27) (28) (29) (4929 (29) (436.77 (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of 6	Gros area e 1 e 2 e 3 101. 48.5	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53	x x x x x x x x x x x x x x x x x x x	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60	(26) (26) (27) (27) (27) (27) (27) (28) (29) (4929 (29) (436.77 (30) (31)
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	Gros area e 1 e 2 e 3 101. 48.5 elements	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.63 198.3	x x x x x x x x x x x x x x x x x x x	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60 9	(26) (26) (27) (27) (27) (27) (27) (27) (28) (29) (4929 (29) (436.77 (30) (31) (31)
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 **	Gros area e 1 e 2 e 3 101. 48.5	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.63 498.3 42.63	x x x1	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60 9 45	K kJ/K (26) (26) (27) (27) (27) (27) (27) (28) (4929 (29) (436.77 (30) (31) (31) (1918.35 (32) (395.28 (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 3 101. 48.5	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53 198.3 42.63 43.92 132	m ²	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60 9 45 9	(26) (26) (27) (27) (27) (27) (27) (3639.75) (28) (4929) (29) (436.77) (30) (31) (31) (1918.35) (32) (395.28) (32c) (1188.043) (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 **	Gros area e 1 e 2 e 3 101. 48.5	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 42.63 43.92 132 39.17	m ²	W/m ² 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60 9 45 9 9	(26) (26) (27) (27) (27) (27) (27) (27) (3639.75) (28) (4929) (29) (436.77) (30) (31) (31) (31) (31) (31) (31) (32) (395.28) (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 3 101. 48.5 elements	29 53 s, m ²	Openin m	igs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 48.53 498.3 42.63 43.92 132 39.17 47.96 47.96 alue calcul	x1 x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	2K = = -0.04 = -0.04 = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	75 60 9 45 9 75 18	(26) (26) (27) (27) (27) (27) (27) (27) (27) (28) (29) (31) (31) (31) (31) (31) (31) (31) (31

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

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

56.08

(33)

Heat capacit	v Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	16739.71	(34)
Thermal mas	•	` ,	P = Cm ÷	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =	, , ,	, ,	172.47	(35)
For design asse	•	`		,			ecisely the	• ,	. ,	TMP in Ta	able 1f	172.47	(00)
can be used ins	tead of a de	tailed calcı	ulation.										_
Thermal brid	•	,			•	K						10.63	(36)
if details of there Total fabric h		are not kn	own (36) =	= 0.05 x (3	1)			(22) 1	(36) =			00.74	7(27)
Ventilation h		alculatod	l monthly	A.				• •	$= 0.33 \times 0$	25)m v (5)		66.71	(37)
Jan	1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m= 40.6	-	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6		(38)
Heat transfer			.0.0	.0.0	10.0	1 .0.0	10.0		= (37) + (3		.0.0		(==)
(39)m= 107.3	_	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31	107.31]	
(00)									Average =			107.31	(39)
Heat loss pa	rameter (H	HLP), W/	m²K		_				= (39)m ÷				
(40)m= 1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11		_
Number of d	avs in mo	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.11	(40)
Jan	i 	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)
						Į.	Į.					J	
4. Water he	ating ene	rav requi	rement:								kWh/y	ear:	
	J											,	
Accumed oc	allo a ball												
Assumed oc if TFA > 1:			[1 - exp	(-0 0003	849 x (TF	FA -13 9	1211 + 0 (0013 x (ΓFA -13		71		(42)
if TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		71		(42)
if TFA > 13 if TFA £ 13 Annual avera	3.9, N = 1 3.9, N = 1 age hot wa	+ 1.76 x ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9) 98	.58]	(42)
if TFA > 13 if TFA £ 13	3.9, N = 1 3.9, N = 1 age hot wa aual average	+ 1.76 x ater usag	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) 98]	` '
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual mot more that 13	3.9, N = 1 3.9, N = 1 age hot wa bual average 25 litres per	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	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) 98	.58]	` '
if TFA > 13 if TFA £ 13 Annual avera Reduce the ann	3.9, N = 1 3.9, N = 1 age hot wand average 25 litres per	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 98			` '
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan	3.9, N = 1 3.9, N = 1 age hot want average 25 litres per litres pe	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	e target o	9) 98	.58]	` '
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 13 Jan Hot water usage	3.9, N = 1 3.9, N = 1 age hot want average 25 litres per litres pe	+ 1.76 x ater usag hot water person per Mar r day for ea	ge in litre usage by a 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 T	erage = designed in the light state of the light st	(25 x N) to achieve Aug (43)	+ 36 a water us Sep 96.61	e target of	9) 98 Nov 104.49	.58 Dec	1182.92	` '
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 13 Jan Hot water usage	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litre	+ 1.76 x ater usage hot water person per Mar r day for ear	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 92.66	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) to achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sur	9) 98 Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual not more that 13 Jan Hot water usage (44)m= 108.4	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litre	+ 1.76 x ater usage hot water person per Mar r day for ear	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 92.66	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) to achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sur	9) 98 Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan Hot water usage (44)m= 108.4 Energy content (45)m= 160.8	3.9, N = 1 3.9, N = 1 age hot want average 25 litres per per in litres per 3 104.49 of hot water 3 140.64	+ 1.76 x ater usag hot water person per Mar r day for ea 100.55	ge in litre usage by a day (all w Apr ach month 96.61 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mon 112.73	Oct 100.55 Total = Suith (see Tai	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73	1182.92	(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan Hot water usage (44)m= 108.4 Energy content (45)m= 160.8	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litre	+ 1.76 x ater usage hot water person per Mar r day for each 100.55 used - calconduction 145.13	Apr Apr ach month 96.61 126.53	es per da 5% if the orater use, I May $Vd,m = fa$ 92.66 $onthly = 4$.	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08 enter 0 in	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46)	+ 36 a water us Sep 96.61 112.73 to (61)	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth (see Tail 131.38)	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ =	.58 Dec 108.43 c, 1d) 155.73		(43) (44) (45)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan Hot water usage (44)m= 108.4 Energy content (45)m= 160.8	3.9, N = 1 3.9, N = 1 age hot wand average 25 litres per per in litres per 3 104.49 of hot water 3 140.64 a water heating 2 21.1	+ 1.76 x ater usag hot water person per Mar r day for ea 100.55	ge in litre usage by a day (all w Apr ach month 96.61 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mon 112.73	Oct 100.55 Total = Sur th (see Ta	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73		(43)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan Hot water usage (44)m= 108.4 Energy content (45)m= 160.8 If instantaneous (46)m= 24.12	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litre	+ 1.76 x ater usage hot water person per Mar r day for each 100.55 used - calconding at point 21.77	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (no	es per da 5% if the of the fater use, I May Vd,m = fat 92.66	ay Vd,av lwelling is not and co Jun ctor from 1 88.72 190 x Vd,r 104.76	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08 enter 0 in 14.56	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91	Oct 100.55 Fotal = Sunth (see Tail 131.38) Fotal = Sunth 19.71	9) Nov 104.49 m(44) ₁₁₂ = pbles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73		(43) (44) (45)
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if TFA > 13 if TFA £ 13 Annual avera Reduce the annual more that 12 Jan Hot water usage (44)m= 108.4 Energy content (45)m= 160.8 If instantaneous (46)m= 24.12 Water storage Storage volut If community Otherwise if Water storage a) If manufat Temperature	3.9, N = 1 3.9, N = 1 age hot was a value average 25 litres per li	ater usage hot water person per Mar 100.55 used - calc 145.13 ing at point 21.77 including and no tale hot water water person per Mar 21.77 control including and no tale hot water person per Mar 100.55	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not 18.98 ag any so ank in dw er (this in oss facto 2b	es per da 5% if the of water use, I May Vd,m = fac 92.66 121.41 hot water 18.21 clar or W welling, e ncludes i	ay Vd,av welling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 15.71 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa (47) pmbi boil	+ 36 a water us Sep 96.61 112.73 16.91 ame vess ers) ente	Oct 100.55 Total = Sunth (see Tail 131.38) Total = Sunth 19.71 Sel	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36 0		(43) (44) (45) (46) (47) (48) (49)
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	ater stora	_			le 2 (kW	h/litre/da	ay)					0		(51)
	munity h	•		on 4.3									•	
	ne factor i erature fa			2h							-	0		(52)
•								(47) (54)	· · · (5 0) · · · ((FO)		0		(53)
_	y lost fro		_	, 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	(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)
			ı	- · ·		1	1				· ·	1		(EZ)
(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	rom rab	le H5 lf t	nere is s	olar wat	ter neatil	ng and a	cylinae	r tnermo	stat)	0		(59)
			<u> </u>		<u> </u>				U			U		(33)
	i loss cal			·	<u>` </u>	`	<u> </u>			ı	ī	I	Ī	(2.1)
(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)
								<u> </u>		` 	` 	`	(59)m + (61)m	
(62)m=	174.56	153.07	158.89	139.84	135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		(62)
	HW input o									r contribut	ion to wate	er heating)		
,	dditional		r	1	r		·			Г	I		Ī	(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 wa	ater hea	ter											
(64)m-			ı	l	Ĭ									
(64)m=	174.56	153.07	158.89	139.84	135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		7(04)
			I		<u> </u>		ļ.	Outp	out from w	ater heate	I r (annual)₁	12	1712.97	(64)
Heat o	gains fror	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
Heat (65)m=	gains fror	n water 49.87	heating,	kWh/mo	onth 0.29	5 ´ [0.85 38.16	× (45)m	Outp + (61)m 40.48	out from w n] + 0.8 3 40.81	ater heate x [(46)m 47.12	r (annual) ₁ + (57)m 51.01	+ (59)m 55.22]	(64) (65)
Heat (65)m=	gains fror 56.91 ude (57)r	m water 49.87 m in cald	heating, 51.69 culation (kWh/mo 45.4 of (65)m	onth 0.29 43.81 only if c	5 ´ [0.85 38.16	× (45)m	Outp + (61)m 40.48	out from w n] + 0.8 3 40.81	ater heate x [(46)m 47.12	r (annual) ₁ + (57)m 51.01	+ (59)m 55.22]	1
Heat (65)m=	gains fror	m water 49.87 m in cald	heating, 51.69 culation (kWh/mo 45.4 of (65)m	onth 0.29 43.81 only if c	5 ´ [0.85 38.16	× (45)m	Outp + (61)m 40.48	out from w n] + 0.8 3 40.81	ater heate x [(46)m 47.12	r (annual) ₁ + (57)m 51.01	+ (59)m 55.22]	1
Heat (65)m= inclu 5. In	gains fror 56.91 ude (57)r	m water 49.87 m in calc iins (see	heating, 51.69 culation of Table 5	kWh/mo 45.4 of (65)m 5 and 5a	onth 0.29 43.81 only if c	5 ´ [0.85 38.16 ylinder i	× (45)m 35.72 s in the	Outp + (61)m 40.48 dwelling	out from w n] + 0.8 2 40.81 or hot w	ater heate x [(46)m 47.12 vater is fr	+ (57)m 51.01	+ (59)m 55.22 munity h]	1
Heat (65)m= inclu 5. In	gains fror 56.91 ude (57)r ternal ga olic gain	m water 49.87 m in calc ins (see s (Table Feb	heating, 51.69 culation of Table 5 2 5), Wat	kWh/mo 45.4 of (65)m 5 and 5a ts Apr	onth 0.29 43.81 only if constant only if	5 ´ [0.85 38.16 ylinder i: Jun	× (45)m 35.72 s in the	Outp + (61)m 40.48 dwelling	out from w 1] + 0.8 : 40.81 or hot w	ater heate x [(46)m 47.12 vater is fr	+ (57)m 51.01 com com	+ (59)m 55.22 munity h]	(65)
Heat (65)m= inclu 5. In	gains from 56.91 ude (57)r ternal ga oolic gain	m water 49.87 m in calc iins (see	heating, 51.69 culation of Table 5	kWh/mo 45.4 of (65)m 5 and 5a	onth 0.29 43.81 only if c	5 ´ [0.85 38.16 ylinder i	× (45)m 35.72 s in the	Outp + (61)m 40.48 dwelling	out from w n] + 0.8 2 40.81 or hot w	ater heate x [(46)m 47.12 vater is fr	+ (57)m 51.01	+ (59)m 55.22 munity h]	1
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Heat (65)m= inclu 5. In Metab	gains from 56.91 ude (57)r ternal gar oolic gain Jan 135.53	m water 49.87 m in calc ins (see s (Table Feb 135.53	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53	onth 0.29 43.81 only if c): May 135.53	5 ´ [0.85 38.16 ylinder is Jun 135.53	× (45)m 35.72 s in the o	Outp + (61)m 40.48 dwelling Aug 135.53	out from w 1] + 0.8 2 40.81 or hot w Sep 135.53	ater heate x [(46)m 47.12 vater is fr	+ (57)m 51.01 com com	+ (59)m 55.22 munity h]	(65)
Heat g (65)m= inclu 5. In Metab (66)m= Lightir (67)m=	gains fror 56.91 ude (57)r ternal gar oolic gain Jan 135.53	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53 ted in Ap	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89	onth 0.29 43.81 only if co : May 135.53 L, equat 9.64	5 ´ [0.85 38.16 ylinder is Jun 135.53 ion L9 o	x (45)m 35.72 s in the o Jul 135.53 r L9a), a	Outp + (61)m 40.48 dwelling Aug 135.53 lso see	Sep 135.53 Table 5	ater heate x [(46)m 47.12 vater is fr Oct 135.53	+ (57)m 51.01 com com Nov 135.53	+ (59)m 55.22 munity h Dec 135.53]	(65)
Heat g (65)m= inclu 5. In Metab (66)m= Lightir (67)m=	gains from 56.91 ude (57)r ternal gar olic gain 135.53 ng gains 23.57	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53 ted in Ap	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89	onth 0.29 43.81 only if co : May 135.53 L, equat 9.64	5 ´ [0.85 38.16 ylinder is Jun 135.53 ion L9 o	x (45)m 35.72 s in the o Jul 135.53 r L9a), a	Outp + (61)m 40.48 dwelling Aug 135.53 lso see	Sep 135.53 Table 5	ater heate x [(46)m 47.12 vater is fr Oct 135.53	+ (57)m 51.01 com com Nov 135.53	+ (59)m 55.22 munity h Dec 135.53]	(65)
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Heat (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m=	gains from 56.91 ude (57)r ternal ga colic gain 135.53 ng gains 23.57 nnces gai 251.49 ng gains	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula 20.94 ns (calc	heating, 51.69 culation of Table 5 5), Wat Mar 135.53 ted in Ap 17.03 ulated in	kWh/mo 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 Appendix 233.52	onth 0.29 43.81 only if co May 135.53 L, equat 9.64 dix L, eq 215.85	Jun 135.53 ion L9 o 8.14 uation L	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1	Outp + (61)m 40.48 dwelling 135.53 lso see 11.43 3a), also 185.53	Sep 135.53 Table 5 15.34 see Ta	oct	r (annual) ₁ + (57)m 51.01 rom com Nov 135.53	+ (59)m 55.22 munity h Dec 135.53]	(65) (66) (67)
Heat (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m=	gains from 56.91 ude (57)r ternal ga colic gain 135.53 ng gains 23.57 nnces gai 251.49 ng gains	m water 49.87 m in calc s (Table Feb 135.53 (calcula 20.94 ns (calc 254.09 (calcula 36.55	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53 ted in Ap 17.03 ulated in 247.52 ated in A 36.55	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55	onth 0.29 43.81 only if colors May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat	Jun 135.53 ion L9 o 8.14 uation L 199.24	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a	Outp + (61)m 40.48 dwelling 135.53 lso see 11.43 3a), also 185.53	Sep 135.53 Table 5 15.34 see Table Table Table	ot	r (annual) ₁ + (57)m 51.01 rom com Nov 135.53 22.73	+ (59)m 55.22 munity h Dec 135.53 24.23]	(65) (66) (67) (68)
Heat (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m=	gains from 56.91 ude (57)r ternal gar olic gain 135.53 ng gains 23.57 ances gai 251.49 ng gains 36.55 s and far	m water 49.87 m in calc s (Table Feb 135.53 (calcula 20.94 ns (calc 254.09 (calcula 36.55	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53 ted in Ap 17.03 ulated in 247.52 ated in A 36.55	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55	onth 0.29 43.81 only if colors May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat	Jun 135.53 ion L9 o 8.14 uation L 199.24	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a	Outp + (61)m 40.48 dwelling 135.53 lso see 11.43 3a), also 185.53	Sep 135.53 Table 5 15.34 see Table Table Table	ot	r (annual) ₁ + (57)m 51.01 rom com Nov 135.53 22.73	+ (59)m 55.22 munity h Dec 135.53 24.23]	(65) (66) (67) (68)
Heat (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pumpi (70)m=	gains from 56.91 ude (57)r ternal gar olic gain 135.53 ng gains 23.57 ances gai 251.49 ng gains 36.55 s and far	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula 20.94 ns (calc 254.09 (calcula 36.55 ns gains	heating, 51.69 culation of the Table 5 e 5), Wat Mar 135.53 ted in Ap 17.03 culated in 247.52 tted in Ap 36.55 (Table 5	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 a Append 233.52 opendix 36.55 5a) 3	onth 0.29 43.81 only if co May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 o 8.14 uation L 199.24 ion L15 36.55	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 lso see 11.43 3a), also 185.53 , also se 36.55	Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	ot	r (annual), + (57)m 51.01 rom com Nov 135.53 22.73 223.78	+ (59)m 55.22 munity h Dec 135.53 24.23]	(65) (66) (67) (68) (69)
Heat (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pumpi (70)m= Losse	gains from 56.91 ude (57)r ternal gar colic gain 135.53 ng gains 23.57 nnces gai 251.49 ng gains 36.55 s and far	m water 49.87 m in calc sins (see s (Table Feb 135.53 (calcula 20.94 ns (calc 254.09 (calcula 36.55 ns gains 3 aporatio	heating, 51.69 culation of the Table 5 5), Wat Mar 135.53 ted in Ap 17.03 culated in 247.52 ated in A 36.55 (Table 5	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55 5a) 3	onth 0.29 43.81 only if co May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 o 8.14 uation L 199.24 ion L15 36.55	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 lso see 11.43 3a), also 185.53 , also se 36.55	Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	ot	r (annual), + (57)m 51.01 rom com Nov 135.53 22.73 223.78	+ (59)m 55.22 munity h Dec 135.53 24.23]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pumpi (70)m= Losse (71)m=	gains from 56.91 ude (57)r ternal gar olic gain Jan 135.53 ng gains 23.57 nnces gai 251.49 ng gains 36.55 s and far 3 s e.g. even	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula 20.94 ns (calcula 36.55 ns gains 3 aporatic -108.42	heating, 51.69 culation of Table 5 e 5), Wat Mar 135.53 ted in Ap 17.03 culated in 247.52 ated in A 36.55 (Table 5 3 on (negar	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55 5a) 3 tive valu	onth 0.29 43.81 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 o 8.14 uation L 199.24 ion L15 36.55	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Outp + (61)m 40.48 dwelling 135.53 lso see 11.43 3a), also 185.53 , also se 36.55	Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	ater heate x [(46)m 47.12 rater is fr Oct 135.53 19.47 ble 5 206.11 2 5 36.55	r (annual) ₁ + (57)m 51.01 rom com Nov 135.53 22.73 223.78 36.55	+ (59)m 55.22 munity h Dec 135.53 24.23 240.39]	(65) (66) (67) (68) (69) (70)
Heat g (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 56.91 ude (57)r ternal gains olic gains 135.53 ng gains 23.57 ances gai 251.49 ng gains 36.55 s and far 3 s e.g. ev	m water 49.87 m in calc ins (see s (Table Feb 135.53 (calcula 20.94 ns (calcula 36.55 ns gains 3 aporatic -108.42	heating, 51.69 culation of Table 5 e 5), Wat Mar 135.53 ted in Ap 17.03 culated in 247.52 ated in A 36.55 (Table 5 3 on (negar	kWh/me 45.4 of (65)m 5 and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55 5a) 3 tive valu	onth 0.29 43.81 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 o 8.14 uation L 199.24 ion L15 36.55	x (45)m 35.72 s in the o Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Outp + (61)m 40.48 dwelling 135.53 lso see 11.43 3a), also 185.53 , also se 36.55	Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	ater heate x [(46)m 47.12 rater is fr Oct 135.53 19.47 ble 5 206.11 2 5 36.55	r (annual) ₁ + (57)m 51.01 rom com Nov 135.53 22.73 223.78 36.55	+ (59)m 55.22 munity h Dec 135.53 24.23 240.39]	(65) (66) (67) (68) (69) (70)

Total internal ga	ains =					(66)m -	+ (67)m	ı + (68	s)m + (69	9)m + (1	70)m +	(71)m +	· (72)m			
(73)m= 418.21 4	415.9	400.69	376.12	351.02	327	.03 3	311.6	318.	.02 33	30.78	355.57	7 384	.01	405.5]	(73)
6. Solar gains:	·															
Solar gains are cald	culated u	ısing sola	r flux from	Table 6a	and as	ssociate	ed equa	tions t	o conve	ert to the	e applic	able ori	entatio	n.		
Orientation: Acc		actor	Area	l		Flux	0-		g_ 			FI Table			Gains	
1 at	ole 6d		m²			Table	ьа		rabi	le 6b	_	Table	ьс		(W)	
Northeast _{0.9x}	0.77	x		5	x	11.2	:8	X	0.	45	X	1	.11	=	19.55	(75)
Northeast _{0.9x}	0.77	X	. ;	5	X	22.9	7	X	0.	45	X	1	.11	=	39.79	(75)
Northeast _{0.9x}	0.77	X	;	5	X	41.3	8	Х	0.	45	X	1	.11	=	71.69	(75)
Northeast _{0.9x}	0.77	x		5	x _	67.9	16	х	0.	45	X	1	.11	=	117.73	(75)
Northeast _{0.9x}	0.77	X		5	x	91.3	5	X	0.	45	X	1.	.11	=	158.26	(75)
Northeast _{0.9x}	0.77	X	į	5	x	97.3	8	X	0.	45	X	1	.11	=	168.72	(75)
Northeast _{0.9x}	0.77	X	į	5	x	91.	1	x	0.	45	X	1	.11	=	157.83	(75)
Northeast _{0.9x}	0.77	X	į	5	x	72.6	3	X	0.	45	X	1	.11	=	125.83	(75)
Northeast _{0.9x}	0.77	X		5	x	50.4	2	X	0.	45	X	1.	.11	=	87.35	(75)
Northeast _{0.9x}	0.77	X		5	x	28.0	7	X	0.	45	X	1.	.11	_ =	48.63	(75)
Northeast _{0.9x}	0.77	X		5	x	14.2	2	X	0.	45	x	1.	.11	_ =	24.6	(75)
Northeast _{0.9x}	0.77	X		5	x	9.2	1	X	0.	45	X	1	.11	=	15.96	(75)
Southeast _{0.9x}	0.77	X	1.	42	x	36.7	'9	X	0.	45	X	1.	.11	=	18.1	(77)
Southeast 0.9x	0.77	X	1.	42	x	62.6	57	x	0.	45	x	1.	.11	=	30.84	(77)
Southeast _{0.9x}	0.77	X	1.	42	x	85.7	'5	X	0.	45	X	1	.11	=	42.19	(77)
Southeast _{0.9x}	0.77	X	1.	42	x	106.	25	X	0.	45	X	1.	.11	=	52.28	(77)
Southeast 0.9x	0.77	X	1.	42	x	119.	01	х	0.	45	x	1	.11	=	58.56	(77)
Southeast 0.9x	0.77	X	1.4	42	x	118.	15	x	0.	45	x	1	.11	=	58.13	(77)
Southeast 0.9x	0.77	x	1.	42	x	113.	91	х	0.	45	x	1	.11	=	56.05	(77)
Southeast 0.9x	0.77	X	1.	42	x	104.	39	х	0.	45	x	1	.11	=	51.36	(77)
Southeast 0.9x	0.77	x	1.	42	x	92.8	i5	х	0.	45	x	1	.11	=	45.69	(77)
Southeast 0.9x	0.77	X	1.	42	x	69.2	27	х	0.	45	x	1	.11	=	34.08	(77)
Southeast 0.9x	0.77	x	1.	42	x	44.0	7	х	0.	45	x	1	.11	=	21.68	(77)
Southeast 0.9x	0.77	X	1.4	42	x	31.4	.9	х	0.	45	x	1	.11	=	15.49	(77)
Southwest _{0.9x}	0.77	x	8.	52	x	36.7	'9		0.	45	x	1	.11	=	108.62	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	62.6	7		0.	45	x	1	.11	_	185.02	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	85.7	'5		0.	45	x	1	.11	_ =	253.16	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	106.	25		0.	45	×	1.	.11	_ =	313.67	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	119.	01		0.	45	x	1	.11	_ =	351.34	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	118.	15		0.	45	×	1	.11	=	348.8	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	113.	91		0.	45	×	1	.11	<u> </u>	336.28	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	104.	39	Ì	0.	45	×	1.	.11	=	308.18	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	92.8	5	İ	0.	45	×	1.	.11	<u> </u>	274.12	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	69.2	.7	İ	0.	45	x	1.	.11	=	204.49	(79)

Southwest _{0.9x}	0.77	Х	8.8	52	X	44.07		0.45	x	1.11	=	130.1	(79)
Southwest _{0.9x}	0.77	x	8.5	52	x	31.49		0.45	_ x [1.11	=	92.96	(79)
•													_
Solar gains in	watts, ca	alculated	for eac	h month			(83)m = S	Sum(74)m .	(82)m				
(83)m= 146.27	255.65	367.04	483.69	568.15	575.65	550.16	485.37	407.16	287.2	176.38	124.41		(83)
Total gains – i	internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	•	•	•	•		I	
(84)m= 564.48	671.55	767.73	859.81	919.18	902.69	861.76	803.39	737.94	642.77	560.4	529.91		(84)
7. Mean inte	rnal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ii	n the livi	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation fac	ctor for a	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.97	0.92	0.83	0.68	0.52	0.58	0.8	0.95	0.99	0.99		(86)
	1 40 00 0 0			L T4 /5		no 240 -		- Oo\	<u> </u>	<u> </u>	<u> </u>		
Mean interna (87)m= 19.4	19.62	19.95	20.34	20.69	20.9	20.97	20.96	e 9c) 20.8	20.34	19.78	19.35]	(87)
(87)m= 19.4	19.62	19.95	20.34	20.09	20.9	20.97	20.96	20.8	20.34	19.76	19.35		(07)
Temperature	during h	neating p	eriods ii	rest of	dwelling	from Ta	able 9, T	h2 (°C)				•	
(88)m= 20	20	20	20	20	20	20	20	20	20	20	20		(88)
Utilisation fac	ctor for g	ains for i	rest of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.99	0.98	0.96	0.9	0.78	0.6	0.41	0.47	0.73	0.93	0.98	0.99		(89)
Mean interna	al temper	rature in t	the rest	of dwelli	na T2 (follow ste	ens 3 to	7 in Tabl	le 9c)	ı		J	
(90)m= 18.54	18.75	19.07	19.46	19.77	19.94	19.99	19.98	19.87	19.46	18.92	18.48		(90)
(11)						1		ļ	Į	l g area ÷ (4	4) =	0.16	(91)
												00	
Mean interna	 			i e		1						1	(00)
(92)m= 18.68	18.89	19.21	19.6	19.92	20.1	20.15	20.14	20.03	19.61	19.06	18.62		(92)
Apply adjusti	1	1 1		· ·	i	1	1		ri – –	T	l	1	(00)
(93)m= 18.53	18.74	19.06	19.45	19.77	19.95	20	19.99	19.88	19.46	18.91	18.47		(93)
8. Space hea									,				
Set Ti to the the utilisation			•		ned at st	ep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-calc	:ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac			<u> </u>	Iviay	Juli	Jui	L	l Geb	1 001	INOV	Dec		
(94)m= 0.99	0.97	0.95	0.89	0.77	0.59	0.41	0.46	0.72	0.92	0.98	0.99		(94)
Useful gains	Į					1		1					` '
(95)m= 557	654.41	728.21	763.92	708.95	533.57	356.98	373.4	532.04	589.42	547.06	524.29		(95)
Monthly aver				<u> </u>		1		1					` '
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al temp	L erature		<u> </u>	x [(93)m	ļ	1		ļ	l	, ,
	1485.29		<u>.</u>	866.38	573.88	364.5	385.23	619.76	950.37	1266.99	1531.48		(97)
Space heating		L						L				l	` '
(98)m= 721.58	i i	461.34	265.24	117.13	0	0	0) (66 0	268.55	518.35	749.35		
1250	1	1		L				l per year	<u>. </u>		<u> </u>	3659.89	(98)
							1016	ii per year	(KWII/yCai	i) = Odiii(3	O)15,912 —		= ``
Space heatir	ng require	ement in	kVVh/m²	/year								37.71	(99)
9a. Energy re		nts – Indi	vidual h	eating s	ystems	including	micro-C	CHP)					
Space heati	•		- اد حدمه								1		7(00.1)
Fraction of s	pace hea	at trom se	econdar	y/supple	mentar	y system						0	(201)

									_
Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								90.5	(206)
Efficiency of secondary/supplementary heating	ng system,	, % 				•	•	0	(208)
Jan Feb Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above 721.58 558.36 461.34 265.24 117.13	i i	0	0	0	268.55	518.35	749.35		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$			U U	U	200.00	010.00	740.00		(211)
797.32 616.97 509.76 293.08 129.42	0	0	0	0	296.74	572.77	828.01		(211)
	1 1		Tota	l (kWh/yea	ar) =Sum(2	1 211) _{15,1012}	=	4044.07	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0	0	0		7(045)
Water heating			Tota	i (Kvvii/yea	ar) =Surri(2	215) _{15,1012}	F	0	(215)
Water heating Output from water heater (calculated above)									
174.56 153.07 158.89 139.84 135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		
Efficiency of water heater								87.3	(216)
(217)m= 89.86 89.79 89.66 89.37 88.76	87.3	87.3	87.3	87.3	89.35	89.74	89.89		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 194.26 170.47 177.21 156.47 152.28	135.25	126.96	143.36	144.38	162.43	174.64	188.55		
			Tota	I = Sum(2	19a) ₁₁₂ =			1926.28	(219)
Annual totals					k'	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1								4044.07	_
Water heating fuel used								1926.28	
Electricity for pumps, fans and electric keep-h	ot							_	
mechanical ventilation - balanced, extract or	positive in	put fron	n outside)			64.97		(230a)
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			139.97	(231)
Electricity for lighting								416.32	(232)
Electricity generated by PVs								-481.92	(233)
Total delivered energy for all uses (211)(221) + (231) +	+ (232).	(237b)	=				6044.71	」 【(338)
12a. CO2 emissions – Individual heating sys	, , ,	` '	` '						<u></u>
rea. 602 officerons marriada noaling eye			010 0111						
	Ene kWł	e rgy n/year			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211)	X			0.2	16	=	873.52	(261)
Space heating (secondary)	(215)	X			0.5	19	=	0	(263)
Water heating	(219)	X			0.2	16	=	416.08	(264)

Space and water heating	(261) + (262) + (263) + (264) =	:	1289.6 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	72.64 (267)
Electricity for lighting	(232) x	0.519	216.07 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year	SU	ım of (265)(271) =	1328.19 (272)
Dwelling CO2 Emission Rate	(27	72) ÷ (4) =	13.68 (273)
El rating (section 14)			87 (274)

		User Details:			
Assessor Name:	Ben Tunningley	Stroma Nu	mber: ST	RO027495	
Software Name:	Stroma FSAP 2012	Software V	ersion: Ve	rsion: 1.0.5.41	
	Pro	operty Address: Plot ()47		
Address :	56 Buttercup Road , Bishops	Waltham, SOUTHAM	IPTON , SO32 1RJ		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³	<u>^</u>
Ground floor		48.53 (1a) x	2.4 (2a)	= 116.47	(3a)
First floor		48.53 (1b) x	2.67 (2b)	= 129.58	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	97.06 (4)			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+(3n)	246.05	(5)
2. Ventilation rate:					
	main secondary 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 fa	ns		3 x 10 =	30	(7a)
Number of passive vents			0 x 10 =	0	(7b)
Number of flueless gas fi	res		0 x 40 =	0	(7c)
					_
Inditantian due to alcience	(Co) (Cb) (70))		r changes per ho	_
•	ys, flues and fans = $(6a)+(6b)+(7a)$ seen carried out or is intended, proceed in		\div (5) =	0.12	(8)
Number of storeys in the		to (11), otherwise continue	. 110111 (3) to (10)	0	(9)
Additional infiltration	g ()		[(9)-1]x0. [^]		(10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry cons		0	(11)
	resent, use the value corresponding to t				_
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter	0	0	(12)
If no draught lobby, en	ter 0.05, else enter 0			0	(13)
Percentage of windows	s and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) -	÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square	metre of envelope area	5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$		0.37	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeabili	ty is being used		
Number of sides sheltere	ed	(00) 4 50 075	(40)	2	(19)
Shelter factor		$(20) = 1 - [0.075 \times (20)]$		0.85	(20)
Infiltration rate incorporat	_	$(21) = (18) \times (20)$	=	0.32	(21)
Infiltration rate modified for					
Jan Feb	Mar Apr May Jun	Jul Aug Ser	Oct Nov D	ec	
Monthly average wind sp	eed from Table 7				

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (22a)m = (22) m ÷ 4	
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1	1.08 1.12 1.18
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
Adjusted initiation rate (allowing for sheller and wind speed) = $(2 \text{ Ta}) \times (22a) \text{m}$ 0.4 0.4 0.39 0.35 0.34 0.3 0.3 0.29 0.32	0.34 0.36 0.37
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0 (23a
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b)	(20)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (230)
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22)m = 0$ 0 0 0 0 0 0 0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22)	D)m + (23b)
(24b)m= 0 0 0 0 0 0 0 0 0	0 0 0 (24)
c) If whole house extract ventilation or positive input ventilation from outside	
if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5$	5 × (23b)
(24c)m= 0 0 0 0 0 0 0 0	0 0 0 (240
 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0 	15]
(24d)m= 0.58 0.58 0.57 0.56 0.56 0.55 0.55 0.54 0.55	0.56 0.56 0.57 (240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.58 0.58 0.57 0.56 0.56 0.55 0.55 0.54 0.55	0.56 0.56 0.57 (25)
3. Heat losses and heat loss parameter:	
ELEMENT Gross area (m²) Openings m² Net Area	A X U k-value A X k (W/K) kJ/m²-K kJ/K
Doors Type 1 2.1 x 1 =	
	2.1 (26)
Doors Type 2 2.1 x 1 =	2.1 (26)
Doors Type 2 $2.1 \times 1 = $ Windows Type 1 $5 \times 1/[1/(1.4) + 0.04] = $	
	2.1 (26)
Windows Type 1 $5 \times 1/[1/(1.4) + 0.04] = $	2.1 (26) 6.63 (27)
Windows Type 1	2.1 (26) 6.63 (27) 11.3 (27)
Windows Type 1 5 $x1/[1/(1.4) + 0.04] = $ Windows Type 2 8.52 $x1/[1/(1.4) + 0.04] = $ Windows Type 3 1.42 $x1/[1/(1.4) + 0.04] = $	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27)
Windows Type 1 5 $x1/[1/(1.4) + 0.04] = $ Windows Type 2 8.52 $x1/[1/(1.4) + 0.04] = $ Windows Type 3 1.42 $x1/[1/(1.4) + 0.04] = $ Floor 48.53 x 0.13 $=$	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28)
Windows Type 1 5 $x1/[1/(1.4) + 0.04] = $ Windows Type 2 8.52 $x1/[1/(1.4) + 0.04] = $ Windows Type 3 1.42 $x1/[1/(1.4) + 0.04] = $ Floor 48.53 x 0.13 $=$ Walls 101.29 19.14 82.15 x 0.18 $=$	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29)
Windows Type 1 5 $x1/[1/(1.4) + 0.04] = $ Windows Type 2 8.52 $x1/[1/(1.4) + 0.04] = $ Windows Type 3 1.42 $x1/[1/(1.4) + 0.04] = $ Floor 48.53 x x Walls x x x Walls x x x Roof x	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30)
Windows Type 1 5 $x1/[1/(1.4) + 0.04] = $ Windows Type 2 8.52 $x1/[1/(1.4) + 0.04] = $ Windows Type 3 1.42 $x1/[1/(1.4) + 0.04] = $ Floor 48.53 $x = $ Walls 101.29 19.14 82.15 $x = $ Roof 48.53 $x = $ $x = $ Total area of elements, $x = $ <td>2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31)</td>	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31)
Windows Type 1 5 x1/[1/(1.4)+0.04] = Windows Type 2 8.52 x1/[1/(1.4)+0.04] = Windows Type 3 1.42 x1/[1/(1.4)+0.04] = Floor 48.53 x 0.13 = Walls 101.29 19.14 82.15 x 0.18 = Roof 48.53 0 48.53 x 0.13 = Total area of elements, m² 198.35 Party wall 42.63 x 0 =	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32)
Windows Type 1 5 x1/[1/(1.4)+0.04] = Windows Type 2 8.52 x1/[1/(1.4)+0.04] = Windows Type 3 1.42 x1/[1/(1.4)+0.04] = Floor 48.53 x 0.13 = Walls 101.29 19.14 82.15 x 0.18 = Roof 48.53 0 48.53 x 0.13 = Total area of elements, m² 198.35 Party wall 42.63 x 0 = Internal wall ** 43.92	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32) (32)
Windows Type 1 5 x1/[1/(1.4)+0.04] = Windows Type 2 8.52 x1/[1/(1.4)+0.04] = Windows Type 3 1.42 x1/[1/(1.4)+0.04] = Floor 48.53 x 0.13 = Walls 101.29 19.14 82.15 x 0.18 = Roof 48.53 0 48.53 x 0.13 = Total area of elements, m² 198.35 Party wall 42.63 x 0 = Internal wall ** 132	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32) (32) (32) (32) (32)
Windows Type 1 5 x1/[1/(1.4)+0.04] = [Windows Type 2 8.52 x1/[1/(1.4)+0.04] = [Windows Type 3 1.42 x1/[1/(1.4)+0.04] = [Floor 48.53 x 0.13 = [Walls 101.29 19.14 82.15 x 0.18 = [Roof 48.53 0 48.53 x 0.13 = [Total area of elements, m² 198.35 Party wall 42.63 x 0 = [Internal wall ** 132 Internal wall ** 39.17	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32) (32) (32) (32) (32) (32) (32) (32) (32)
Windows Type 1 5 x1/[1/(1.4) + 0.04] = Windows Type 2 8.52 x1/[1/(1.4) + 0.04] = Windows Type 3 1.42 x1/[1/(1.4) + 0.04] = Floor 48.53 x 0.13 = Walls 101.29 19.14 82.15 x 0.18 = Roof 48.53 0 48.53 x 0.13 = Total area of elements, m² 198.35 Party wall 42.63 x 0 = Internal wall ** 43.92 Internal wall ** 132 Internal floor 47.96 Internal ceiling 47.96 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32) (32) (32) (33) (32) (34) (32) (35) (32) (36) (32) (37) (32) (38) (32) (39) (32) (30) (32)
Windows Type 1 5 x1/[1/(1.4)+0.04] = [Windows Type 2 8.52 x1/[1/(1.4)+0.04] = [Windows Type 3 1.42 x1/[1/(1.4)+0.04] = [Floor 48.53 x 0.13 = [Walls 101.29 19.14 82.15 x 0.18 = [Roof 48.53 0 48.53 x 0.13 = [Total area of elements, m² 198.35 Party wall 42.63 x 0 = [Internal wall ** 132 Internal wall ** 39.17 Internal floor 47.96 Internal ceiling 47.96	2.1 (26) 6.63 (27) 11.3 (27) 1.88 (27) 6.308899 (28) 14.79 (29) 6.31 (30) (31) (32) (32) (32) (33) (32) (34) (32) (35) (32) (36) (32) (37) (32) (38) (32) (39) (32) (30) (32)

Heat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16739.71	(34)
Thermal mass	,	,	P = Cm ÷	: TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess	sments whe	ere the de	tails of the	•			ecisely the	indicative	values of	TMP in Ta	able 1f	200	(/
Thermal bridge				using Ap	pendix l	K						15.42	(36)
if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric hea	at loss							(33) +	(36) =			66.83	(37)
Ventilation hea	t loss ca	alculated	monthly	У				(38)m	$= 0.33 \times ($	25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 47.19	46.94	46.69	45.51	45.29	44.26	44.26	44.07	44.66	45.29	45.73	46.2		(38)
Heat transfer of	oefficien	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 114.03	113.77	113.52	112.34	112.12	111.09	111.09	110.9	111.49	112.12	112.57	113.03		_
Heat loss para	meter (H	ILP), W/	′m²K						Average = = (39)m ÷		12 /12=	112.34	(39)
(40)m= 1.17	1.17	1.17	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.16		_
Number of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.16	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
			-	-	-	-	-	-	-			•	
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
A I												•	
Assumed occu 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	ge in litre	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)	.58		(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 person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,av Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us	se target o	9) 98			, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125	9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x ater usag hot water person per Mar	ge in litre usage by a day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)	.58		, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan	9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x ater usag hot water person per Mar	ge in litre usage by a 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) 98	.58		, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 108.43	P, N = 1 · P, N = 1 ·	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 92.66	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) to achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sui	9) Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	, ,
if TFA > 13.9 if TFA £ 13.9 Annual averag Reduce the annual not more that 125 Jan Hot water usage in	P, N = 1 · P, N = 1 ·	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 92.66	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) to achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sui	9) Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	(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= 108.43	P, N = 1 · P, N = 1 ·	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 92.66	ay Vd,av Iwelling is not and co Jun ctor from 7	erage = designed to ld) Jul Table 1c x 88.72	(25 x N) to achieve Aug (43) 92.66	+ 36 a water us Sep 96.61	Oct 100.55 Total = Sui	9) Nov 104.49 m(44) ₁₁₂ =	.58 Dec 108.43	1182.92	(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= 108.43 Energy content of	P, N = 1 - P, N = 1 P	+ 1.76 x ater usag hot water person per Mar day for ea 100.55 used - calc 145.13	ge in litre usage by s day (all w Apr ach month 96.61 culated mo	es per da 5% if the a vater use, I May Vd,m = far 92.66 onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 97m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mon 112.73	Oct 100.55 Total = Suith (see Ta	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73	1182.92	(43)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 108.43 Energy content of (45)m= 160.8	P, N = 1 - P, N = 1 P	+ 1.76 x ater usag hot water person per Mar day for ea 100.55 used - calc 145.13	ge in litre usage by s day (all w Apr ach month 96.61 culated mo	es per da 5% if the a vater use, I May Vd,m = far 92.66 onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 97m / 3600 111.4	+ 36 a water us Sep 96.61 0 kWh/mon 112.73	Oct 100.55 Total = Sur 131.38	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41	.58 Dec 108.43 c, 1d) 155.73		(43)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage ir (44)m= 108.43 Energy content of (45)m= 160.8	P, N = 1 - 1 - 2 - 1 - 2 - 1 - 2 - 1 - 2 - 1 - 2 - 2	ter usaghot water person per Mar day for ea 100.55 used - calculations at point	ge in litre usage by a day (all w Apr ach month 96.61 culated mo 126.53	es per da 5% if the a vater use, I May Vd,m = far 92.66 onthly = 4.	ay Vd,av Iwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46)	+ 36 a water us Sep 96.61 0 kWh/mort 112.73	Oct 100.55 Total = Sun th (see Ta 131.38	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ =	.58 Dec 108.43		(43) (44) (45)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous w (46)m= 24.12	P, N = 1 - P, N = 1 - P, N = 1 - P, N = 1 - P - P - P - P - P - P - P - P - P -	ter usaghot water berson per Mar day for ea 100.55 used - calcate 145.13 ag at point 21.77	ge in litre usage by a day (all w Apr ach month 96.61 culated mo 126.53 of use (no	es per da 5% if the a vater use, I May $Vd,m = fa$ 92.66 I 121.41 I I I I I I I I	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 07m / 3600 111.4 boxes (46) 16.71	+ 36 a water us Sep 96.61 112.73 1 to (61) 16.91	Oct 100.55 Total = Surith (see Tall 131.38) Total = Surith 19.71	9) Nov 104.49 m(44) ₁₁₂ = 1bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43		(43) (44) (45)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous w (46)m= 24.12 Water storage	P, N = 1 e hot was all average litres per properties ter usaghot water berson per Mar day for ea 100.55 used - calcate 145.13 ag at point 21.77 includin	ge in litre usage by a day (all w Apr ach month 96.61 culated mo 126.53 of use (no 18.98 ag any so ank in dw	es per da 5% if the a vater use, I May $Vd,m = fa$ 92.66 $to the limits of the two tests of the limits of the lim$	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 r storage), 15.71 /WHRS	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 16.91 ame vess	Oct 100.55 Total = Sunth (see Tall 131.38) Total = Sunth (see Tall 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46)	
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage ir (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous w (46)m= 24.12 Water storage Storage volum If community h Otherwise if no	P, N = 1 · P, N = 1 ·	+ 1.76 x Inter usage hot water person per day for ear 100.55 Used - calconditions and point 21.77 Including the modern of the water the same series and the same series are sam	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not 18.98 ag any so ank in dw er (this in	es per da 5% if the o vater use, I May Vd,m = fa 92.66 onthly = 4. 121.41 o hot water 18.21 olar or W velling, e ocludes i	ay Vd,av Iwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 r storage), 15.71 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 16.91 ame vess	Oct 100.55 Total = Sunth (see Tall 131.38) Total = Sunth (see Tall 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage in (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous w (46)m= 24.12 Water storage Storage volum If community h Otherwise if no Water storage	P, N = 1 · P, N = 1 ·	ter usaghot water berson per Mar day for ea 100.55 used - calc 145.13 ag at point 21.77 including that water eclared le	ge in litre usage by a day (all w Apr ach month 96.61 126.53 of use (not) 18.98 ag any so ank in dw er (this in	es per da 5% if the o vater use, I May Vd,m = fa 92.66 onthly = 4. 121.41 o hot water 18.21 olar or W velling, e ocludes i	ay Vd,av Iwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 r storage), 15.71 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 112.73 16.91 ame vess	Oct 100.55 Total = Sunth (see Tall 131.38) Total = Sunth (see Tall 19.71) sel	9) Nov 104.49 m(44)12 =	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46) (47)
if TFA > 13.5 if TFA £ 13.5 Annual averag Reduce the annual not more that 125 Jan Hot water usage ir (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous w (46)m= 24.12 Water storage Storage volum If community h Otherwise if no Water storage a) If manufacti	P, N = 1 - P, N = 1 - P, N = 1 - P, N = 1 - P, N = 1 - P - P - P - P - P - P - P - P - P -	ter usaghot water berson per day for ear 100.55 used - calc 145.13 ag at point 21.77 includin nd no ta hot water eclared lem Table storage	ge in litre usage by s day (all w Apr ach month 96.61 126.53 of use (not) 18.98 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 $Vd,m = fa$ 92.66	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 r storage), 15.71 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa (47)	+ 36 a water us Sep 96.61 0 kWh/mor 112.73 0 to (61) 16.91 ame vess ers) ente	Oct 100.55 Total = Sunth (see Tall 131.38) Total = Sunth (see Tall 19.71) sel	9) Nov 104.49 m(44) ₁₁₂ = sbles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.58 Dec 108.43 c, 1d) 155.73 23.36		(43) (44) (45) (46) (47)

Hot wa														
	ater stora	-			le 2 (kW	h/litre/da	ıy)					0		(51)
	munity he	•		on 4.3									ı	
	e factor fr erature fa			2h								0		(52)
•								(47) (54)	· · · (5 0) · · · ((50)		0		(53)
٠.	y lost fron (50) or (5		_	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =		0		(54) (55)
	storage le	, ,	•	for each	month			((56)m = (55) v (41)	m		U		(55)
							 	. , ,	, , ,				I	(50)
(56)m=	er contains	0 dedicates	0 d solar sto	0	0 = (56)m	0	0 H11\1 ∴ (5	0	0 7)m = (56)	0 m where (0 H11) is fro	0 m Annend	iv H	(56)
-				- · ·			1							(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	ry circuit l	,	,									0		(58)
	ry circuit l				,	•	` '	, ,		u 4la a uaa a	-4-4\			
(mo (59)m=	dified by f	0	om rab	le H5 lf t	nere is s	olar wat	er neatii	ng and a	cylinae	r tnermo	stat) 0	0		(59)
					<u> </u>				U		U	U		(55)
	i loss calc				<u>` </u>	ì	· ` '				i		ı	
(61)m=	50.96	46.03	50.96	47.64	47.22	43.75	45.21	47.22	47.64	50.96	49.32	50.96		(61)
Total h	_							<u> </u>		` 	<u>` </u>	<u> </u>	(59)m + (61)m	
(62)m=	211.76	186.67	196.09	174.17	168.63	148.52	142.29	158.62	160.37	182.33	192.72	206.69		(62)
	HW input ca									r contribut	ion to wate	er heating)		
•	dditional			1	r		·						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			<u> </u>	ı		<u> </u>			<u> </u>			I	
(64)m=	211.76	186.67	196.09	174.17	168.63	148.52	142.29	158.62	160.37	182.33	192.72	206.69		1
								Outp	out from w	ater heate	r (annual)₁	12	2128.85	(0.4)
									_					(64)
_	gains from			i	1	· -				- 		+ (59)m		.
(65)m=	66.21	58.27	61	53.98	52.17	45.77	43.58	48.85	49.39	56.42	60.01	+ (59)m 64.52	1	(65)
(65)m= inclu	66.21 ude (57)m	58.27 n in calc	61 culation (53.98 of (65)m	52.17 only if c	45.77	43.58	48.85	49.39	56.42	60.01	+ (59)m 64.52	1	.
(65)m= inclu	66.21	58.27 n in calc	61 culation (53.98 of (65)m	52.17 only if c	45.77	43.58	48.85	49.39	56.42	60.01	+ (59)m 64.52	1	.
(65)m= inclu 5. In	66.21 ude (57)m ternal gain olic gains	58.27 n in calc ns (see s (Table	61 culation of Table 5	53.98 of (65)m and 5a	52.17 only if c	45.77 ylinder is	43.58 s in the o	48.85 dwelling	49.39 or hot w	56.42	60.01	+ (59)m 64.52 munity h	1	.
(65)m= inclu 5. In Metab	66.21 ude (57)m ternal gain olic gains Jan	58.27 In in calcons (see Table Feb	61 culation of Table 5 5), Wat Mar	53.98 of (65)m and 5a ts Apr	52.17 only if c	45.77 ylinder is Jun	43.58 s in the o	48.85 dwelling Aug	49.39 or hot w	56.42 vater is fr	60.01 om com	+ (59)m 64.52 munity h	1	(65)
(65)m= inclu 5. In Metab	66.21 ude (57)m ternal gair olic gains Jan 135.53	58.27 n in calcons (see (Table Feb 135.53	61 culation of Table 5 5), Wat Mar 135.53	53.98 of (65)m 6 and 5a ts Apr 135.53	52.17 only if c : May 135.53	45.77 ylinder is Jun 135.53	43.58 s in the o	48.85 dwelling Aug 135.53	49.39 or hot w Sep 135.53	56.42	60.01	+ (59)m 64.52 munity h	1	.
(65)m= inclu 5. In Metab (66)m= Lightin	66.21 ude (57)m ternal gain olic gains Jan 135.53	58.27 n in calcons (see Feb 135.53 calcula	61 culation of Table 5 5), Wat Mar 135.53	53.98 of (65)m and 5a ts Apr 135.53 ppendix	52.17 only if c : May 135.53 L, equat	Jun 135.53	43.58 s in the o Jul 135.53 r L9a), a	48.85 dwelling Aug 135.53 lso see	49.39 or hot w Sep 135.53 Table 5	56.42 vater is fr Oct 135.53	60.01 om com Nov 135.53	+ (59)m 64.52 munity h Dec 135.53	1	(65)
(65)m= inclu 5. In Metab	66.21 ude (57)m ternal gair olic gains Jan 135.53	58.27 n in calcons (see (Table Feb 135.53	61 culation of Table 5 5), Wat Mar 135.53	53.98 of (65)m 6 and 5a ts Apr 135.53	52.17 only if c : May 135.53	45.77 ylinder is Jun 135.53	43.58 s in the o	48.85 dwelling Aug 135.53	49.39 or hot w Sep 135.53	56.42 vater is fr	60.01 om com	+ (59)m 64.52 munity h	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain	s (Table Feb 135.53 calcula 20.94 ns (calcula calcula	61 culation of Table 5 5), Wat Mar 135.53 ted in Ap 17.03 ulated in	53.98 of (65)m 6 and 5a ts Apr 135.53 ppendix 12.89 n Append	52.17 only if colors May 135.53 L, equat 9.64 dix L, eq	Jun 135.53 ion L9 or 8.14 uation L	Jul 135.53 r L9a), a 8.79	Aug 135.53 Iso see	49.39 or hot w Sep 135.53 Table 5	56.42 rater is fr Oct 135.53	60.01 om com Nov 135.53	+ (59)m 64.52 munity h Dec 135.53	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain	n in calcons (see Table Feb 135.53 calcular 20.94	61 culation of Paragraph (1988) E 5), Wat Mar 135.53 ted in Ap 17.03	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89	52.17 only if c): May 135.53 L, equat 9.64	45.77 ylinder is Jun 135.53 ion L9 or 8.14	43.58 s in the o Jul 135.53 r L9a), a 8.79	Aug 135.53 Iso see	49.39 or hot w Sep 135.53 Table 5	56.42 rater is fr Oct 135.53	60.01 om com Nov 135.53	+ (59)m 64.52 munity h Dec 135.53	1	(65)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain	s (Table Feb 135.53 calcula 20.94 ns (calcula 254.09	61 culation of Table 5 5), Wat Mar 135.53 ted in Ap 17.03 ulated in 247.52	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 Appendix 233.52	52.17 only if c : May 135.53 L, equat 9.64 dix L, eq 215.85	Jun 135.53 ion L9 or 8.14 uation L	Jul 135.53 r L9a), a 8.79 13 or L1 188.14	Aug 135.53 Iso see 11.43 3a), also	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11	Oct 135.53 19.47 ble 5 206.11	60.01 om com Nov 135.53	+ (59)m 64.52 munity h Dec 135.53	1	(65) (66) (67)
(65)m= inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49	s (Table Feb 135.53 calcula 20.94 ns (calcula 254.09	61 culation of Table 5 5), Wat Mar 135.53 ted in Ap 17.03 ulated in 247.52	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 Appendix 233.52	52.17 only if c : May 135.53 L, equat 9.64 dix L, eq 215.85	Jun 135.53 ion L9 or 8.14 uation L	Jul 135.53 r L9a), a 8.79 13 or L1 188.14	Aug 135.53 Iso see 11.43 3a), also	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11	Oct 135.53 19.47 ble 5 206.11	60.01 om com Nov 135.53	+ (59)m 64.52 munity h Dec 135.53	1	(65) (66) (67)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nnces gain 251.49 ng gains (ns (see Table Feb 135.53 calcular 20.94 ns (calcular 254.09 (calcular 36.55	61 culation of the Table 5 cul	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 of Appendix 233.52 opendix 36.55	52.17 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat	Jun 135.53 ion L9 or 8.14 uation L 199.24	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a	Aug 135.53 Iso see 11.43 3a), also 185.53	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table	Oct 135.53 19.47 ble 5 206.11	60.01 om com Nov 135.53 22.73	+ (59)m 64.52 munity h Dec 135.53 24.23	1	(65) (66) (67) (68)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	de (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49 ng gains (36.55	ns (see Table Feb 135.53 calcular 20.94 ns (calcular 254.09 (calcular 36.55	61 culation of the Table 5 cul	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 of Appendix 233.52 opendix 36.55	52.17 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat	Jun 135.53 ion L9 or 8.14 uation L 199.24	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a	Aug 135.53 Iso see 11.43 3a), also 185.53	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table	Oct 135.53 19.47 ble 5 206.11	60.01 om com Nov 135.53 22.73	+ (59)m 64.52 munity h Dec 135.53 24.23	1	(65) (66) (67) (68)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	de (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49 ng gains (36.55	ns (see c (Table Feb 135.53 calcular 20.94 ns (calcular 36.55 s gains	61 culation of Paragraph 17.03 ted in Apr 17.03 ulated in 247.52 ted in Apr 16.55 (Table 5	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55 opendix	52.17 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 or 8.14 uation L 199.24 ion L15 36.55	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 Iso see 11.43 3a), also 185.53 , also se 36.55	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	Oct 135.53 19.47 ble 5 206.11 25 36.55	0.01 om com Nov 135.53 22.73 223.78	+ (59)m 64.52 munity h Dec 135.53 24.23 240.39	1	(65) (66) (67) (68) (69)
inclu 5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	de (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49 ng gains (36.55 s and fans	ns (see factorial factorial 61 culation of Table 5 5), Wat Mar 135.53 ted in Ap 17.03 ulated in 247.52 ted in Ap 36.55 (Table 5	53.98 of (65)m of and 5a ts Apr 135.53 opendix 12.89 n Append 233.52 opendix 36.55 opendix	52.17 only if co): May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 or 8.14 uation L 199.24 ion L15 36.55	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 Iso see 11.43 3a), also 185.53 , also se 36.55	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	Oct 135.53 19.47 ble 5 206.11 25 36.55	0.01 om com Nov 135.53 22.73 223.78	+ (59)m 64.52 munity h Dec 135.53 24.23 240.39	1	(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=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49 ng gains (36.55 s and fans s e.g. eva	ns (see a (Table Feb 135.53 calcula 20.94 ns (calcula 254.09 (calcula 36.55 s gains 3 aporatio	61 culation of Table 5 culation of Table 5 culation of Table 5 culation of Table 5 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culation of Table 5 cula	53.98 of (65)m of (65)m of and 5a tts Apr 135.53 opendix 12.89 of Appendix 233.52 opendix 36.55 of a) 3 tive value	52.17 only if colors May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 or 8.14 uation L 199.24 ion L15 36.55	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 Iso see 11.43 3a), also 185.53 , also se 36.55	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	Oct 135.53 19.47 ble 5 206.11 2 5 36.55	60.01 om com Nov 135.53 22.73 223.78 36.55	+ (59)m 64.52 munity h Dec 135.53 24.23 240.39 36.55	1	(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=	66.21 ude (57)m ternal gair olic gains Jan 135.53 ng gains (23.57 nces gain 251.49 ng gains (36.55 s and fans s e.g. eva -108.42	ns (see a (Table Feb 135.53 calcula 20.94 ns (calcula 254.09 (calcula 36.55 s gains 3 aporatio	61 culation of Table 5 culation of Table 5 culation of Table 5 culation of Table 5 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culated in April 17.03 culation of Table 5 cula	53.98 of (65)m of (65)m of and 5a tts Apr 135.53 opendix 12.89 of Appendix 233.52 opendix 36.55 of a) 3 tive value	52.17 only if colors May 135.53 L, equat 9.64 dix L, eq 215.85 L, equat 36.55	Jun 135.53 ion L9 or 8.14 uation L 199.24 ion L15 36.55	Jul 135.53 r L9a), a 8.79 13 or L1 188.14 or L15a 36.55	Aug 135.53 Iso see 11.43 3a), also 185.53 , also se 36.55	49.39 or hot w Sep 135.53 Table 5 15.34 see Ta 192.11 ee Table 36.55	Oct 135.53 19.47 ble 5 206.11 2 5 36.55	60.01 om com Nov 135.53 22.73 223.78 36.55	+ (59)m 64.52 munity h Dec 135.53 24.23 240.39 36.55	1	(65) (66) (67) (68) (69) (70)

Total internal	gains -					(66)r	n + (67)m	n ± (68	3)m +	· (69)m + (1	70\m +	(71)m	+ (72\m	1			
(73)m= 430.71	428.4	413.19	388.04	362.27	337		322.17	329		342.7	368.08		6.52	418]		(73)
6. Solar gain										<u> </u>		-					
Solar gains are		using sola	r flux from	Table 6a	and a	ssocia	ated equa	itions	to cor	nvert to the	e applic	able o	rientatio	n.			
Orientation:	Access F Table 6d		Area m²			Flux Tab	d le 6a		Ta	g_ able 6b		l Table	FF e 6c		Gains (W)		
Northeast _{0.9x}	0.77	х	5	5	х	11	1.28	x		0.63	x		0.7	=	17.	24	(75)
Northeast 0.9x	0.77	х	5	5	x $\overline{\ }$	22	2.97	x		0.63	×		0.7	=	35.	09	(75)
Northeast _{0.9x}	0.77	х	5	5	x $\overline{\ }$	41	1.38	x		0.63	×		0.7	=	63.	23	(75)
Northeast _{0.9x}	0.77	X	5	5	x [67	7.96	x		0.63	×		0.7	<u> </u>	103	.84	(75)
Northeast _{0.9x}	0.77	X	5	5	x \Box	91	1.35	x		0.63	×		0.7	=	139	.58	(75)
Northeast _{0.9x}	0.77	X	5	5	x [97	7.38	x		0.63	x		0.7	_ =	148	.81	(75)
Northeast _{0.9x}	0.77	х	5	5	x	9	1.1	x		0.63	x		0.7	=	139	.21	(75)
Northeast _{0.9x}	0.77	x	5	5	х	72	2.63	x		0.63	x		0.7	_ =	110	.98	(75)
Northeast _{0.9x}	0.77	X	5	5	x	50).42	x		0.63	x		0.7	=	77.	05	(75)
Northeast _{0.9x}	0.77	X	5	5	x	28	3.07	x		0.63	x		0.7	=	42.	89	(75)
Northeast _{0.9x}	0.77	X	5	5	x [1	4.2	x		0.63	x		0.7	_ =	21.	69	(75)
Northeast _{0.9x}	0.77	X	5	5	x	9	.21	x		0.63	x		0.7	=	14.	08	(75)
Southeast _{0.9x}	0.77	х	1.4	12	x	36	6.79	x		0.63	x		0.7	=	15.	97	(77)
Southeast _{0.9x}	0.77	X	1.4	12	x	62	2.67	x		0.63	x		0.7	=	27	.2	(77)
Southeast _{0.9x}	0.77	X	1.4	12	x	85	5.75	x		0.63	x		0.7	=	37.	21	(77)
Southeast _{0.9x}	0.77	х	1.4	12	x	10	6.25	x		0.63	x		0.7	=	46.	11	(77)
Southeast _{0.9x}	0.77	X	1.4	12	x	11	9.01	x		0.63	x		0.7	=	51.	65	(77)
Southeast _{0.9x}	0.77	х	1.4	12	x	11	8.15	x		0.63	x		0.7	=	51.	27	(77)
Southeast _{0.9x}	0.77	Х	1.4	12	x	11	3.91	x		0.63	x		0.7	=	49.	43	(77)
Southeast _{0.9x}	0.77	х	1.4	12	x	10	4.39	x		0.63	x		0.7	=	45	.3	(77)
Southeast _{0.9x}	0.77	х	1.4	12	x	92	2.85	x		0.63	x		0.7	=	40.	29	(77)
Southeast _{0.9x}	0.77	Х	1.4	12	x	69	9.27	x		0.63	x		0.7	=	30.	06	(77)
Southeast _{0.9x}	0.77	х	1.4	12	x	44	1.07	x		0.63	x		0.7	=	19.	13	(77)
Southeast _{0.9x}	0.77	Х	1.4	12	x	31	1.49	X		0.63	x		0.7	=	13.	66	(77)
Southwest _{0.9x}	0.77	Х	8.5	52	x	36	6.79]		0.63	x		0.7	=	95	.8	(79)
Southwest _{0.9x}	0.77	Х	8.5	52	x	62	2.67]		0.63	x		0.7	=	163	.19	(79)
Southwest _{0.9x}	0.77	х	8.5	52	x	85	5.75]		0.63	x		0.7	=	223	.28	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	10	6.25]		0.63	x		0.7	=	276	.66	(79)
Southwest _{0.9x}	0.77	Х	8.5	52	x	11	9.01]		0.63	x		0.7	=	309	.88	(79)
Southwest _{0.9x}	0.77	х	8.5	52	x	11	8.15]		0.63	X		0.7	=	307	.64	(79)
Southwest _{0.9x}	0.77	х	8.5	52	x	11	3.91]		0.63	X		0.7	=	290	6.6	(79)
Southwest _{0.9x}	0.77	х	8.5	52	x	10	4.39]		0.63	X		0.7	=	271	.81	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	92	2.85]		0.63	X		0.7	=	241	.77	(79)
Southwest _{0.9x}	0.77	x	8.5	52	x	69	9.27]		0.63	X		0.7	=	180	.36	(79)

Southwest _{0.9x} 0.77 x 8.52 x 44.07 0.63 x 0.7 = 11	14.75 (79
Southwest _{0.9x} 0.77 x 8.52 x 31.49 0.63 x 0.7 = 8	1.99 (79
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
83)m= 129.01 225.48 323.73 426.61 501.11 507.73 485.24 428.1 359.11 253.31 155.57 109.73	(83
Fotal gains – internal and solar (84)m = (73)m + (83)m , watts	
84)m= 559.72 653.89 736.92 814.65 863.38 845.33 807.41 757.36 701.81 621.38 552.09 527.73	(84
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	21 (85
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
36)m= 1 1 0.99 0.97 0.9 0.76 0.59 0.64 0.87 0.98 1 1	(86
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
37)m= 19.7 19.86 20.12 20.45 20.74 20.93 20.98 20.98 20.85 20.46 20.02 19.68	(87
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
38)m= 19.94 19.94 19.94 19.95 19.96 19.96 19.96 19.97 19.96 19.96 19.95 19.95	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
39)m= 1 0.99 0.99 0.95 0.86 0.66 0.46 0.51 0.8 0.97 0.99 1	(89
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
90)m= 18.21 18.44 18.82 19.3 19.7 19.92 19.96 19.96 19.83 19.32 18.68 18.18	(90
).16 (91
	,
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 92)m= 18.45	(92
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(3.
Appropriate the mean mean memberature from rable 16, where appropriate	
93)m= 18.45 18.68 19.03 19.48 19.87 20.08 20.13 20.12 20 19.51 18.9 18.42	(93
.,	(93
8. Space heating requirement	(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	(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	(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:	
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: 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1	(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: 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m	(94
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34	
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: 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 Monthly average external temperature from Table 8	(94
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: 04)m= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 05)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 Monthly average external temperature from Table 8 06)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	(94
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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]	(94
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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= 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45	(94 (95
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: 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 25)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 Monthly average external temperature from Table 8 166)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] 267)m= 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	(94 (95
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm, W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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] 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 188)m= 785.87 617.19 520.09 300.68 130.81 0 0 0 0 298.03 561.81 804.35	(94 (95
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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= 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98)m= 785.87 617.19 520.09 300.68 130.81 0 0 0 0 298.03 561.81 804.35 Total per year (kWh/year) = Sum(98) _{1-8,9-12} 40	(94 (95 (96
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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= 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98)m= 785.87 617.19 520.09 300.68 130.81 0 0 0 0 298.03 561.81 804.35 Total per year (kWh/year) = Sum(98)4912 40 Space heating requirement in kWh/m²/year	(94 (95 (97 18.83
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= 1 0.99 0.98 0.95 0.86 0.68 0.48 0.53 0.81 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m 95)m= 557.76 648.82 723 771.46 740.03 571.16 386.36 403.79 565.61 598.25 548.04 526.34 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= 1614.04 1567.26 1422.05 1189.08 915.85 608.89 391.67 412.77 657.63 998.83 1328.33 1607.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98)m= 785.87 617.19 520.09 300.68 130.81 0 0 0 0 298.03 561.81 804.35 Total per year (kWh/year) = Sum(98) _{1-8,9-12} 40	(94 (95 (97 18.83

Fraction of chace heat from main system(s)		(202) = 1 =	(201) =				1	(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)
	Jun Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	
Space heating requirement (calculated above)	Juli Juli	Aug	ОСР	Oct	1404	Dec] Kvvii/yCd	ai
785.87 617.19 520.09 300.68 130.81	0 0	0	0	298.03	561.81	804.35		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$						-	_	(211)
841.4 660.8 556.84 321.93 140.05	0 0	0	0	319.09	601.51	861.19		_
Space heating fuel (secondary), kWh/month		Total	(kWh/yea	ar) =Sum(2	211) _{15,1012}	;=	4302.82	(211)
$= \{[(98) \text{m x } (201)] \} \text{ x } 100 \div (208)$ $(215) \text{m} = $	0 0	T 0 T	0	0	0	0	1	
(213)111= 0 0 0 0	0 0			ar) =Sum(2		_	0	(215)
Water heating			` •	,	715,1012			
Output from water heater (calculated above)					1	1	1	
	48.52 142.2	9 158.62	160.37	182.33	192.72	206.69		7,
Efficiency of water heater (217)m= 88.05 87.83 87.39 86.41 84.42	80.3 80.3	80.3	80.3	86.28	87.59	88.13	80.3	(216) (217)
Fuel for water heating, kWh/month	00.3 00.3	60.3	00.3	00.20	67.59	00.13]	(217)
(219) m = (64) m × $100 \div (217)$ m								
(219)m= 240.51 212.52 224.38 201.55 199.74 1	84.95 177.2		199.71	211.33	220.04	234.52		7
Annual totals		lotal	= Sum(21	19a) ₁₁₂ =	A/I- /		2503.98	(219)
Annual totals Space heating fuel used, main system 1							kWh/year 4302.82	7
Water heating fuel used							2503.98	1
Electricity for pumps, fans and electric keep-hot								┙
central heating pump:						30	1	(230c)
boiler with a fan-assisted flue]]	(230e)
		oum o	of (220a)	(220a) -		45		_
Total electricity for the above, kWh/year sum of (230a)(230g) =							75	(231)
Electricity for lighting							416.32	(232)
Total delivered energy for all uses (211)(221) +	` , ,	, , ,	=				7298.12	(338)
12a. CO2 emissions – Individual heating system	s including r	micro-CHP						
	Energy kWh/year			Emission factor kg CO2/kWh			Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	929.41	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	540.86	
Space and water heating	(261) + (26	2) + (263) + (2	(64) =				1470.27	(265)
. •			,				14/0.2/	
Electricity for pumps, fans and electric keep-hot	(231) x		,	0.5	10	=	38.93	(267)

Electricity for lighting (232) x 0.519 = 216.07 (268)

Total CO2, kg/year sum of (265)...(271) = 1725.26 (272)

TER = 17.78 (273)