Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 Printed on 16 August 2021 at 13:33:10

Project Information:

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

Dwelling Details:

NEW DWELLING AS BUILT

Site Reference: Albany Farm

Total Floor Area: 97.06m²

Plot Reference: Plot 046

Address: 58 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) 17.92 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.84 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.9 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)	ОК
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	ОК

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 4.40
Maximum 10.0

4 Heating efficiency

Main Heating system: Database: (rev 480, 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 Hot water controls:	Programmer, room therm No cylinder thermostat No cylinder	nostat and TRVs	ок
Boiler interlock:	Yes		ОК
Low energy lights			
Percentage of fixed lights win Minimum	th low-energy fittings	100.0% 75.0%	ок
Mechanical ventilation			
Continuous extract system (Specific fan power: Maximum	decentralised)	0.16 0.18 0.7	ОК
Summertime temperature			
Overheating risk (South Eng	yland):	Slight	ОК
sed on:			
Overshading:		Very Little	
Windows facing: North East		5m²	
Windows facing: South Wes		8.52m²	
Windows facing: North Wes	t	1.42m²	
Ventilation rate:		4.00	
Blinds/curtains:		None	
) Key features			
Roofs U-value		0.11 W/m ² K	
Party Walls U-value		0 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

		User Details:				
Assessor Name:	Ben Tunningley	Stroma N	umber:	STRC	0027495	
Software Name:	Stroma FSAP 2012	Software	Version:	Versio	on: 1.0.5.41	
	Pro	operty Address: Plo	ot 046			
Address :	58 Buttercup Road , Bishops	Waltham, SOUTH	AMPTON , SO32	1RJ		
1. Overall dwelling dime	nsions:					
		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))+(3b)+(3c)+(3d)+(3e)+(3n) =	246.05	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hour	
Number of chimneys	0 + 0	+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent far	ns		0	x 10 =	0	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fin	res		0	x 40 =	0	(7c)
				۸: ما	anges nor her	
Infiltration due to chimne	(a. flues and fans(6a) (6b) (7a)			nanges per hou	_
•	ys, flues and fans = (6a)+(6b)+(7a een carried out or is intended, proceed		0 nue from (9) to (16)	÷ (5) =	0	(8)
Number of storeys in th		10 (11), 01110111100 0011111	(0) 10 (10)		0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or (0.35 for masonry co	onstruction		0	(11)
if both types of wall are pr deducting areas of openin	resent, use the value corresponding to t	the greater wall area (af	ter			-
	loor, enter 0.2 (unsealed) or 0.1	(sealed), else ente	er O		0	(12)
If no draught lobby, ent	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 (1	4) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15)	=	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per squar	re metre of envel	ope area	4.40000009536743	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$			0.22	(18)
Air permeability value applies	s if a pressurisation test has been done	or a degree air permea	bility is being used			_
Number of sides sheltere	d	(00) 4 50 07	- (40)I		2	(19)
Shelter factor		(20) = 1 - [0.07]			0.85	(20)
Infiltration rate incorporat		$(21) = (18) \times (2$	0) =		0.19	(21)
Infiltration rate modified for		, , , , , , , , , , , , , , , , , , , 			1	
Jan Feb	Mar Apr May Jun	Jul Aug S	Sep Oct N	ov Dec]	
Monthly average wind sp	eed from Table 7				_	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (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		
۸ جاز، رمده جا زیملازالس		م (مالمين			ما دران ما م		(040) **	(000)					
Adjusted infiltr	0.23	e (allowi	0.21	0.2	0.18	0.18	(21a) x	(22a)m	0.2	0.21	0.22		
Calculate effe	ctive air	change i	l -		l		0.17	0.10	0.2	0.21	0.22		_
If mechanica												0.5	(23a)
If exhaust air h		0		, ,	, ,	. `	,, .	,) = (23a)			0.5	(23b)
If balanced with		-	-	_					SI.) (001) [4 (00.)	0	(23c)
a) If balance (24a)m= 0	ed mecha	anical ve	entilation 0	with he	at recove	ery (MVI	TR) (248	$\frac{a)m = (22)}{0}$	2b)m + (23b) × [1 – (23c) 0	÷ 100] 	(24a)
b) If balance	_							L			0		(Z+a)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	<u> </u>	ļ		<u> </u>	ļ	<u> </u>							,
,	n < 0.5 ×			•	•				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				•	•					-	-		
<u> </u>	n = 1, the	<u>`</u>	<u> </u>	ŕ	<u>`</u>		 						(0.44)
(24d)m= 0	0	0	0	0	0	0	0	(05)	0	0	0		(24d)
Effective air (25)m= 0.5	cnange _{0.5}	rate - er	nter (24a 0.5	0.5	0) or (24)	c) or (24 0.5	0.5	x (25) 0.5	0.5	0.5	0.5		(25)
()	1	l	0.0	0.0	0.0	0.0			0.0	0.0	0.0		(=0)
3. Heat losse					NInt Au		Herel		A V 11		la contra	A V	1.
3. Heat losse	s and he Gros area	SS	oaramete Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m²-ł		
	Gros	SS	Openin	ıgs						K)			
ELEMENT	Gros	SS	Openin	ıgs	A ,r	m²	W/m2	2K	(W/I	K)			(
ELEMENT Doors Type 1	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K = [(W/l	K)			(26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	ıgs	A ,r	m ²	W/m2 1.4	2K = [= [0.04] = [2.94 2.94	K)			(26)
Doors Type 1 Doors Type 2 Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1	m ²	W/m2 1.4 1.4 /[1/(1.4)+	2K = [2.94 2.94 6.63	K)			(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 5 8.52	m ²	W/m2 1.4 1.4 (1/(1.4)+ (1/(1.4)+	2K = [2.94 2.94 6.63				(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = [= [0.04] = [0.04] = [0.04] = [2.94 2.94 6.63 11.3		kJ/m²-ŀ	< kJ/ł	(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area	ss (m²)	Openin m	gs 1 ²	A ,r 2.1 2.1 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 = [= 0.04] = [0.04] = [0.04] = [= 0.04] = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383		kJ/m²-ŀ	3639.75	(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area e 1 e 2 e 3	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	m² x x1 x1 x1 x1 x2 x3 x4 x5 x <	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	3639.75 4929	(26) (26) (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	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 x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	3639.75 4929	(26) (26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area e 1 e 2 e 3 101.2 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 x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	3639.75 4929 436.77	(26) (26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area 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 48.63 198.3	x x x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	3639.75 4929 436.77	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (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 ***	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 x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45	3639.75 4929 436.77 1918.35 395.28	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area 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 48.53 498.3 42.63 43.92	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9	3639.75 4929 436.77 1918.35 395.28	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Tloor 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/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 9	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (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 Internal ceiling * for windows and	Gros area e 1 e 2 e 3 101.: 48.5 elements	29 33 , m ²	Openin m	indow U-ve	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 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/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 75 18	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6 863.28 431.64	(26) (26) (27) (27) (27) (28) (29) (30) (31) (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 ceiling	Gros area 101.: 48.5 Elements Gros area	29 33 , m ²	Openin m 19.14 0	indow U-ve	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 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	2K = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 75 18	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6 863.28 431.64	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32c)

Heat capacity	Cm = S((A x k)						((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			
(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 not 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 not 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 sper production of hot water heating the loss:	the trust of tr	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 = 1bles 1b, 1 143.41 m(45) ₁₁₂ = 21.51	.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 128. Jan Hot water usage (44)m= 108.43 Energy content of (45)m= 160.8 If instantaneous (46)m= 24.12 Water storage	9, N = 1 9, N = 1 ge hot was all average 5 litres per	+ 1.76 x ater usag hot water person per Mar r day for ea 100.55 used - calc 145.13 ng at point 21.77	Apr Apr 96.61 126.53 of use (not 18.98)	es per da 5% if the of	ay Vd,av lwelling is not and co Jun ctor from 7 88.72 190 x Vd,r 104.76 r storage),	erage = designed to ld) Jul Table 1c x 88.72 m x nm x E 97.08 enter 0 in 14.56 storage	(25 x N) to achieve Aug (43) 92.66 111.4 boxes (46) 16.71 within sa	+ 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 = 1bles 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 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 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 of the water storage water s	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 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 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)
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 volum If community of the water storage a) If manufact Temperature	9, N = 1 9, N = 1 ge hot water set in litres per	ater usage hot water person per Mar 100.55 used - calcate 145.13 ng at point 21.77 including and no tale hot water 100 tale makes a calcate like makes a	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 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) mbi boil	+ 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 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) (48) (49)
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 ng at point 21.77 including and no tale hot water acclared learn 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 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>	,							ı	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 A 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 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)

Total internal	gains =	l.				(66)	m + (67)m	+ (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 620.01	615.26	591.26	553.94	515.52	48	1.22	461.25	470	.13	491.67	529.22	2 570.98	602.77]	(73)
6. Solar gains	S:														
Solar gains are	calculated	using sola	r flux from	Table 6a	and a	associ	ated equa	tions	to co	nvert to the	e applic	able orientat	ion.		
Orientation:			Area			Flu			_	g_ -		FF		Gains	
	Table 6d		m²			Tal	ole 6a		Т	able 6b		Table 6c		(W)	
Northeast _{0.9x}	1	Х		5	x [1	1.28	X		0.45	x	1.11	=	25.39	(75)
Northeast _{0.9x}	1	X		5	x [2	2.97	x		0.45	X	1.11	=	51.68	(75)
Northeast _{0.9x}	1	Х		5	x [4	1.38	X		0.45	x	1.11	=	93.1	(75)
Northeast _{0.9x}	1	X		5	x	6	7.96	X		0.45	X	1.11	=	152.9	(75)
Northeast _{0.9x}	1	Х		5	x	9	1.35	X		0.45	X	1.11	=	205.53	(75)
Northeast _{0.9x}	1	X		5	x	9	7.38	X		0.45	X	1.11	=	219.12	(75)
Northeast _{0.9x}	1	X		5	X	ę	91.1	X		0.45	X	1.11	=	204.98	(75)
Northeast _{0.9x}	1	X		5	X	7	2.63	X		0.45	X	1.11	=	163.41	(75)
Northeast _{0.9x}	1	X		5	x	5	0.42	X		0.45	X	1.11	=	113.45	(75)
Northeast _{0.9x}	1	X		5	X	2	8.07	X		0.45	X	1.11	=	63.15	(75)
Northeast _{0.9x}	1	X	5	5	x	•	14.2	X		0.45	X	1.11	=	31.94	(75)
Northeast _{0.9x}	1	X		5	x	(9.21	X		0.45	X	1.11	=	20.73	(75)
Southwest _{0.9x}	1	X	8.8	52	x	3	6.79			0.45	X	1.11	=	141.07	(79)
Southwest _{0.9x}	1	Х	8.8	52	x	6	2.67			0.45	x	1.11	=	240.29	(79)
Southwest _{0.9x}	1	X	8.8	52	x	8	5.75			0.45	X	1.11	=	328.78	(79)
Southwest _{0.9x}	1	X	8.8	52	x [10	06.25			0.45	X	1.11	=	407.37	(79)
Southwest _{0.9x}	1	Х	8.8	52	x	1	19.01			0.45	X	1.11	=	456.29	(79)
Southwest _{0.9x}	1	Х	8.5	52	x	1	18.15			0.45	X	1.11	=	452.99	(79)
Southwest _{0.9x}	1	X	8.8	52	x	1	13.91			0.45	X	1.11	=	436.73	(79)
Southwest _{0.9x}	1	X	8.8	52	x	10	04.39			0.45	X	1.11	=	400.23	(79)
Southwest _{0.9x}	1	X	8.8	52	x	9	2.85			0.45	X	1.11	=	355.99	(79)
Southwest _{0.9x}	1	X	8.8	52	x	6	9.27			0.45	X	1.11	=	265.57	(79)
Southwest _{0.9x}	1	X	8.8	52	x	4	4.07			0.45	X	1.11	=	168.97	(79)
Southwest _{0.9x}	1	X	8.8	52	X	3	1.49			0.45	×	1.11	=	120.72	(79)
Northwest 0.9x	1	X	1.4	12	x	1	1.28	X		0.45	X	1.11	=	7.21	(81)
Northwest _{0.9x}	1	X	1.4	12	x	2	2.97	X		0.45	X	1.11	=	14.68	(81)
Northwest _{0.9x}	1	X	1.4	12	x	4	1.38	X		0.45	X	1.11	=	26.44	(81)
Northwest 0.9x	1	X	1.4	12	X	6	7.96	X		0.45	X	1.11	=	43.42	(81)
Northwest _{0.9x}	1	X	1.4	12	x	9	1.35	X		0.45	X	1.11	=	58.37	(81)
Northwest 0.9x	1	X	1.4	12	x	9	7.38	x		0.45	X	1.11	=	62.23	(81)
Northwest 0.9x	1	х	1.4	12	x	(91.1	x		0.45	X	1.11	=	58.21	(81)
Northwest 0.9x	1	Х	1.4	12	x	7	2.63	x		0.45	X	1.11	=	46.41	(81)
Northwest 0.9x	1	X	1.4	12	x	5	0.42	x		0.45	x	1.11	=	32.22	(81)
Northwest 0.9x	1	x	1.4	12	x	2	8.07	x		0.45	x	1.11	=	17.93	(81)

Northwest 0.9x													
	1	х	1.4	12	х	14.2	х	0.45	х	1.11	=	9.07	(81)
Northwest 0.9x	1	x	1.4	12	x	9.21	x	0.45	x	1.11	<u> </u>	5.89	(81)
Solar gains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m= 173.66	306.64	448.32	603.69	720.19	734.33	699.92	610.05	501.66	346.66	209.98	147.34		(83)
Total gains – i	internal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts	•	•		•			
(84)m= 793.67	921.9	1039.58	1157.63	1235.7	1215.55	1161.17	1080.18	993.33	875.88	780.96	750.11		(84)
7. Mean inter	rnal temp	erature	(heating	season)								
Temperature						from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation fac	_	٠.			•			` ,			I		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.92	0.84	0.7	0.54	0.4	0.44	0.67	0.88	0.96	0.98		(86)
` ′	ļ	<u> </u>		T. "	ļ	0		<u> </u>					
Mean interna	· ·	1		· `	i	i	i	·	00.55	00.04	40.00		(97)
(87)m= 19.68	19.91	20.22	20.58	20.83	20.96	20.99	20.98	20.9	20.55	20.04	19.62		(87)
Temperature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 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 r	est of d	welling,	h2,m (se	ee Table	9a)						
(89)m= 0.97	0.95	0.9	0.81	0.65	0.46	0.31	0.35	0.59	0.85	0.95	0.98		(89)
Mean interna	l temper	atura in t	the rest	of dwalli	na T2 (f	ollow etc	ne 3 to	Tin Tahl	o 0c)	<u> </u>			
(90)m= 18.81	19.03	19.34	19.66	19.88	19.97	19.99	19.99	19.94	19.65	19.16	18.75		(90)
10.01	10.00	10.04	10.00	10.00	10.07	10.00	10.00	Į		g area ÷ (4		0.16	(91)
									Er (— Erviii	g aroa . (., –	0.16	(91)
Mean interna	al temper	ature (fo	r the wh		lling) = f	LA × T1	+ (1 – fL	A) × T2			-		
(92)m= 18.95	19.17	19.48	19.81	20.04	20.13	20.15	20.15	20.09	19.8	19.31	18.89		(92)
Apply adjustr	ment to t	ne mean	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 18.8	19.02	19.33	19.66	19.89	19.98	20	20	19.94	19.65	19.16	18.74		(93)
8. Space hea													
Set Ti to the			•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation					1	11	A	0	0-4	Nierr	Daa		
Jan Utilisation for	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.94	1		0.64			1			0.04	0.97		(94)
(94)m= 0.96		0.89	0.79				1 0 2E	0.50	0.00		I 0.97 I		(34)
oseiui gains,	, nmom ,	14/ (0/	1) > (0	l	0.46	0.31	0.35	0.59	0.83	0.94			
(05)m 764.22	9646	W = (94)	, ,	4)m	ļ		l	ı		<u> </u>			(95)
(95)m= 764.23	<u> </u>	925.23	919.7	4)m 795.53	560.42	362.55	381.91	0.59 583.92	730.71	733.46	726.89		(95)
Monthly aver	age exte	925.23 rnal tem	919.7 perature	4)m 795.53	560.42 able 8	362.55	381.91	583.92	730.71	733.46	726.89		, ,
Monthly aver (96)m= 4.3	age exte	925.23 rnal tem 6.5	919.7 perature 8.9	4)m 795.53 e from Ta	560.42 able 8	362.55 16.6	381.91	583.92	730.71	<u> </u>			(95) (96)
Monthly aver (96)m= 4.3 Heat loss rat	age exte	925.23 rnal tem 6.5 an intern	919.7 perature 8.9 al tempe	4)m 795.53 e from Ta 11.7 erature,	560.42 able 8 14.6 Lm , W :	362.55 16.6 =[(39)m 2	381.91 16.4 x [(93)m	583.92 14.1 – (96)m	730.71	733.46	726.89		(96)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34	age exte 4.9 e for mea	925.23 rnal tem 6.5 an intern 1376.78	919.7 perature 8.9 al tempe	4)m 795.53 e from Ta 11.7 erature, 878.61	560.42 able 8 14.6 Lm , W =	362.55 16.6 =[(39)m : 365.35	381.91 16.4 x [(93)m 386.5	583.92 14.1 – (96)m 627.15	730.71 10.6] 970.89	733.46	726.89		, ,
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34 Space heatin	4.9 e for means 1515.45	925.23 rnal tem 6.5 an intern 1376.78 ement fo	919.7 perature 8.9 al tempe 1154.78 r each n	4)m 795.53 e from Ta 11.7 erature, 878.61 nonth, k	560.42 able 8 14.6 Lm , W : 577.67	362.55 16.6 =[(39)m: 365.35 th = 0.02	381.91 16.4 x [(93)m 386.5 24 x [(97	583.92 14.1 — (96)m 627.15)m — (95	730.71 10.6] 970.89)m] x (4	733.46 7.1 1293.74 1)m	726.89 4.2 1560.22		(96)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34	4.9 e for means 1515.45	925.23 rnal tem 6.5 an intern 1376.78	919.7 perature 8.9 al tempe	4)m 795.53 e from Ta 11.7 erature, 878.61	560.42 able 8 14.6 Lm , W =	362.55 16.6 =[(39)m : 365.35	381.91 16.4 x [(93)m 386.5 24 x [(97	583.92 14.1 - (96)m 627.15)m - (95	730.71 10.6] 970.89)m] x (4 178.7	733.46 7.1 1293.74 1)m 403.4	726.89 4.2 1560.22		(96)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34 Space heatin	4.9 e for means 1515.45	925.23 rnal tem 6.5 an intern 1376.78 ement fo	919.7 perature 8.9 al tempe 1154.78 r each n	4)m 795.53 e from Ta 11.7 erature, 878.61 nonth, k	560.42 able 8 14.6 Lm , W : 577.67	362.55 16.6 =[(39)m: 365.35 th = 0.02	381.91 16.4 x [(93)m 386.5 24 x [(97	583.92 14.1 — (96)m 627.15)m — (95	730.71 10.6] 970.89)m] x (4 178.7	733.46 7.1 1293.74 1)m 403.4	726.89 4.2 1560.22	2795.8	(96)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34 Space heatin	4.9 e for mea 1515.45 ng require 437.37	925.23 Frnal tem 6.5 an intern 1376.78 ement fo 335.95	919.7 perature 8.9 al tempe 1154.78 r each n 169.25	4)m 795.53 e from Ta 11.7 erature, 878.61 nonth, k	560.42 able 8 14.6 Lm , W : 577.67	362.55 16.6 =[(39)m: 365.35 th = 0.02	381.91 16.4 x [(93)m 386.5 24 x [(97	583.92 14.1 - (96)m 627.15)m - (95	730.71 10.6] 970.89)m] x (4 178.7	733.46 7.1 1293.74 1)m 403.4	726.89 4.2 1560.22	2795.8	(96)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34 Space heatin (98)m= 589.32	age external 4.9 e for mean 1515.45 ng require 437.37	925.23 Franch tem 6.5 an intern 1376.78 ement fo 335.95 ement in	919.7 perature 8.9 al tempe 1154.78 r each n 169.25	4)m 795.53 e from Ta 11.7 erature, 878.61 nonth, kt 61.81	560.42 able 8 14.6 Lm , W : 577.67 Wh/mon	362.55 16.6 =[(39)m : 365.35 th = 0.02	381.91 16.4 x [(93)m 386.5 24 x [(97 0	583.92 14.1 — (96)m 627.15)m — (95 0	730.71 10.6] 970.89)m] x (4 178.7	733.46 7.1 1293.74 1)m 403.4	726.89 4.2 1560.22		(96) (97)
Monthly aver (96)m= 4.3 Heat loss rat (97)m= 1556.34 Space heatin (98)m= 589.32	age external 4.9 e for mean 1515.45 ng require 437.37 ng require quiremen 1515.45	925.23 Franch tem 6.5 Franch intern 1376.78 Franch for 335.95 Franch tem 1376.78 Franch intern 1376.78 Franch intern 1376.78	919.7 perature 8.9 al tempe 1154.78 r each n 169.25 kWh/m²	4)m 795.53 e from Ta 11.7 erature, 878.61 nonth, kl 61.81 e/year eating s	560.42 able 8 14.6 Lm , W : 577.67 Wh/mon 0	362.55 16.6 =[(39)m : 365.35 th = 0.02 0	381.91 16.4 x [(93)m 386.5 24 x [(97 0	583.92 14.1 — (96)m 627.15)m — (95 0	730.71 10.6] 970.89)m] x (4 178.7	733.46 7.1 1293.74 1)m 403.4	726.89 4.2 1560.22		(96) (97)

Fraction of space	heat from r	main syst	tem(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total h	eating from	main sy	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of main	space hea	iting syste	em 1								90.5	(206)
Efficiency of seco	ndary/supp	lementar	y heating	g system	າ, %						0	(208)
	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating red	' 	<u> </u>	·			l 0	0	470.7	402.4	620	1	
			61.81	0	0	0	0	178.7	403.4	620]	(044)
$(211)m = \{[(98)m \times 651.19 \mid 483]\}$			68.3	0	0	0	0	197.46	445.74	685.08	1	(211)
							l (kWh/yea				3089.28	(211)
Space heating fue	el (seconda	ry), kWh/	month									_
$= \{[(98)m \times (201)]\}$	•	• ,									_	
(215)m= 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating	hootor (ook	ouloted a	hovo)									
Output from water			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= 89.75 89	65 89.45	89.02	88.28	87.3	87.3	87.3	87.3	89.04	89.58	89.79		(217)
Fuel for water heat	-											
(219)m = (64) m x (219) m = 194.5 170			153.11	135.25	126.96	143.36	144.38	163	174.95	188.75]	
						Tota	I = Sum(2	19a) ₁₁₂ =		l	1929.72	(219)
Annual totals								k\	Wh/year	•	kWh/year	_
Space heating fuel	used, mair	า system	1								3089.28	╛
Water heating fuel	used										1929.72	
Electricity for pump	s, fans and	d electric	keep-ho	t								
mechanical ventil	ation - bala	nced, ext	ract or p	ositive i	nput fron	n outside	e			64.97]	(230
central heating pu	mp:									30]	(230
boiler with a fan-a	ssisted flue	Э								45	j	(230
Total electricity for	the above,	kWh/yea	ır			sum	of (230a).	(230g) =			139.97	(231)
Electricity for lighting	าต	·									402.56	⊐
Electricity generate											-481.92	」`
Total delivered ene	•	ueoe (211) (221)	± (221)	T (333)	(237h)	_				5079.61](338)
		13C3 (Z I I)(~~ 1)	T (231)	+ (232).	(2370)					307 9.01	
40 -												
10a. Fuel costs -			stems:									
10a. Fuel costs -			stems:	Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
10a. Fuel costs - Space heating - ma	ndividual h	eating sy	stems:	kW					12)	x 0.01 =		(240)
	ndividual h	eating sy	rstems:	kW (21	/h/year			(Table	12) 8	x 0.01 = x 0.01 =	£/year](240)](241)

Water heating cost (other fuel)	(219)	3.48 x 0.01 =	67.15 (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) s			
Energy for lighting	(232)	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) as needed		
	.(247) + (250)(254) =		302.66 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255) x	(256)] ÷ $[(4) + 45.0]$ =		0.89 (257)
SAP rating (Section 12)			87.52 (258)
12a. CO2 emissions – Individual heating syst	ems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	667.29 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	416.82 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1084.1 (265)
Electricity for pumps, fans and electric keep-ho	ot (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	SU	m of (265)(271) =	1115.56 (272)
CO2 emissions per m²	(2	72) ÷ (4) =	11.49 (273)
EI rating (section 14)			89 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	3768.93 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2354.26 (264)
Space and water heating	(261) + (262) + (263) + (264) =		6123.18 (265)
Electricity for pumps, fans and electric keep-ho	ot (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) = 6309.25 (272)

 Primary energy kWh/m²/year
 $(272) \div (4) =$ 65 (273)

		User Det	ails:				
Assessor Name:	Ben Tunningley		troma Num	nber:	STRC	0027495	
Software Name:	Stroma FSAP 2012	S	oftware Ve	rsion:	Versio	on: 1.0.5.41	
		Property Ad	dress: Plot 04	l 6			
Address :	58 Buttercup Road , Bish	nops Waltham	, SOUTHAMF	PTON , SO32 1F	₹J		
1. Overall dwelling dime	ensions:						
Ground floor		Area(r		Av. Height(m)	(2a) =	Volume(m³)) (3a)
First floor					_		Ⅎ`
	a) . (1b) . (1a) . (1d) . (1a) .	48.5		2.67	(2b) =	129.58	(3b)
	a)+(1b)+(1c)+(1d)+(1e)+	.(1n) 97.0		.).(2-).(2-1).(2-).	(0)		_
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+	(3n) =	246.05	(5)
2. Ventilation rate:	main secon	dary of	her	total		m³ per hou	r
Number of chimneys	heating heating	ng ˙			40 =		_
Number of chimneys			<u> </u>	0	20 =	0	(6a)
Number of open flues		Ť	0 =			0	(6b)
Number of intermittent fa			Ĺ		10 =	0	(7a)
Number of passive vents			Ĺ	0	10 =	0	(7b)
Number of flueless gas fi	res		L	0 ×	40 =	0	(7c)
					Air ch	nanges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b	o)+(7a)+(7b)+(7c)	= [0	÷ (5) =	0	(8)
	peen carried out or is intended, pro	oceed to (17), oth	erwise continue f	rom (9) to (16)			-
Number of storeys in the Additional infiltration	he dwelling (ns)			1/0	N 41-0 4	0	(9)
	.25 for steel or timber frame	or 0.35 for m	naeonry conet		9)-1]x0.1 =	0	(10)
	resent, use the value correspondir		=	raction		0	(11)
deducting areas of openii	- :	0.4.4.1.11					_
·	floor, enter 0.2 (unsealed) o	or 0.1 (sealed)	, else enter 0			0	(12)
If no draught lobby, en	ter 0.05, eise enter 0 s and doors draught strippe	.d				0	(13)
Window infiltration	s and doors draught strippe		25 - [0.2 x (14) ÷	100] =		0	(14)
Infiltration rate				12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic me	etres per hour	per square m	netre of envelop	e area	4.4000000953674	= '
If based on air permeabil	lity value, then $(18) = [(17) \div 20]$	0]+(8), otherwise	(18) = (16)			0.22	(18)
	es if a pressurisation test has been	done or a degre	e air permeability	is being used			_
Number of sides sheltere Shelter factor	ed	(20	0) = 1 - [0.075 x (19)1 =		2	(19)
Infiltration rate incorporate	ting shelter factor	•	$(0.073 \times (0.073 \times ($	/1		0.85	$\frac{1}{2}$
Infiltration rate modified f	-	(2	., (.0, 1 (20) =			0.19	(21)
Jan Feb	Mar Apr May Ju	ın Jul	Aug Sep	Oct Nov	Dec	1	
Monthly average wind sp			<u> </u>	1 2	1	1	
,	1 1		<u> </u>	1 1		7	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

(22)m=

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
۸ جاز، رمده جا زیملازالس		a (allawi			ما دران ما م		(040) **	(000)					
Adjusted infiltr	0.23	e (allowi	0.21	0.2	0.18	0.18	(21a) x	(22a)m	0.2	0.21	0.22		
Calculate effe	ctive air	change i	l -		l		0.17	0.10	0.2	0.21	0.22		_
If mechanica												0.5	(23a)
If exhaust air h		0		, ,	, ,	. `	,, .	,) = (23a)			0.5	(23b)
If balanced with		-	-	_					SI.) (001) [4 (00.)	0	(23c)
a) If balance (24a)m= 0	ed mecha	anical ve	entilation 0	with he	at recove	ery (MVI	TR) (248	$\frac{a)m = (22)}{0}$	2b)m + (23b) × [1 – (23c) 0	÷ 100] 	(24a)
b) If balance	_							L			0		(Z+a)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	<u> </u>	ļ		<u> </u>	ļ	<u> </u>							,
,	n < 0.5 ×			•	•				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				•	•					-	-		
<u> </u>	n = 1, the	<u>`</u>	<u> </u>	ŕ	<u>`</u>		 						(0.44)
(24d)m= 0	0	0	0	0	0	0	0	(05)	0	0	0		(24d)
Effective air (25)m= 0.5	cnange _{0.5}	rate - er	nter (24a 0.5	0.5	0) or (24)	c) or (24 0.5	0.5	x (25) 0.5	0.5	0.5	0.5		(25)
()	1	l	0.0	0.0	0.0	0.0			0.0	0.0	0.0		(=0)
3. Heat losse					NInt Au		Herel		A V 11		la contra	A V	1.
3. Heat losse	s and he Gros area	SS	oaramete Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m²-ł		
	Gros	SS	Openin	ıgs						K)			
ELEMENT	Gros	SS	Openin	ıgs	A ,r	m²	W/m2	2K	(W/I	K)			(
ELEMENT Doors Type 1	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K = [(W/l	K)			(26)
ELEMENT Doors Type 1 Doors Type 2	Gros area	SS	Openin	ıgs	A ,r	m ²	W/m2 1.4	2K = [= [0.04] = [2.94 2.94	K)			(26)
Doors Type 1 Doors Type 2 Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1	m ²	W/m2 1.4 1.4 /[1/(1.4)+	2K = [2.94 2.94 6.63	K)			(26) (26) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area	SS	Openin	ıgs	A ,r 2.1 2.1 5 8.52	m ²	W/m2 1.4 1.4 (1/(1.4)+ (1/(1.4)+	2K = [2.94 2.94 6.63				(26) (26) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type	Gros area	ss (m²)	Openin	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = [= [0.04] = [0.04] = [0.04] = [2.94 2.94 6.63 11.3		kJ/m²-ŀ	< kJ/ł	(26) (26) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor	Gros area	ss (m²)	Openin m	gs 1 ²	A ,r 2.1 2.1 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 = [= 0.04] = [0.04] = [0.04] = [= 0.04] = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383		kJ/m²-ŀ	3639.75	(26) (26) (27) (27) (27) (27)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area e 1 e 2 e 3	29 53	Openin m	gs 1 ²	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	m² x x1 x1 x1 x1 x2 x3 x4 x5 x <	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	3639.75 4929	(26) (26) (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	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 x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	eK = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-ŀ	3639.75 4929	(26) (26) (27) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area e 1 e 2 e 3 101.2 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 x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	3639.75 4929 436.77	(26) (26) (27) (27) (27) (27) (28) (29) (30) (31)
Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area 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 48.63 198.3	x x x1	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9	3639.75 4929 436.77	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (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 ***	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 x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45	3639.75 4929 436.77 1918.35 395.28	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall Internal wall ** Internal wall **	Gros area 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 48.53 498.3 42.63 43.92	m ²	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9	3639.75 4929 436.77 1918.35 395.28	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Windows Type Windows Type Tloor 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/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24 0.11	EK = [-0.04] = [-0.0	(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 9	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (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 Internal ceiling * for windows and	Gros area e 1 e 2 e 3 101.: 48.5 elements	29 33 , m ²	Openin m	indow U-ve	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 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/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 75 18	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6 863.28 431.64	(26) (26) (27) (27) (27) (28) (29) (30) (31) (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 ceiling	Gros area 101.: 48.5 Elements Gros area	29 33 , m ²	Openin m 19.14 0	indow U-ve	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 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	2K = [(W/l 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		75 60 9 45 9 75 18	3639.75 4929 436.77 1918.35 395.28 1188.043 2937.6 863.28 431.64	(26) (26) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32c)

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 then Total fabric h		are not kn	own (36) =	= 0.05 x (3	1)			(22) 1	(36) =			00.74	7(27)
Ventilation h		alculated	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 or	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 108.43	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 - calculated 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	tater usage hot water person per Mar 100.55 used - calculated 145.13 ang 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)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual reduce the	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litres	ater usage hot water person per Mar 100.55 145.13 145.13 177 21.77	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) litres in	(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 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		(43) (44) (45) (46)
if TFA > 13 if TFA £ 13 Annual avera Reduce the annual reduce the	3.9, N = 1 3.9, N = 1 age hot was aual average 25 litres per litre	ater usage hot water person per Mar 100.55 145.13 145.13 177 21.77	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) litres in	(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 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		(43) (44) (45) (46)
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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 (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pumpi (70)m=	gains from 56.91 ude (57)r ternal ga colic gain 135.53 ng gains 23.57 unces 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	+ (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 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	+ (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)

Committee Com	Total internal	gains =				((66)m + (67)r	n + (68	8)m +	+ (69)m + (70)m +	(71)m + (72)	m		
Solar gains are calculated using solar flux from Table 6a and associated equatives to convent to the applicable orientation. Access Factor Table 6d m²	(73)m= 418.21	415.9	400.69	376.12	351.02	327.0	3 311.6	318	3.02	330.78	355.5	7 384.01	405.5]	(73)
Orientation: Access Factor Table 6d	6. Solar gains	S:			•										
Northeast 0.9x	Solar gains are o	alculated	using sola	r flux from	Table 6a	and ass	ociated equa	ations	to co	onvert to the	e applic	able orientat	ion.		
Northeast 0 sk 0.77					l				_						
Northeast 0.9x	l _	able 6d					able 6a	_		able 6b	_	l able 6c		(VV)	
Northeast 0.9x	<u> </u>	0.77	X		5	x	11.28	X		0.45	X	1.11	=	19.55	(75)
Northeast 0.9% 0.77	Northeast 0.9x	0.77	X		5	x	22.97	X		0.45	X	1.11	=	39.79	(75)
Northeast 0.9x	<u> </u>	0.77	X		5	x	41.38	X		0.45	X	1.11	=	71.69	(75)
Northeast 0.9x	<u> </u>	0.77	X		5	x	67.96	X		0.45	X	1.11	=	117.73	(75)
Northeast 0.9x	<u> </u>	0.77	X		5	x	91.35	X		0.45	X	1.11	=	158.26	(75)
Northeast 0.9x	<u> </u>	0.77	X		5	x	97.38	X		0.45	X	1.11	=	168.72	(75)
Northeast 0.9x	<u> </u>	0.77	X		5	X	91.1	X		0.45	X	1.11	=	157.83	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X		5	x	72.63	X		0.45	X	1.11	=	125.83	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	Х		5	x	50.42	X		0.45	X	1.11	=	87.35	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X		5	x	28.07	X		0.45	X	1.11	=	48.63	(75)
Southwesto,9x	Northeast _{0.9x}	0.77	X		5	x	14.2	X		0.45	x	1.11	=	24.6	(75)
Southwest0.9x	Northeast _{0.9x}	0.77	X		5	X	9.21	X		0.45	X	1.11	=	15.96	(75)
Southwesto, 9x 0.77	Southwest _{0.9x}	0.77	X	8.	52	X	36.79			0.45	X	1.11	=	108.62	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	X	8.	52	X	62.67			0.45	X	1.11	=	185.02	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	X	8.	52	x	85.75			0.45	X	1.11	=	253.16	(79)
Southwesto.9x 0.77 x 8.52 x 118.15 0.45 x 1.11 = 348.8 (79) Southwesto.9x 0.77 x 8.52 x 113.91 0.45 x 1.11 = 336.28 (79) Southwesto.9x 0.77 x 8.52 x 104.39 0.45 x 1.11 = 336.28 (79) Southwesto.9x 0.77 x 8.52 x 92.85 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 292.96 (79) Northwesto.9x 0.77	Southwest _{0.9x}	0.77	X	8.	52	x	106.25			0.45	X	1.11	=	313.67	(79)
Southwesto.9x 0.77 x 8.52 x 113.91 0.45 x 1.11 = 336.28 (79) Southwesto.9x 0.77 x 8.52 x 104.39 0.45 x 1.11 = 308.18 (79) Southwesto.9x 0.77 x 8.52 x 92.85 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 204.49 (79) Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 204.49 (79) Northwest 0.9x 0.77 x 1.42 x 11.28 x 0.45 x 1.11 = 5.55 (81) Northwest 0.9x	Southwest _{0.9x}	0.77	X	8.	52	x	119.01			0.45	X	1.11	=	351.34	(79)
Southwesto.9x 0.77 x 8.52 x 104.39 0.45 x 1.11 = 308.18 (79) Southwesto.9x 0.77 x 8.52 x 92.85 0.45 x 1.11 = 274.12 (79) Southwesto.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 204.49 (79) Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 204.49 (79) Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 130.1 (79) Southwesto.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 130.1 (79) Northwesto.9x 0.77 x 1.42 x 22.97 x 0.45 x 1.11 = 11.3 (81) Northwesto.9x	Southwest _{0.9x}	0.77	X	8.	52	x	118.15			0.45	X	1.11	=	348.8	(79)
Southwest0.9x 0.77 x 8.52 x 92.85 0.45 x 1.11 = 274.12 (79) Southwest0.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 204.49 (79) Southwest0.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 130.1 (79) Southwest0.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 130.1 (79) Northwest 0.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 11.28 x 0.45 x 1.11 = 5.55 (81) Northwest 0.9x 0.77 x 1.42 x 41.38 x 0.45 x 1.11 = 20.36 (81) Northwe	Southwest _{0.9x}	0.77	X	8.	52	x	113.91			0.45	x	1.11	=	336.28	(79)
Southwesto.9x 0.77 x 8.52 x 69.27 0.45 x 1.11 = 204.49 (79) Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 130.1 (79) Southwesto.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 11.28 x 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 22.97 x 0.45 x 1.11 = 5.55 (81) Northwest 0.9x 0.77 x 1.42 x 41.38 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 91.35 x 0.45 x 1.11 = 44.94 (81)	Southwest _{0.9x}	0.77	Х	8.	52	x	104.39			0.45	x	1.11	=	308.18	(79)
Southwesto.9x 0.77 x 8.52 x 44.07 0.45 x 1.11 = 130.1 (79) Southwesto.9x 0.77 x 8.52 x 31.49 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 11.28 x 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 22.97 x 0.45 x 1.11 = 5.55 (81) Northwest 0.9x 0.77 x 1.42 x 41.38 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 67.96 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 91.35 x 0.45 x 1.11 = 44.94	Southwest _{0.9x}	0.77	X	8.	52	x	92.85			0.45	x	1.11	=	274.12	(79)
Southwest _{0.9x} 0.77 x 8.52 x 31.49 0.45 x 1.11 = 92.96 (79) Northwest 0.9x 0.77 x 1.42 x 11.28 x 0.45 x 1.11 = 5.55 (81) Northwest 0.9x 0.77 x 1.42 x 22.97 x 0.45 x 1.11 = 11.3 (81) Northwest 0.9x 0.77 x 1.42 x 41.38 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 67.96 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 91.35 x 0.45 x 1.11 = 44.94 (81) Northwest 0.9x 0.77 x 1.42 x 97.38 x 0.45 x 1.11 =	Southwest _{0.9x}	0.77	Х	8.	52	x	69.27			0.45	x	1.11	=	204.49	(79)
Northwest 0.9x	Southwest _{0.9x}	0.77	X	8.	52	x	44.07			0.45	x	1.11	=	130.1	(79)
Northwest 0.9x 0.77 x 1.42 x 22.97 x 0.45 x 1.11 = 11.3 (81) Northwest 0.9x 0.77 x 1.42 x 41.38 x 0.45 x 1.11 = 20.36 (81) Northwest 0.9x 0.77 x 1.42 x 67.96 x 0.45 x 1.11 = 33.44 (81) Northwest 0.9x 0.77 x 1.42 x 97.38 x 0.45 x 1.11 = 44.94 (81) Northwest 0.9x 0.77 x 1.42 x 97.38 x 0.45 x 1.11 = 47.92 (81) Northwest 0.9x 0.77 x 1.42 x 91.1 x 0.45 x 1.11 = 44.82 (81) Northwest 0.9x 0.77 x 1.42 x 72.63 x 0.45 x 1.11	Southwest _{0.9x}	0.77	X	8.	52	x	31.49			0.45	x	1.11	=	92.96	(79)
Northwest 0.9x	Northwest 0.9x	0.77	X	1.	42	x	11.28	X		0.45	x	1.11	=	5.55	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	Х	1.	42	x	22.97	X		0.45	x	1.11	=	11.3	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	1.	42	x	41.38	X		0.45	x	1.11	=	20.36	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	1.	42	x	67.96	X		0.45	×	1.11		33.44	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	1.	42	х	91.35	x		0.45	x	1.11	=	44.94	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	1.	42	x	97.38	X		0.45	x	1.11	=	47.92	(81)
Northwest 0.9x 0.77 x 1.42 x 50.42 x 0.45 x 1.11 = 24.81 (81)	Northwest _{0.9x}	0.77	X	1.	42	x	91.1	j ×		0.45	×	1.11	=	44.82	(81)
Northwest 0.9x 0.77 x 1.42 x 50.42 x 0.45 x 1.11 = 24.81 (81)	Northwest _{0.9x}	0.77	X	1.	42	x	72.63	j ×		0.45	×	1.11	=	35.73	(81)
	Northwest _{0.9x}		x			x		j x	Ī	0.45	x		=	24.81	(81)
	Northwest _{0.9x}	0.77	x	1.	42	x	28.07	x		0.45	x	1.11	=	13.81	(81)

Northwest 0.9x	0.77	X	1.4	12	x	14.2	x	0.45	x	1.11	=	6.99	(81)
Northwest _{0.9x}	0.77	Х	1.4	12	x	9.21	x	0.45	x	1.11	=	4.53	(81)
Solar gains in						1	`	Sum(74)m .	· · ·			1	
(83)m= 133.72	ļ	345.21	464.84	554.54	565.43	538.94	469.74	386.28	266.93	161.69	113.46		(83)
Total gains – i					`		T 707 70	T - 1 - 2 - 2			540.05	1	(0.4)
(84)m= 551.93	652.02	745.89	840.97	905.56	892.47	850.54	787.76	717.06	622.5	545.7	518.95	J	(84)
7. Mean inter			`		<i>'</i>								
Temperature	_	• .			•		ble 9, Th	11 (°C)				21	(85)
Utilisation fac	T				<u> </u>	 						1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ļ	(00)
(86)m= 0.99	0.99	0.97	0.93	0.83	0.68	0.53	0.58	0.81	0.95	0.99	0.99	J	(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tab	le 9c)	1	1		1	
(87)m= 19.39	19.59	19.92	20.33	20.68	20.9	20.97	20.96	20.79	20.32	19.77	19.33]	(87)
Temperature	during h	neating p	eriods ir	rest of	dwellin	g 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	0.91	0.79	0.6	0.42	0.47	0.74	0.94	0.98	0.99		(89)
Mean interna	al temper	ature in	the rest	of dwelli	ng T2 (follow ste	eps 3 to	7 in Tabl	le 9c)	•		•	
(90)m= 18.52	18.73	19.05	19.44	19.77	19.94	19.99	19.98	19.87	19.44	18.9	18.47]	(90)
	<u>!</u>	•				•		1	fLA = Livin	g area ÷ (4) =	0.16	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	llina) =	fLA × T1	+ (1 – fl	A) x T2					_
(92)m= 18.66	18.87	19.19	19.59	19.92	20.1	20.15	20.14	20.02	19.59	19.04	18.61]	(92)
Apply adjustr	ment to t	he mean	interna	temper	ature fr	om Table	4e, wh	ere appro	opriate			I	
(93)m= 18.51	18.72	19.04	19.44	19.77	19.95	20	19.99	19.87	19.44	18.89	18.46		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ed at s	tep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-cald	culate	
the utilisation	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Utilisation fac	1		· ·	iviay	Jun	1 Jui	Aug	Сер	1 001	INOV	Dec	l	
(94)m= 0.99	0.98	0.95	0.89	0.78	0.6	0.42	0.47	0.73	0.92	0.98	0.99]	(94)
Useful gains,	, hmGm	, W = (9 ⁴	4)m x (8	4)m	!		!	!	!	!	<u>!</u>	1	
(95)m= 545.12	636.78	710.41	751.83	703.75	532.15	356.61	372.55	525.73	574.79	533.71	513.81		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8							•	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat							 	1 ` ´ 				1	
(97)m= 1525.18		1345.72		865.63	573.68	364.44	385.1	618.85	948.25	1265.09	1530		(97)
Space heatin	Ť	1	1	1	I	1	 	i `	í 	r	750.05	1	
(98)m= 729.17	568.51	472.68	272.68	120.44	0	0	0	0	277.85	526.6	756.05	0700.00	
_							I ota	al per year	(KVVh/yeai	r) = Sum(9	Ŏ) _{15,912} =	3723.98	(98)
Space heating	ng require	ement in	kWh/m²	/year								38.37	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating s	ystems	including	g micro-(CHP)					
Space heati	•												_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentar	y system						0	(201)

Fraction of space he	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heat	ing from	main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main sp	ace heat	ting syste	em 1								90.5	(206)
Efficiency of seconda	ary/suppl	ementar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requir 729.17 568.51	ement (c	calculate	d above)	0	0	0	0	277.85	526.6	756.05]	
$(211)m = \{[(98)m \times (201)]\}$	<u> </u>			U	0	0	0	211.03	320.0	730.03		(211)
805.71 628.19	522.29	301.3	133.08	0	0	0	0	307.02	581.87	835.41]	(211)
	<u>ļ</u>		<u> </u>		l .	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	4114.89	(211)
Space heating fuel (s	econdar	y), kWh/	month									_
= {[(98)m x (201)] } x 1	<u> </u>	 									1	
(215)m= 0 0	0	0	0	0	0	0 Tota	0 L(k\Wh/vea	0 ar) =Sum(2	0	0	0	(215)
Water heating						rota	i (RVVIII) y CC	ar) =0am(2	- 1 0/15,1012	•	0	(213)
Output from water hea	ater (calc	ulated a	bove)									
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 hea											87.3	(216)
(217)m= 89.86 89.8	89.67	89.39	88.78	87.3	87.3	87.3	87.3	89.38	89.75	89.9		(217)
Fuel for water heating $(219)m = (64)m \times 10$												
(219)m= 194.25 170.45	177.18	156.44	152.25	135.25	126.96	143.36	144.38	162.38	174.63	188.54		_
						Tota	I = Sum(2				1926.07	(219)
Annual totals Space heating fuel us	ed. main	svstem	1					K	Wh/year		kWh/year 4114.89	7
Water heating fuel use		- ,									1926.07	_
Electricity for pumps,		electric	keen-ho	t							1020.01	
mechanical ventilation			-		onut fron	n outside				64.07	1	(230a)
		iceu, exi	iaci oi p	OSILIVE II	iput iron	ii outside	7			64.97] 1	
central heating pump										30]	(230c)
boiler with a fan-assi							. (000)	(000.)		45		(230e)
Total electricity for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			139.97	(231)
Electricity for lighting											416.32	(232)
Electricity generated by	y PVs										-481.92	(233)
Total delivered energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				6115.33	(338)
12a. CO2 emissions	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHP						
					ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main	system 1)		(211	1) x			0.2	16	=	888.82	(261)
Space heating (secon	dary)			(215	5) x			0.5	19	=	0	(263)
Water heating				(219	9) x			0.2	16	=	416.03	(264)
3									-			」 ` ′

Space and water heating	(261) + (262) + (263) + (264) =		1304.85	(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	sum	of (265)(271) =	1343.44	(272)
Dwelling CO2 Emission Rate	(272)	(a) ÷ (4) =	13.84	(273)
EI rating (section 14)			87	(274)

		User Details:			
Assessor Name:	Ben Tunningley	Stroma Nui	mber: STI	RO027495	
Software Name:	Stroma FSAP 2012	Software V	ersion: Ver	sion: 1.0.5.41	
	Pro	operty Address: Plot ()46		
Address :	58 Buttercup Road , Bishops	Waltham, SOUTHAM	IPTON , SO32 1RJ		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m ³	<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)+(3a)	3b)+(3c)+(3d)+(3e)+(3n) =	246.05	(5)
2. Ventilation rate:					
	main secondary heating heating	other	total	m³ per hou	ır
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent 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)
			A:-		
Infiltration due to chimne	up fluor and fano - (62)±(6b)±(72)+(7h)+(7c) =		changes per ho	_
•	ys, flues and fans = (6a)+(6b)+(7a) neen carried out or is intended, proceed		$\begin{array}{c} 30 \\ \text{from (9) to (16)} \end{array} \div (5) =$	0.12	(8)
Number of storeys in the		(/,	(5) 35 (1.5)	0	(9)
Additional infiltration	5 ()		[(9)-1]x0.1	= 0	(10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry cons	struction	0	(11)
if both types of wall are pl deducting areas of openir	resent, use the value corresponding to tanger; if equal user 0.35	he greater wall area (after			_
= -	loor, 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)
•	q50, expressed in cubic metres		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)
	s if a pressurisation test has been done	or a degree air permeabili	ty is being used		_
Number of sides sheltere	ed	(20) – 1 [0.075 v	(40)] -	2	(19)
Shelter factor	ing abolton for story	$(20) = 1 - [0.075 \times (20)]$		0.85	(20)
Infiltration rate incorporat		$(21) = (18) \times (20)$	=	0.32	(21)
Infiltration rate modified f		,, , , , , ,	1 0 / 1 11 -	\neg	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov De	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,m² U-value W/m2K	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 = $ Walls 101.29 19.14 82.15 $x = $ Roof 48.53 $x = $ 0.13 0.13 Technique 48.53 $x = $ 0.13 0.13 0.13	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) (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)
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)

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 a	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 ·	+ 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 lwelling 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 ·	+ 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 lwelling 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 ·	+ 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 e hot was all average litres per p Feb in litres per 104.49 hot water all 140.64	+ 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 e hot was all average litres per p Feb in litres per 104.49 hot water all 140.64	+ 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 - 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 - 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 per propertie	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 ·	+ 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 the calconditions are the calconditions and the calconditions are the calcon	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 ·	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 - 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 factoria	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 2.5 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 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 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)	ım + (67)m	ı + (68	3)m + ((69)m + (1	70)m +	(71)m + (72)r	n		
(73)m= 430.71	428.4	413.19	388.04	362.27	3	37.6	322.17	329	.27	342.7	368.08	3 396.52	418]	(73)
6. Solar gains	t .									·		•			
Solar gains are ca	alculated	using sola	r flux from	Table 6a	and	assoc	iated equa	tions	to con	vert to the	e applic	able orientation	on.		
	ccess Fable 6d	actor	Area m²			Flu Tal	x ble 6a			g_ ble 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	0.77	х	5	;	x	1	1.28	x		0.63	x	0.7	_ =	17.24	(75)
Northeast 0.9x	0.77	X	5	;	x	2	22.97	х		0.63	×	0.7	=	35.09	(75)
Northeast _{0.9x}	0.77	X	5	;	X	4	1.38	х		0.63	×	0.7	_ =	63.23	(75)
Northeast _{0.9x}	0.77	X	5	;	X	6	7.96	x		0.63	×	0.7	=	103.84	(75)
Northeast _{0.9x}	0.77	X	5	5	X	9	1.35	x		0.63	x	0.7	=	139.58	(75)
Northeast _{0.9x}	0.77	X	5	5	X	9	7.38	x		0.63	x	0.7	=	148.81	(75)
Northeast _{0.9x}	0.77	X	5	5	x	!	91.1	x		0.63	x	0.7	=	139.21	(75)
Northeast _{0.9x}	0.77	X	5	5	x	7	72.63	x		0.63	x	0.7	=	110.98	(75)
Northeast _{0.9x}	0.77	X	5	5	x	5	50.42	x		0.63	X	0.7	=	77.05	(75)
Northeast _{0.9x}	0.77	X	5	5	X	2	28.07	x		0.63	X	0.7	=	42.89	(75)
Northeast _{0.9x}	0.77	X	5	5	x		14.2	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)
Southwest _{0.9x}	0.77	X	8.5	52	X	3	86.79			0.63	X	0.7	=	95.8	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	6	32.67			0.63	X	0.7	=	163.19	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	8	35.75			0.63	X	0.7	=	223.28	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	1	06.25			0.63	X	0.7	=	276.66	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	1	19.01			0.63	x	0.7	=	309.88	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	1	18.15			0.63	X	0.7	=	307.64	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	1	13.91			0.63	X	0.7	=	296.6	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	1	04.39			0.63	x	0.7	=	271.81	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	S	2.85			0.63	X	0.7	=	241.77	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	6	9.27			0.63	x	0.7	=	180.36	(79)
Southwest _{0.9x}	0.77	X	8.5	52	x	4	4.07			0.63	x	0.7	=	114.75	(79)
Southwest _{0.9x}	0.77	X	8.5	52	X	3	31.49			0.63	x	0.7	=	81.99	(79)
Northwest 0.9x	0.77	X	1.4	12	X	1	1.28	x		0.63	x	0.7	=	4.9	(81)
Northwest _{0.9x}	0.77	X	1.4	12	X	2	22.97	X		0.63	x	0.7	=	9.97	(81)
Northwest _{0.9x}	0.77	X	1.4	12	X	4	1.38	X		0.63	x	0.7	=	17.96	(81)
Northwest 0.9x	0.77	X	1.4	12	X	6	7.96	X		0.63	x	0.7	=	29.49	(81)
Northwest 0.9x	0.77	X	1.4	12	x	9	1.35	x		0.63	X	0.7		39.64	(81)
Northwest 0.9x	0.77	X	1.4	12	x	9	7.38	x		0.63	X	0.7	=	42.26	(81)
Northwest _{0.9x}	0.77	X	1.4	12	x		91.1	x		0.63	x	0.7		39.54	(81)
Northwest 0.9x	0.77	X	1.4	12	x	7	72.63	x		0.63	x	0.7		31.52	(81)
Northwest _{0.9x}	0.77	X	1.4	12	x	5	0.42	x		0.63	X	0.7	=	21.88	(81)
Northwest _{0.9x}	0.77	x	1.4	12	x	2	28.07	х		0.63	x	0.7	=	12.18	(81)

Nauthman							, –						– 1
Northwest 0.9x		X	1.4	12	X	14.2	_ x	0.63	×	0.7	=	6.16	(81)
Northwest 0.9x	0.77	X	1.4	12	X	9.21	X	0.63	×	0.7	=	4	(81)
Solar gains ir	_	alculated		h month	1		(83)m = 3	Sum(74)m	(82)m			1	
(83)m= 117.94		304.47	409.99	489.11	498.7		414.31	340.7	235.43	142.61	100.07		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)	m , watts							
(84)m= 548.65	636.66	717.66	798.03	851.37	836.3	32 797.51	743.58	683.4	603.5	539.12	518.06		(84)
7. Mean inte	ernal temp	perature	(heating	season)								
Temperature	·					ea from Tal	ble 9, Tl	ո1 (°C)				21	(85)
Utilisation fa	_	• .			-			` ,					_
Jan	Feb	Mar	Apr	May	Ju	<u> </u>	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97	0.91	0.76	_	0.65	0.88	0.98	1	1	1	(86)
		<u>Į</u>		<u> </u>	<u> </u>	ļ	ļ		1 0.00	<u> </u>	· .	I	, ,
Mean intern		1		· `		i	1	1 ′ 				1	
(87)m= 19.69	19.85	20.1	20.43	20.74	20.9	3 20.98	20.97	20.84	20.45	20.01	19.67	J	(87)
Temperature	e during h	neating p	eriods ir	n rest of	dwell	ing from Ta	able 9, 1	h2 (°C)					
(88)m= 19.94	19.94	19.94	19.95	19.96	19.9	6 19.96	19.97	19.96	19.96	19.95	19.95		(88)
Utilisation fa	ctor for a	iains for i	rest of d	welling	h2 m	(see Tahle	(92)	•	•	•		•	
(89)m= 1	1	0.99	0.96	0.87	0.67	`	0.52	0.81	0.97	1	1]	(89)
		!		<u> </u>	<u> </u>	I	Į	ļ		<u> </u>	<u> </u>	l	()
Mean intern	-	1		1		<u> </u>	ri e	1	· ·			1	
(90)m= 18.2	18.42	18.79	19.28	19.69	19.9	1 19.96	19.96	19.82	19.3	18.66	18.16		(90)
								1	fLA = Livir	ng area ÷ (4	4) =	0.16	(91)
Mean intern	al temper	rature (fo	r the wh	ole dwe	lling) :	= fLA × T1	+ (1 – f	LA) × T2					
(92)m= 18.44	18.65	19	19.47	19.86	20.0	8 20.13	20.12	19.99	19.49	18.88	18.41	1	(92)
Apply adjust	ment to t	he mean	interna	l temper	ature	from Table	4e, wh	ere appr	opriate			ı	
(93)m= 18.44	18.65	19	19.47	19.86	20.0	8 20.13	20.12	19.99	19.49	18.88	18.41		(93)
8. Space he	ating req	uirement											
Set Ti to the	mean in	ternal ter	nperatu	re obtair	ned at	step 11 of	Table 9	b, so tha	at Ti,m=(76)m an	d re-cald	culate	
the utilisatio												_	
Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	:				_	_				_	
(94)m= 1	0.99	0.98	0.95	0.86	0.68	0.48	0.54	0.82	0.97	0.99	1		(94)
Useful gains	, hmGm	W = (94)	4)m x (8	4)m			_						
(95)m= 546.89	632.23	705.38	758.46	733.93	569.5	386.04	403.01	558.37	583.19	535.53	516.8		(95)
Monthly ave	rage exte	ernal tem	perature	from T	able 8	3						_	
(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 ra	te for me	an intern	al tempe	erature,	Lm , ۱	N = [(39)m]	x [(93)n	n– (96)m]			_	
(97)m= 1612.3	7 1564.7	1419.31	1187.07	914.93	608.6	391.63	412.66	656.59	996.51	1326.42	1606		(97)
Space heati	ng requir	ement fo	r each n	nonth, k	Wh/m	onth = 0.02	24 x [(97	7)m – (95	5)m] x (4	1)m		-	
(98)m= 792.72	626.62	531.16	308.59	134.67	0	0	0	0	307.51	569.44	810.36		
	•	•				•	Tot	al per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	4081.08	(98)
Space heati	na requir	ement in	k\Wh/m²	²/vear								42.05	(99)
·	· .							OLIB'				42.00	
9a. Energy re	•	nts – Indi	vidual h	eating s	ystem	is including	micro-	CHP)					
Space heat	_	n4 for	وانسمم	ا ا									7(00.1)
Fraction of s	space nea	at from se	econdar	y/supple	ment	ary system						0	(201)

									_
Fraction of space heat from main system(s)		(202) = 1 - (201) =							(202)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =								1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system,	<u>%</u>	-			1		0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 792.72 626.62 531.16 308.59 134.67	0	0	0	0	307.51	569.44	810.36		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$!		007.101	000	0.0.00		(211)
848.74 670.9 568.7 330.4 144.18	0	0	0	0	329.24	609.68	867.63		(211)
	<u> </u>		Total	(kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4369.46	(211)
Space heating fuel (secondary), kWh/month									_
= {[(98)m x (201)] } x 100 ÷ (208)						1	1	Ī	
(215)m= 0 0 0 0 0	0	0	0 Total	0 (k\\/\b/\/\cos	0	0 215) _{15.1012}	0		7(245)
Water heating			Total	(KVVII/yea	ar) =5urri(2	2 1 3) _{15,1012}	.	0	(215)
Output from water heater (calculated above)									
	148.52	142.29	158.62	160.37	182.33	192.72	206.69		_
Efficiency of water heater						•	•	80.3	(216)
` '	80.3	80.3	80.3	80.3	86.36	87.61	88.15		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
$(210)\Pi_{1} = (01)\Pi_{1} \times 100 : (217)\Pi_{1}$									
(219)m= 240.46 212.45 224.27 201.41 199.58 1	184.95	177.2	197.53	199.71	211.14	219.97	234.48		
(219)m= 240.46 212.45 224.27 201.41 199.58 1	184.95	177.2		199.71 = Sum(2		219.97	234.48	2503.15	(219)
Annual totals	184.95	177.2			19a) ₁₁₂ =	219.97 Wh/year	l	kWh/year	」 `
Annual totals Space heating fuel used, main system 1	184.95	177.2			19a) ₁₁₂ =	<u>I</u>	l		」 ` `
Annual totals	84.95	177.2			19a) ₁₁₂ =	<u>I</u>	l	kWh/year	」 `
Annual totals Space heating fuel used, main system 1	184.95	177.2			19a) ₁₁₂ =	<u>I</u>	l	kWh/year 4369.46	」 `
Annual totals Space heating fuel used, main system 1 Water heating fuel used	84.95	177.2			19a) ₁₁₂ =	<u>I</u>	l	kWh/year 4369.46	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	84.95	177.2			19a) ₁₁₂ =	<u>I</u>		kWh/year 4369.46	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	84.95	177.2	Total	= Sum(2	19a) ₁₁₂ =	Wh/year	30	kWh/year 4369.46	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	84.95	177.2	Total	= Sum(2	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 4369.46 2503.15	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Total	= Sum(2:	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 4369.46 2503.15	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	(231) +	+ (232).	sum (237b)	= Sum(2: of (230a).	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 4369.46 2503.15 75 416.32	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) +	(231) +	+ (232). ding mid	sum (237b)	= Sum(2: of (230a).	19a) ₁₁₂ = k 1	Wh/year	30 45	kWh/year 4369.46 2503.15 75 416.32 7363.93	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) +	(231) + ns includ	- (232). ding mid	sum (237b)	= Sum(2: of (230a).	19a) ₁₁₂ = k¹(230g) =	Wh/year	30 45	kWh/year 4369.46 2503.15 75 416.32 7363.93	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system	(231) + ns includ	⊦ (232). ding mid e rgy n/year	sum (237b)	= Sum(2: of (230a).	(230g) =	ion fac	30 45	75 416.32 7363.93 Emissions kg CO2/yea	(230c) (230e) (231) (232) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system	(231) + ns includ Ene kWh (211)	+ (232). ding mid ergy n/year x	sum (237b)	= Sum(2: of (230a).	19a) ₁₁₂ = k1(230g) = Emiss kg CO	ion fac 2/kWh	30 45 tor	75 416.32 7363.93 Emissions kg CO2/yea	(230c) (230e) (231) (232) (338) (338)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	(231) + s include kWh (211) (215)	+ (232). ding mid ergy n/year × ×	sum (237b)	= Sum(2: of (230a).	19a) ₁₁₂ = k1	ion fac 2/kWh	30 45 tor =	75 416.32 7363.93 Emissions kg CO2/yea 943.8	(230c) (230e) (231) (232) (338) (338) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	(231) + s include	th (232). Iding midergy In/year X X	sum (237b)	= Sum(2:	19a) ₁₁₂ = k1(230g) = Emiss kg CO	ion fac 2/kWh	30 45 tor	### kWh/year 4369.46	(230c) (230e) (231) (232) (338) (338) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	(231) + s include	+ (232). ding mid ergy n/year x x + (262)	sum (237b)	= Sum(2:	19a) ₁₁₂ = k1	ion fac 2/kWh	30 45 tor =	75 416.32 7363.93 Emissions kg CO2/yea 943.8	(230c) (230e) (231) (232) (338) (338) (261) (263)

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

Total CO2, kg/year sum of (265)...(271) = 1739.48 (272)

TER = 17.92 (273)