Regulations Compliance Report

roject Information	on:			
sessed By:	Ben Tunningley	(STRO027495)	Building Type:	Semi-detached House
welling Details:				
W DWELLING	AS BUILT		Total Floor Area: 9	7.06m ²
e Reference :	Albany Farm		Plot Reference:	Plot 045
dress :	60 Buttercup Roa	ad , Bishops Waltham, SOUTH	AMPTON, SO32 1RJ	
lient Details:				
me:	Bargate Homes			
dress :	The New Barn, ∖	/icarage Farm Business Par, Wi	inchester Road, Fair Oak, S	050 7HD
•		within the SAP calculations. ations compliance.		
a TER and DEF		·		
	ting system: Mains	gas		
el factor: 1.00 (- ,	· \		
-	oxide Emission Rate		17.78 kg/m ²	
b TFEE and DF	Dioxide Emission R	ate (DER)	13.68 kg/m ²	O
	rgy Efficiency (TFE	E)	53.6 kWh/m ²	
•	nergy Efficiency (DI		44.4 kWh/m²	
		,		O
Fabric U-value	es			
Element		Average	Highest	
External		0.24 (max. 0.30)	0.24 (max. 0.70)	01
Party wa	II	0.00 (max. 0.20)	-	0
Floor Roof		0.11 (max. 0.25)	0.11 (max. 0.70)	0
Opening	e	0.11 (max. 0.20) 1.40 (max. 2.00)	0.11 (max. 0.35) 1.40 (max. 3.30)	OI OI
		1.40 (110)	1.40 (max. 0.00)	
a Thermal brid		from linear thermal transmittand	ces for each junction	
	bridging calculated	nom moar tromar tranomitari		
Thermal Air permeabili	ity			
Thermal Air permeabili Air permea			4.53	
Thermal Air permeabili	ity			O
Thermal Air permeabili Air permea Maximum Heating efficie	ity bility at 50 pascals ency		4.53 10.0	OI
Thermal Air permeabili Air permea Maximum	ity bility at 50 pascals ency	Database: (rev 480, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi)	4.53 10.0 t index 017929): s or underfloor heating - ma	
Thermal Air permeabili Air permea Maximum Heating efficie	ity bility at 50 pascals ency	Database: (rev 480, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi) Efficiency 89.6 % SEDBUK2	4.53 10.0 t index 017929): s or underfloor heating - ma	ains gas
Air permeabili Air permea Maximum Heating efficie	ity bility at 50 pascals ency	Database: (rev 480, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi)	4.53 10.0 t index 017929): s or underfloor heating - ma	

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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
ow energy lights			
Percentage of fixed lights wi Minimum	th low-energy fittings	100.0% 75.0%	ОК
lechanical ventilation			
Continuous extract system (Specific fan power: Maximum	decentralised)	0.16 0.18 0.7	ОК
Summertime temperature			
Overheating risk (South Enged on:	ıland):	Slight	OK
Overshading: Windows facing: North East Windows facing: South Wes Windows facing: South East Ventilation rate: Blinds/curtains:	t	Very Little ^{5m²} 8.52m² 1.42m² 4.00 None	
Key features			
Roofs U-value Party Walls U-value Floors U-value Photovoltaic array		0.11 W/m²K 0 W/m²K 0.11 W/m²K	

						User D	etails:						
Assessor Software I			n Tunnir oma FS	0.			Strom Softwa	are Vei	rsion:			0027495 on: 1.0.5.41	
							Address						
Address :			Buttercu	o Road ,	, Bishops	s Waltha	am, SOL	JTHAMP	TON, SO	O32 1RJ	ļ		
1. Overall d	weiling di	mension	IS:			A	n (ma 2)			: o: la \$ (ma)		\/el.ume/m3)	
Ground floor							a(m²) 18.53	(1a) x		ight(m)	(2a) =	Volume(m ³)	(3a)
										2.4	1		
First floor							8.53	(1b) x	2	.67	(2b) =	129.58	(3b)
Total floor ar	ea TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r	n) g	97.06	(4)					
Dwelling volu	ıme							(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	246.05	(5)
2. Ventilatio	n rate:												
			main heating		econdar leating	у	other		total			m ³ per hour	
Number of cl	nimneys	Г	0	+	0] + [0] = [0	x 4	40 =	0	(6a)
Number of o	oen flues	Ē	0	- - + -	0	<u> </u> + [0] = [0	x2	20 =	0	(6b)
Number of in	termittent	⊥ fans						- с Г	0	x	10 =	0](7a)
Number of pa	assive ver	nts							0	x ^	10 =	0	_](7b)
Number of flu									0	x 4	40 =	0](7c)
	Jeleos ga	0 1100						L	0			0	(/ C)
											Air ch	nanges per hou	ır
Infiltration du	e to chim	neys, flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	0	<u> </u>	÷ (5) =	0	(8)
lf a pressuris	ation test ha	is been ca	rried out or	is intende	ed, procee	d to (17),	otherwise	continue fr					
Number of	•		elling (ns	5)								0	(9)
Additional					_					[(9)-	-1]x0.1 =	0	(10)
Structural									uction			0	(11)
	es of wall an areas of ope				ponung ic	i ille great	er wall are	a (allei					
If suspend	ed woode	en floor, o	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draug	ht lobby,	enter 0.0	05, else e	enter 0								0	(13)
Percentag		ows and	doors dr	aught st	ripped							0	(14)
Window in							0.25 - [0.2					0	(15)
		~~~~~		مانية مناه			(8) + (10)					0	(16)
Air permea If based on a	•						•	•	etre of e	invelope	area	4.5300002098083	4
Air permeabi	•		,						is being u	sed		0.23	(18)
Number of si						·		,	0			2	(19)
Shelter facto	r						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rat	e incorpo	rating sh	nelter fac	tor			(21) = (18	) x (20) =				0.19	(21)
Infiltration rat		d for mo	nthly win	d speed	ł			1		1		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly aver	age wind	speed f	rom Tabl	e 7								•	
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Factor	(22a)m =	(22)m ÷	- 4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infil	tration rat	te (allow	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23		
Calculate eff		-	rate for t	he appli	cable ca	se	•		-	-			
If mechanie If exhaust air			ondix N (2	3h) - (23		auation (I		wice (23t	(232)		l	0.5	(23a)
If balanced w		• • • •		, ,	, ,				) = (20a)		l	0.5	(23b)
a) If balance		-	-	-					2h)m i (	22h) v [	_ 1 (22م)	0	(23c)
(24a)m= 0				0			0	0 0			1 - (230)	÷ 100]	(24a)
b) If balance					-	-				-	, , , , , , , , , , , , , , , , , , ,		(
(24b)m= 0				0				0		0	0		(24b)
c) If whole				-		-		-	, ,	Ů	, °		. ,
	)m < 0.5 x			-	-				.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 natura	l ventilati	on or wh	nole hous	e positi	ve input	ventilatio	n from l	oft	<u>.</u>				
if (22b)	)m = 1, th	en (24d)	)m = (22b	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
<mark>(24d)m=</mark> 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective a	ir change	rate - ei	nter (24a	) or (24	o) or (24	c) or (24	d) in boy	(25)					
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
					1		1						
3. Heat loss	es and he	eat loss	paramete	ər:	1	1							
3. Heat loss	Gro		paramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	к)	k-value kJ/m²·k		
	Gros area	SS	Openin	gs						K)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	n²	W/m2	К	(W/	K)			ΊK
ELEMENT	Gros area 1 2	SS	Openin	gs	A ,r	m ² x	W/m2	K = =	(W/ 2.94	K)			′K (26)
ELEMENT Doors Type 1 Doors Type 2	Gros area 1 2 2 0 0 1	SS	Openin	gs	A ,r 2.1 2.1	m ² x x x x1	W/m2	K = = 0.04] =	(W/ 2.94 2.94	K)			K (26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ	Gros area 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SS	Openin	gs	A ,r 2.1 2.1 5	m ² x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/ 2.94 2.94 6.63	K)			K (26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ	Gros area 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SS	Openin	gs	A ,r 2.1 2.1 5 8.52	n ² x x x ¹ x ¹ x ¹	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/ 2.94 2.94 6.63 11.3				(26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ Windows Typ	Gro: area 2 2 2 2 2 2 2 2 2 2 2 2 3	ss (m²)	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53	m ² x x x x1 x1 x1 x1 3 x	W/m2 1.4 (1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (1/(1.4)+ 0.11	K = = = 0.04] = 0.04] =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383		kJ/m²-k	( kJ/	(26) (26) (27) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor	Groa area 1 2 2 2 2 2 2 2 2 2 2 2 2 2 3	ss (m²) 29	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	m ² x x x x1 x1 x1 x1 3 x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24	K = = = = = = = = = = = = = = = = = = =	(W// 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-k 75 60	( kJ/	(26) (26) (27) (27) (27) (27) (28) (29)
ELEMENT Doors Type 2 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls Roof	Groarea area 2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 2 2 2 2	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x ³ x x x x ³ x x x ³ x x x x ³ x x x ³ x x x ³ x x x ³ x x x x ³ x x x x ³ x x x x x x ³ x x x x x x x x x x x x x x x x x x x	W/m2 1.4 (1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (1/(1.4)+ 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383		kJ/m²-k 75	K kJ/	K (26) (27) (27) (27) 5 (28) (29) (30)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls	Groarea area 2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 2 2 2 2	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	n ² x x x ¹ x ¹ x ¹ x ¹ x ² 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	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.94 2.94 6.63 11.3 1.88 5.3383 19.72		kJ/m²-k 75 60	( kJ/ 3639.75 4929 436.77	K (26) (27) (27) (27) 5 (28) (29) (30) (31)
ELEMENT Doors Type 2 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls Roof Total area of	Gross area area 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63	n ² x x x x ¹ x ¹ x ¹ x ² x 5 x 5 x 5 x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		kJ/m²-k 75 60 9 45	( kJ/ 3639.75 4929 436.77	K (26) (27) (27) (27) (27) (28) (29) (29) (30) (31) 5 (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls Roof Total area of Party wall	Groater $area$ area 1 2 be 1 be 2 be 3 101. 48. elements	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 43.92	n ² x x x x ¹ x ¹ x ¹ x ² x 5 x 5 x 5 x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		kJ/m²- k 75 60 9 45 9	<ul> <li>3639.75</li> <li>4929</li> <li>436.77</li> <li>1918.35</li> <li>395.28</li> </ul>	K (26) (27) (27) (27) 5 (28) (29) (30) (31) 5 (32) (32c)
ELEMENT Doors Type 2 Doors Type 2 Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall 3	Gro: area area 2 2 2 2 2 2 3 2 2 3 2 2 3 2 3 2 3 2 3	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 43.92 132	n ² x x x ¹ x ¹ x ¹ x ¹ x ¹ x ² x x x ³ x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		kJ/m²-k 75 60 9 45 9 9	<ul> <li>3639.75</li> <li>4929</li> <li>436.77</li> <li>1918.35</li> <li>395.28</li> <li>1188.04</li> </ul>	K (26) (27) (27) (27) 5 (28) (29) (30) (31) 5 (32) 3 (32c)
ELEMENT Doors Type 2 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall 3	Gro: area area 2 2 2 2 2 2 3 2 2 3 2 2 3 2 3 2 3 2 3	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 132 39.17	n ² x x x ¹ x ¹ x ¹ x ¹ x ² 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 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		kJ/m²-k 75 60 9 45 9 9 9 75	<ul> <li>3639.75</li> <li>4929</li> <li>436.77</li> <li>1918.35</li> <li>395.28</li> <li>1188.043</li> <li>2937.6</li> </ul>	K (26) (27) (27) (27) 5 (28) (29) (30) (31) 5 (32) (32c) 3 (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Typ Windows Typ Windows Typ Floor Walls Roof Total area of Party wall Internal wall 1 Internal wall 1	Gross area area 1 2 be 1 be 2 be 3 101. 48.9 elements	ss (m²) 29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 43.92 132	n ² x x x ¹ x ¹ x ¹ x ¹ x ² 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 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	K = = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34		kJ/m²-k 75 60 9 45 9 9	<ul> <li>3639.75</li> <li>4929</li> <li>436.77</li> <li>1918.35</li> <li>395.28</li> <li>1188.04</li> </ul>	K (26) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32c) (32c) (32c) (32c) (32c) (32c)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

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

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

56.08 (33)

Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16739.71	(34)
Therm	al mass	parame	ter (TMF	- = Cm ÷	+ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			172.47	(35)
	-	sments wh ad of a dea			construct	ion are no	t known pr	recisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						10.63	(36)
if details	of therma	al bridging	are not kn	nown (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			66.71	(37)
Ventila	tion hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	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 tr	ansfer o	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 In	uss nara	meter (H		/m²K		1				Average = = (39)m ÷	Sum(39)1.	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	1	
()											Sum(40)1		1.11	(40)
Numbe	er of day	/s in moi	nth (Tab	le 1a)									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting enei	rgy requ	irement:								kWh/y	ear:	
	_												•	
		ирапсу, I о м – 1			(-0.0003		-130	)2)] + 0.0	013 v (1	TFA -13		71		(42)
	A £ 13.9		1 1.70 X		( 0.0000	H0 X (11	77 10.0	/2/] 1 0.0		1177 10.	0)			
								(25 x N)				.58	]	(43)
		-		usage by : r day (all w		-	-	to achieve	a water us	se target o	f		-	
													1	
Hot wat	Jan	Feb	Mar day for or	Apr ach month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
		r						<b></b>					1	
(44)m=	108.43	104.49	100.55	96.61	92.66	88.72	88.72	92.66	96.61	100.55	104.49	108.43	4400.00	
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) ₁₁₂ = ables 1b, 1		1182.92	(44)
(45)m=	160.8	140.64	145.13	126.53	121.41	104.76	97.08	111.4	112.73	131.38	143.41	155.73	1	
()							01100				m(45) ₁₁₂ =		1550.99	(45)
lf instant	taneous w	vater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	24.12	21.1	21.77	18.98	18.21	15.71	14.56	16.71	16.91	19.71	21.51	23.36	]	(46)
Water	storage	loss:						1					1	
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	munity h	neating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage					. /1 \ \ //	(1-)						1	
				oss facto	JE IS KNO	wn (KVVI	i∕uay):					0	]	(48)
-		actor fro										0		(49)
•••			-	e, kWh/ye cylinder l		or is not		(48) x (49)	) =			0	J	(50)

		-		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
	•	eating s		on 4.3									l	(==)
		from Tal		<b>2</b> h								0		(52)
•		actor fro										0		(53)
•••			-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
		54) in (5										0		(55)
Water	storage	loss cal	culated	for each	month		-	((56)m = (	55) × (41)	m	-	-		
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
	•	•	,	for each		59)m = (	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	ostat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	 )m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
Total h	eat real	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(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)
Solar DH	W input a	alculated	usina App	endix G or	· Appendix	I H (negativ	l ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)		
				and/or V								,g)		
(63)m=	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)
	-	-	-	Ũ	Ũ	Ū	Ū	Ũ	Ũ	0	0	Ū		(/(-/
		ater hea		400.04	405.40	440.00	440.04	405.40	400.04	445.40	450.70	400.40	l	
(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	1712.97	(64)
Lloot a	aina fra		haating	LAN/b/m	anth 0 0		( <i>AE</i> ) m				r (annual)₁			(04)
(65)m=	56.91	49.87	51.69	45.4	43.81	38.16	35.72	40.48	40.81	47.12	+ (57)m 51.01	+ (59)m	]	(65)
														()
	. ,			. ,	-	synnaer is	s in the c	Jweiling	or not w	ater is in	rom com	munity r	leating	
5. Int	ernal ga	uns (see	l able 5	5 and 5a	):									
Metabo		s (Table		ts			i	i		r	r	r	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)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5			-		
(67)m=	56.99	50.61	41.16	31.16	23.29	19.67	21.25	27.62	37.07	47.07	54.94	58.57		(67)
Appliar	nces gai	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
(68)m=	375.35	379.25	369.43	348.54	322.16	297.37	280.81	276.91	286.73	307.62	334	358.79		(68)
Cookin	ig gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	53.97	53.97	53.97	53.97	53.97	53.97	53.97	53.97	53.97	53.97	53.97	53.97		(69)
Pumps	and far	ns gains	(Table &											
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)	•					•		
		-108.42	· •		-108.42	· ·	-108.42	-108.42	-108.42	-108.42	-108.42	-108.42		(71)
Water	heating	gains (T	able 5)											
(72)m=	76.49	74.21	69.48	63.05	58.88	53	48.01	54.41	56.68	63.34	70.85	74.22		(72)

#### (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (73)(73)m= 620.01 615.26 591.26 553.94 515.52 481.22 461.25 470.13 491.67 529.22 570.98 602.77 6. Solar gains Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. FF Orientation: Access Factor Flux Gains Area g_ Table 6a Table 6b Table 6d m² Table 6c (W) Northeast 0.9x (75) x 5 х 11.28 х 0.45 25.39 1 х 1.11 = Northeast 0.9> (75)1 X 5 X 22.97 х 0.45 x 1.11 = 51.68 Northeast 0.9x (75)1 5 41.38 х 0.45 х 1.11 = 93.1 X х Northeast 0.9x (75)1 х 5 х 67.96 Х 0.45 х 1.11 = 152.9 Northeast 0.9x 5 91.35 х 0.45 х 1.11 205.53 (75)1 X х = Northeast 0.9x 1 5 97.38 X 0.45 х 1.11 = 219.12 (75)х х Northeast 0.9x 5 х х (75)1 X х 91.1 0.45 1.11 _ 204.98 Northeast 0.9x 1 5 0.45 163.41 (75)Х х 72.63 х х 1.11 = Northeast 0.9x (75)1 5 х 50.42 х 0.45 х 1.11 = 113.45 Northeast 0.9x (75)1 Х 5 х 28.07 х 0.45 х 1.11 = 63.15 Northeast 0.9x (75) 1 X 5 х 14.2 х 0.45 х 1.11 31.94 Northeast 0.9x (75) 5 9.21 х 0.45 х = 1 х х 1.11 20.73 Southeast 0.9x 1 X 1.42 х 36.79 х 0.45 х 1.11 23.51 (77) = Southeast 0.9x (77) 1 x 1.42 х 62.67 х 0.45 х = 40.05 1.11 Southeast 0.9x 1 1.42 x 85.75 х 0.45 х 1.11 54.8 (77)X = Southeast 0.9x (77) х х х 1 x 1 4 2 106.25 0 45 1.11 = 67.89 Southeast 0.9x 1 1.42 х 119.01 х 0.45 х 1.11 76.05 (77)х = Southeast 0.9x (77)1 x 0.45 x 75.5 X 1.42 х 118.15 1.11 = Southeast 0.9x х х (77)1 х 1.42 х 113.91 0.45 1.11 = 72.79 Southeast 0.9x (77) 1 x 1.42 x 104.39 x 0.45 x 1.11 = 66.71 Southeast 0.9x 1 x 1.42 x 92.85 x 0.45 x 1.11 = 59.33 (77)Southeast 0.9x (77) 1 x 1.42 x 69.27 x 0.45 x 1.11 = 44.26 Southeast 0.9x 1 1.42 x 44.07 х 0.45 х 1.11 = 28.16 (77)х Southeast 0.9x 1 1.42 31.49 x 0.45 x 1.11 20.12 (77) x x = Southwesto.9x 1 8.52 x 36.79 0.45 х 1.11 = 141.07 (79)x Southwest0.9x 1 8.52 0.45 1.11 240.29 (79) х 62.67 х = Southwesto.9x (79) 1 8.52 85.75 0.45 х 1.11 _ 328.78 Х Southwest0.9x (79) 1 8.52 106.25 0.45 х 1.11 = 407.37 Southwest0.9x х (79) 1 X 8.52 X 456.29 119.01 0.45 1.11 Southwest_{0.9x} (79) 1 8.52 Х 118.15 0.45 x 1.11 = 452.99 Х Southwesto.9x (79) 1 8.52 113.91 0.45 1.11 436.73 X X х = Southwest_{0.9x} х х (79) 1 8 52 104 39 0 45 1.11 400 23 Х Southwesto.9x (79) 1 8.52 х 92.85 0.45 х 1.11 355.99 X = Southwesto.9x 1 8.52 69.27 0.45 1.11 265.57 (79)х x X =

Southw	/est <mark>0.9x</mark>	1	×	8.5	52	x	4	4.07		0.45	☐ x [	1.11	=	168.97	(79)
Southw	/est <mark>0.9x</mark>	1	×	8.5	52	x	3	1.49		0.45		1.11	<b>-</b>	120.72	(79)
	L			0.0	,2	^ I	0	1.40		0.40				120.72	
Solar	noine in	watta a	alaulataa	l for ooo	h month				(92)m = S	um(74)m	(92)m				
(83)m=	189.97	332.01	alculated 476.67	628.16	737.86		47.6	714.49	630.35	um(74)m. 528.77	372.99	229.07	161.58	I	(83)
			and solar					-	000.00	020.77	072.00	220.01	101.00	i	(/
(84)m=	809.98	947.27	1067.94	1182.1	1253.38	<u>`</u>	,	1175.74	1100.48	1020.44	902.2	800.05	764.34	1	(84)
(04)11-	003.30	347.27	1007.94	1102.1	1200.00	12	20.02	1175.74	1100.40	1020.44	302.2	000.00	704.34	1	(04)
7. Me	an inter	nal temp	perature	(heating	season	)									
Temp	perature	during h	neating p	eriods in	n the livi	ng a	area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	n (se	ee Ta	ble 9a)					-	_	_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.95	0.91	0.83	0.7		).53	0.39	0.44	0.65	0.87	0.96	0.98		(86)
Mean	interna	I temper	ature in	livina ar	22 T1 (fr	വിറ	w sto	ns 3 to 7	in Tabl	- 9c)		•		·	
(87)m=	19.7	19.93	20.25	20.59	20.84	1	0.96	20.99	20.98	20.9	20.57	20.06	19.63	I	(87)
						I					20.01	20.00	10.00	l	
	r	<u> </u>	neating p	1	1	dw				, ,		-		1	( )
(88)m=	20	20	20	20	20		20	20	20	20	20	20	20	l	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						
(89)m=	0.97	0.94	0.9	0.8	0.64	0	0.46	0.31	0.35	0.58	0.84	0.95	0.97		(89)
Moon		l tompor	ature in	the rest	of dwoll	ina	T2 (fr	allow sto	ns 3 to ⁻	7 in Tabl		-		1	
(90)m=	18.83	19.06	19.36	19.68	19.89	<u> </u>	9.97	19.99	19.99	19.94	19.67	19.18	18.77	1	(90)
(30)11-	10.05	19.00	19.50	19.00	19.09	<u> </u>	5.51	13.33	13.33			ng area ÷ (4		0.40	
												ng arca - (-	•) –	0.16	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling	g) = fl	_A × T1	+ (1 – fL	A) × T2		_			
(92)m=	18.97	19.2	19.5	19.82	20.04	2	0.13	20.15	20.15	20.1	19.82	19.33	18.91		(92)
Apply	v adjustr	nent to t	he mear	n interna	l temper	atu	re fro	m Table	4e, whe	ere appro	opriate			_	
(93)m=	18.82	19.05	19.35	19.67	19.89	1	9.98	20	20	19.95	19.67	19.18	18.76		(93)
8. Sp	ace hea	ting requ	uirement	t											
						ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=	(76)m an	d re-calo	ulate	
the ut	tilisation	r	or gains	using Ta	able 9a						r			1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
Utilisa			ains, hm	): I							·			1	
(94)m=	0.96	0.93	0.88	0.79	0.64	0	).46	0.31	0.35	0.58	0.82	0.94	0.97	l	(94)
Usefu	-	1	, W = (94	r	· · · · · · · · · · · · · · · · · · ·						r			1	
(95)m=	778.15	884.09	943.06	929.79	798.83	56	61.08	362.69	382.24	587.4	743.66	748.22	739.35	j	(95)
	r	r	ernal tem	r <u> </u>	i	-					· · · · ·			1	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16.4	14.1	10.6	7.1	4.2	j	(96)
Heat	loss rate	e for me	an interr	· · · ·	erature,	Lm	, W =	=[(39)m >	k [(93)m	– (96)m					
(97)m=	1558.33	1518.26	1379.36	1156.21	879.07	57	77.76	365.37	386.55	627.63	972.76	1295.87	1562		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh,	/mont	h = 0.02	4 x [(97)	)m – (95	)m] x (	11)m			
(98)m=	580.46	426.17	324.61	163.03	59.7		0	0	0	0	170.46	394.31	612.05		
									Tota	l per year	(kWh/ye	ar) = Sum(9	8)15,912 =	2730.76	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year									28.13	(99)
•		• •			•	Vot	omei	ماريطنوه	miere 6	- (סעי					
			nts – Ind	Muuarn	eaungs	yste	ems-li	nciuaing	micro-C						
-	<b>e heatiı</b> ion of sp	-	at from s	econdar	y/supple	eme	entary	system						0	(201)

Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	<u> </u>	ement (c	alculate	d above)		i			i i	1	-	-	
	580.46	426.17	324.61	163.03	59.7	0	0	0	0	170.46	394.31	612.05		
(211)m			r	100 ÷ (20						r			1	(211)
	641.39	470.9	358.68	180.14	65.97	0	0	0 Tota	0	188.35	435.7 211) _{15.1012}	676.3	3017.42	(211)
•	)m x (20		econdar 00 ÷ (20	ry), kWh/ )8) 0	month	0	0	0	0	0	0	0	]	], ,
								Tota	l I (kWh/yea	l ar) =Sum(2	1 215) _{15,1012}	2 ⁼	0	(215)
Water	heating	J												J
Output				ulated a				<b></b>			<b></b>		7	
<b>-</b> #:-:	174.56	153.07	158.89	139.84	135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		
(217)m=	-	ater hea 89.63	89.42	88.99	88.26	87.3	87.3	87.3	87.3	89	89.57	89.79	87.3	(216) (217)
` `			kWh/m		00.20	07.3	07.3	07.3	07.3	09	09.57	09.79	]	(217)
		-	) ÷ (217)							-	-	-	_	
(219)m=	194.52	170.77	177.68	157.13	153.15	135.25	126.96	143.36	144.38	163.07	174.98	188.77		-
								Tota	I = Sum(2				1930.02	(219)
	I totals		nd main	system	1					k	Wh/year	r	<b>kWh/year</b> 3017.42	1
	•			System	•									] T
	•	fuel use											1930.02	
		•		electric									-	
mech	anical v	entilatio	n - balar	nced, ext	ract or p	ositive ir	nput fron	n outside	Ð			64.97		(230a)
centra	al heatin	ig pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45	]	(230e)
Total e	electricity	/ for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			139.97	(231)
Electric	city for li	ghting											402.56	(232)
Electric	city gene	erated b	y PVs										-481.92	(233)
Total d	lelivered	l energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				5008.05	(338)
				eating sy		, , ,	. ,	· ·						_]
						<b>F</b>	- 1			<b>5</b>			Evel Or at	
						Fu kW	<b>el</b> /h/year			Fuel P (Table			<b>Fuel Cost</b> £/year	
Space	heating	- main «	system 1	1			1) x			3.4	·	x 0.01 =	105.01	(240)
	-						3) x					x 0.01 =		-
	-		system 2	<u>-</u>						0			0	(241)
Space	neating	- secon	dary			(215	5) x			13.	19	x 0.01 =	0	(242)

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	67.16 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	18.46 (249)
(if off-peak tariff, list each of (230a) to (230g			
Energy for lighting	(232)	13.19 × 0.01 =	53.1 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01 =	-63.57 (252)
Appendix Q items: repeat lines (253) and (2 Total energy cost (24	254) as needed 5)(247) + (250)(254) =		300.17 (255)
11a. SAP rating - individual heating system	าร		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(25	55) x (256)] ÷ [(4) + 45.0] =		0.89 (257)
SAP rating (Section 12)			87.62 (258)
12a. CO2 emissions – Individual heating s	ystems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	651.76 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	416.88 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	1068.65 (265)
Electricity for pumps, fans and electric keep	-hot (231) x	0.519 =	72.64 (267)
Electricity for lighting	(232) x	0.519 =	208.93 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year		sum of (265)(271) =	1100.1 (272)
CO2 emissions per m ²		(272) ÷ (4) =	11.33 (273)
El rating (section 14)			90 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	3681.25 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2354.63 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	6035.88 (265)
Electricity for pumps, fans and electric keep	-hot (231) x	3.07 =	429.7 (267)
Electricity for lighting	(232) x	0 =	1235.85 (268)
Energy saving/generation technologies Item 1		3.07 =	-1479.49 (269)

'Total Primary Energy Primary energy kWh/m²/year sum of (265)...(271) =

6221.94	(272)
64.1	(273)

(272) ÷ (4) =

					User D	Details:						
Assessor Name: Software Name:		n Tunnir oma FS	•••			Softwa	a Num are Vei	rsion:			027495 on: 1.0.5.41	
						Address						
Address :			p Road ,	, Bishops	s Waltha	am, SOU	ITHAMP	TON, SO	032 1RJ			
1. Overall dwelling dim	nension	S:										
One word the en						a(m²)			ight(m)	1	Volume(m ³ )	٦
Ground floor						18.53	(1a) x	2	2.4	(2a) =	116.47	(3a)
First floor					2	18.53	(1b) x	2	.67	(2b) =	129.58	(3b)
Total floor area TFA = (	1a)+(1b	o)+(1c)+(	(1d)+(1e	e)+(1r	I) <u> </u>	97.06	(4)					
Dwelling volume					L		(3a)+(3b)	)+(3c)+(3d	d)+(3e)+	.(3n) =	246.05	(5)
2. Ventilation rate:												
		main neating		econdar leating	у	other		total			m ³ per hour	
Number of chimneys	Ĺ	0	] + [	0	] + [	0	=	0	x 4	40 =	0	(6a)
Number of open flues	Ē	0	-   +	0	-   +	0	-   = [	0	x 2	20 =	0	(6b)
Number of intermittent	fans						- L	0	x 1	0 =	0	(7a)
Number of passive vent	ts						Ē	0	x 1	0 =	0	(7b)
Number of flueless gas	fires						Г	0	x 4	40 =	0	(7c)
							L					J
										Air ch	hanges per hou	ır
Infiltration due to chimn								0		÷ (5) =	0	(8)
If a pressurisation test has				ed, procee	d to (17),	otherwise of	continue fr	om (9) to (	(16)		[	
Number of storeys in Additional infiltration	the dwe	elling (ns	5)						[(0)	11/0 1	0	(9)
Structural infiltration:	0 25 foi	r staal or	timbor f	frame or	0 35 fo	r masoni	w constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are							•	uction			0	](11)
deducting areas of oper	• /	•			4 ( 1)							<b>1</b>
If suspended wooder			•	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e				wine o ol							0	(13)
Percentage of window Window Window infiltration	NS anu		augni si	npped		0.25 - [0.2	• x (14) ∸ 1	001 =			0	(14)
Infiltration rate						(8) + (10)			+ (15) =		0	(15) (16)
Air permeability value	e. a50. e	expresse	d in cub	oic metre	s per ho					area	4.5300002098083	
If based on air permeat	•					•	•				0.23	(18)
Air permeability value app								is being u	sed			], ,
Number of sides shelte	red										2	(19)
Shelter factor							[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	-					(21) = (18	) x (20) =				0.19	(21)
Infiltration rate modified				1		1.	-	-	<b>I</b>		1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind s	·					<u> </u>			1		1	
(22)m= 5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	

Wind Fa	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	d infiltra	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	: (21a) x	(22a)m					
	0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23		
			-	rate for t	he appli	cable ca	ise				<u>.</u>			<b>—</b> ,
		l ventila		endix N, (2	(2h) = (22)		acuation (		nuino (22)	(220)		Ļ	0.5	(23a)
				endix N, (2						<i>)</i> = (23a)		Ļ	0.5	(23b)
			•	•	•					2h)m i (	(22b) v [	1 (220)	0	(23c)
(24a)m=									$\frac{1}{0} = \frac{2}{2}$	20)m + ( 0	230) × [	1 - (23c)	÷ 100]	(24a)
Ľ	-			ntilation	-							Ů		(=)
(24b)m=								0			230)	0		(24b)
Ľ	-			tilation o				-		Ů	Ů	Ů		()
,				then (24	•					.5 × (23k	<b>)</b> )			
(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 n	atural \	/entilation	on or wh	ole hous	e positi	ve input	ventilati	on from	oft		<u>.</u>			
if	(22b)m	ı = 1, th	en (24d)	m = (22	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effect	tive air	change	rate - er	nter (24a	) or (24	o) or (24	c) or (24	ld) in bo	k (25)					
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. Hea	t losses	s and he	eat loss	paramete	er:									
3. Hea ELEM		and he Gros area	SS	paramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·K		X k /K
	ENT	Gros	SS	Openin	gs									
ELEM	ENT ype 1	Gros	SS	Openin	gs	A ,r	m²	W/m2	K	(W/				/K
ELEM Doors T	ENT ⁻ ype 1 	Gros area	SS	Openin	gs	A ,r	m ² x	W/m2	2K = = =	(W/ 2.94				/K (26)
ELEM Doors T Doors T	ENT ⁻ ype 1 ⁻ ype 2 vs Type	Gros area	SS	Openin	gs	A ,r 2.1 2.1	m ² x x x x ¹	W/m2	2K = = = 0.04] =	(W/ 2.94 2.94				/K (26) (26)
ELEM Doors T Doors T Window	ENT ype 1 ype 2 vs Type vs Type	Gros area 1 2	SS	Openin	gs	A ,r 2.1 2.1 5	m ² x x x x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+	2K = 0.04] = 0.04] =	(W/ 2.94 2.94 6.63				/K (26) (26) (27)
ELEM Doors T Doors T Window Window	ENT ype 1 ype 2 vs Type vs Type	Gros area 1 2	SS	Openin	gs	A ,r 2.1 2.1 5 8.52	m ² x x x ¹ x ¹ x ¹	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = 0.04] = 0.04] =	(W/ 2.94 2.94 6.63 11.3 1.88	к)		( kJ	/K (26) (26) (27) (27) (27)
ELEM Doors T Doors T Window Window Floor	ENT ype 1 ype 2 vs Type vs Type	Gros area 1 2 3	ss (m²)	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53	m ² x x x ¹ x ¹ x ¹ x ²	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11	2K = 0.04] = 0.04] = 0.04] = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383	K)	kJ/m²·K 75	( kJ <u>3639.7</u>	/K (26) (27) (27) (27) 5 (28)
ELEM Doors T Doors T Window Window Window Floor Walls	ENT ype 1 ype 2 vs Type vs Type	Gros area 1 2 3	ss (m²) 29	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15	m ² x x x1 x1 x1 x1 x1 3 x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72	K)	kJ/m²-K 75 60	K kJ 3639.7 4929	/K (26) (27) (27) (27) (27) 5 (28) (29)
ELEM Doors T Doors T Window Window Floor Walls Roof	ENT Type 1 Type 2 Vs Type Vs Type	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x ³ x x x ³ x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11	2K = 0.04] = 0.04] = 0.04] = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383	K)	kJ/m²·K 75	( kJ <u>3639.7</u>	/K (26) (27) (27) (27) 5 (28) (29) 7 (30)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total are	ENT Type 1 Type 2 Vs Type Vs Type Vs Type	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x x 5 x x 5	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	2K = = = 0.04] = 0.04] = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	kJ/m²-K 75 60 9	( kJ 3639.7 4929 436.77	/K (26) (27) (27) (27) 5 (28) (29) 7 (30) (31)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total are Party wa	ENT ype 1 ype 2 vs Type vs Type vs Type ea of el all	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63	m ² x x x1 x1 x1 x1 3 x 5 x 5 x 5 3 x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72	K)	kJ/m²-K 75 60 9 45	( kJ 3639.7 4929 436.77 1918.3	/K (26) (27) (27) (27) (27) 5 (28) (29) 7 (30) (31) 5 (32)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total ard Party wa Internal	ENT Type 1 Type 2 vs Type vs Type vs Type ea of el all wall **	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 43.92	m ² x x x1 x1 x1 x1 3 x 5 x 5 x 5 3 x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	2K = = = 0.04] = 0.04] = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	kJ/m²-K 75 60 9 45 9	<ul> <li>K.J.</li> <li>3639.7</li> <li>4929</li> <li>436.77</li> <li>1918.3</li> <li>395.26</li> </ul>	/K (26) (27) (27) (27) 5 (28) (29) 7 (30) (31) 5 (32) 3 (32c)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total are Party wa Internal Internal	ENT ype 1 ype 2 vs Type vs Type vs Type ea of el all wall ** wall **	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 132	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x ² x ²	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	2K = = = 0.04] = 0.04] = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	kJ/m²-K 75 60 9 45 9 9	<ul> <li>K.J.</li> <li>3639.7</li> <li>4929</li> <li>436.77</li> <li>1918.3</li> <li>395.28</li> <li>1188.04</li> </ul>	/K (26) (27) (27) (27) 5 (28) (29) (31) 5 (32) 3 (32c) 13 (32c)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total ard Party wa Internal Internal Internal	ENT ype 1 ype 2 vs Type vs Type vs Type vs Type ea of el all wall ** wall ** wall **	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 132 39.17	m ² x x x ¹ x ¹ x ¹ x ¹ x ¹ x ² x x x ³ x x ⁵ x x x ⁵ x x ² x ² x ² x ² x ² x ² x ³ x x ⁵ x ² x ² x ³ x ³ x ³ x ⁴	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	2K = = = 0.04] = 0.04] = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	kJ/m²-K 75 60 9 45 9 9 9 75	<ul> <li>K kJ</li> <li>3639.7</li> <li>4929</li> <li>436.77</li> <li>1918.3</li> <li>395.26</li> <li>1188.04</li> <li>2937.6</li> </ul>	/K (26) (27) (27) (27) 5 (28) (29) 7 (30) (31) 5 (32) 3 (32c) 5 (32c) 5 (32c)
ELEMI Doors T Doors T Window Window Floor Walls Roof Total are Party wa Internal Internal	ENT ype 1 ype 2 vs Type vs Type vs Type vs Type ea of el all wall ** wall ** wall ** floor	Gros area 1 2 3 101. 48.5	29 53	Openin m	gs 2	A ,r 2.1 2.1 5 8.52 1.42 48.53 82.15 48.53 198.3 42.63 132	m ² x x ¹ x ¹ x ¹ x ¹ x ² x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.11 0.24 0.11	2K = = = 0.04] = 0.04] = = = = = = = = =	(W/ 2.94 2.94 6.63 11.3 1.88 5.3383 19.72 5.34	K)	kJ/m²-K 75 60 9 45 9 9	<ul> <li>K.J.</li> <li>3639.7</li> <li>4929</li> <li>436.77</li> <li>1918.3</li> <li>395.28</li> <li>1188.04</li> </ul>	/K (26) (27) (27) 5 (28) (29) 7 (30) (31) 5 (32) 3 (32c) 3 (32c) 3 (32c) 3 (32c) 3 (32c)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

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

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

56.08 (33)

Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16739.71	(34)
Therm	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			172.47	(35)
	-	sments wh ad of a de			construct	ion are no	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
	-			culated	• •		ĸ						10.63	(36)
	of therma abric he		are not kr	10wn (36) =	= 0.05 x (3	1)			(33) +	(36) =			66.74	(37)
			alculator	d monthly							25)m x (5)		66.71	(37)
ventila	Jan	Feb	Mar	Apr	y 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	40.6		(38)
	ansfor (	L 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	1	
(00)11-	107.01	107.01	107.01	107.01	107.01	107.01	107.01	107.01			Sum(39)1		107.31	(39)
Heat Ic	oss para	ameter (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		_
Numbe	er of day	/s in mo	nth (Tab	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)
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/y	ear:	
A			NI										7	(
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x ( ⁻	TFA -13.		.71		(42)
			ater usa	ae in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		90	8.58	1	(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o			1	(1-)
not more	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)			-			-	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		-			-	
(44)m=	108.43	104.49	100.55	96.61	92.66	88.72	88.72	92.66	96.61	100.55	104.49	108.43		_
Energy o	content of	^t hot water	used - cal	culated mo	onthly = 4.	190 x Vd,ı	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1182.92	(44)
(45)m=	160.8	140.64	145.13	126.53	121.41	104.76	97.08	111.4	112.73	131.38	143.41	155.73	]	
										Total = Su	m(45) ₁₁₂ =	=	1550.99	(45)
lf instant	taneous v	vater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46)	) to (61)		-		_	
(46)m=	24.12	21.1	21.77	18.98	18.21	15.71	14.56	16.71	16.91	19.71	21.51	23.36		(46)
	storage		ingludir		olor or M		otorogo	within or					1	(47)
-							-	within sa	ame ves	501		0		(47)
Otherw	vise if no	o stored		ank in dw er (this ir	-			(47) ombi boil	ers) ente	er '0' in (	47)			
	storage		eclared I	oss facto	ar is kno	wn (k\//	n/dav).					0	1	(48)
		actor fro					nuay).					0	] 7	
•				∘ ∠b e, kWh/ye	aar			(48) x (49)	) –		<u> </u>	0	]	(49)
•••			-	cylinder l		or is not	known:	(49) × (49)	, –			0	]	(50)

		•		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
	•	eating s		on 4.3										
		from Ta										0		(52)
Tempe	erature f	actor fro	m lable	2b								0		(53)
•••			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (5	55)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	om Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	, om Table	3					•	·	0		(58)
	•	•		for each		59)m = (	(58) ÷ 36	65 x (41)	m			-		
	•			le H5 if t			. ,	• • •		r thermo	ostat)			
、 (59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	month (	′61)m =	(60) ÷ 36	35 x (41)	)m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76	l	(61)
													l (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	(59)11 + (61)11	(62)
														(02)
										r contribut	ion to wate	er heating)		
				and/or \				I	ŕ				I	(62)
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from w	ater hea	ter							-	-	-		
(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		-
								Outp	out from w	ater heate	r (annual)₁	112	1712.97	(64)
Heat g	ains froi	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m=	56.91	49.87	51.69	45.4	43.81	38.16	35.72	40.48	40.81	47.12	51.01	55.22		(65)
inclu	ide (57)i	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fr	rom com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	5 and 5a	):									
Metabo	olic gain	s (Table	5) Wat	ts										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53		(66)
Lightin	n dains	(calcula	L ted in Ar	pendix	L equat	ion I 9 o	rl9a)a	lso see "	L Table 5	I	I	I		
(67)m=	23.57	20.94	17.03	12.89	9.64	8.14	8.79	11.43	15.34	19.47	22.73	24.23		(67)
				Append										
(68)m=	251.49	254.09	247.52	233.52	215.85	199.24	188.14	185.53	192.11	206.11	223.78	240.39	l	(68)
				ppendix										()
(69)m=	36.55	36.55	36.55	36.55	2, equal 36.55	36.55	36.55	36.55	36.55	36.55	36.55	36.55	l	(69)
					30.33	30.55	30.55	30.55	30.55	30.55	30.55	30.33		(00)
-		ns gains	r –	<u> </u>									I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
	<u> </u>		· •	tive valu	, <u>,</u>	· · · · · · · · · · · · · · · · · · ·				1.	<u> </u>	<u> </u>	I	
(71)m=			-108.42	-108.42	-108.42	-108.42	-108.42	-108.42	-108.42	-108.42	-108.42	-108.42		(71)
		gains (T	, I							i	i	i	I	
(72)m=	76.49	74.21	69.48	63.05	58.88	53	48.01	54.41	56.68	63.34	70.85	74.22		(72)

Total internal	gains =	1				(66)n	n + (67)m	ר + ( <mark>6</mark> 8	s)m + (69)m -	+ (70)m +	(71)m + (72	!) <b>m</b>		
(73)m= 418.21	415.9	400.69	376.12	351.02	327.	03	311.6	318	.02 330.78	3 355.5	384.01	405.5	1	(73)
6. Solar gain	s:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and as	socia	ted equa	tions	o convert to	the appli		tion.		
Orientation:	Access F Table 6d		Area m²	l		Flux Tabl	e 6a		g_ Table 6l	b	FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x		5	хГ	11	.28	) ×	0.45	×	1.11	=	19.55	(75)
Northeast 0.9x	0.77	x		5	x		.97	x	0.45	×	1.11	=	39.79	(75)
Northeast 0.9x	0.77	x		5	x		.38	x	0.45	x	1.11		71.69	(75)
Northeast 0.9x	0.77	x		5	x		.96	x	0.45	×	1.11	=	117.73	
Northeast 0.9x	0.77	x		5	x		.35	x	0.45	x	1.11		158.26	
Northeast 0.9x	0.77	×		5	×		.38	x	0.45	×	1.11	=	168.72	
Northeast 0.9x	0.77	x		5	×		1.1	x	0.45	×	1.11	=	157.83	
Northeast 0.9x	0.77	x		5	×	72	.63	x	0.45	×	1.11	=	125.83	(75)
Northeast 0.9x	0.77	x		5	x	50	.42	x	0.45	×	1.11	=	87.35	(75)
Northeast 0.9x	0.77	x		5	×	28	.07	x	0.45	×	1.11	=	48.63	(75)
Northeast 0.9x	0.77	x		5	×	14	1.2	x	0.45	×	1.11	=	24.6	(75)
Northeast 0.9x	0.77	x		5	×	9.	21	x	0.45	x	1.11	=	15.96	(75)
Southeast 0.9x	0.77	x	1.4	42	×	36	.79	x	0.45	x	1.11	=	18.1	(77)
Southeast 0.9x	0.77	x	1.4	42	×	62	.67	x	0.45	x	1.11	=	30.84	(77)
Southeast 0.9x	0.77	x	1.4	42	x	85	.75	x	0.45	x	1.11	=	42.19	(77)
Southeast 0.9x	0.77	x	1.4	42	x	106	6.25	x	0.45	x	1.11	=	52.28	(77)
Southeast 0.9x	0.77	x	1.4	42	x	119	9.01	x	0.45	x	1.11	=	58.56	(77)
Southeast 0.9x	0.77	x	1.4	42	x	118	3.15	x	0.45	x	1.11	=	58.13	(77)
Southeast 0.9x	0.77	x	1.4	42	x	11:	3.91	x	0.45	x	1.11	=	56.05	(77)
Southeast 0.9x	0.77	x	1.4	42	x	104	4.39	x	0.45	x	1.11	=	51.36	(77)
Southeast 0.9x	0.77	X	1.4	42	x	92	.85	x	0.45	x	1.11	=	45.69	(77)
Southeast 0.9x	0.77	x	1.4	42	x	69	.27	x	0.45	x	1.11	=	34.08	(77)
Southeast 0.9x	0.77	x	1.4	42	x	44	.07	x	0.45	x	1.11	=	21.68	(77)
Southeast 0.9x	0.77	X	1.4	42	x	31	.49	x	0.45	x	1.11	=	15.49	(77)
Southwest0.9x	0.77	x	8.	52	x	36	.79	]	0.45	x	1.11	=	108.62	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	62	.67	]	0.45	x	1.11	=	185.02	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	85	.75	]	0.45	x	1.11	=	253.16	(79)
Southwest0.9x	0.77	X	8.	52	x	106	6.25	]	0.45	X	1.11	=	313.67	(79)
Southwest _{0.9x}	0.77	x	8.	52	×	119	9.01		0.45	x	1.11	=	351.34	(79)
Southwest _{0.9x}	0.77	x	8.	52	x	118	3.15	]	0.45	x	1.11	=	348.8	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	11:	3.91	]	0.45	x	1.11	=	336.28	(79)
Southwest _{0.9x}	0.77	X	8.	52	x	104	4.39	]	0.45	x	1.11	=	308.18	(79)
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	69	.27	]	0.45	x	1.11	=	204.49	(79)

Southw	/est _{0.9x}	0.77	x	8.5	52	×	4	4.07		0.45	] × [	1.11	=	130.1	(79)
Southw	/est <mark>0.9x</mark>	0.77	×	8.5	52	хĪ	3	1.49		0.45	=	1.11		92.96	(79)
		0			/_	L				0.10					
Solar	naine in	watte c	alculated	t for eac	h month				(83)m – S	um(74)m .	(82)m				
(83)m=	146.27	255.65	367.04	483.69	568.15	1	5.65	550.16	485.37	407.16	287.2	176.38	124.41		(83)
			and solar					watts						I	
(84)m=	564.48	671.55	767.73	859.81	919.18	<u>,</u>	2.69	861.76	803.39	737.94	642.77	560.4	529.91	1	(84)
				I	I	I	2.00				0.2		020101		(- /
			perature			·									_
Temp	perature	during h	neating p	periods i	n the livi	ng a	area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	i (se	e Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.97	0.92	0.83	0	.68	0.52	0.58	0.8	0.95	0.99	0.99		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fe	ollov	<i>N</i> ster	os 3 to 7	' in Tabl	e 9c)					
(87)m=	19.4	19.62	19.95	20.34	20.69	1	0.9	20.97	20.96	20.8	20.34	19.78	19.35		(87)
					L	I	I	·						I	
	r		neating p	1	1	1				, <i>, ,</i>				l	(00)
(88)m=	20	20	20	20	20		20	20	20	20	20	20	20	ł	(88)
Utilisa	ation fac	ctor for g	ains for	rest of d	welling,	h2,r	m (se	e Table	9a)	-	-	-			
(89)m=	0.99	0.98	0.96	0.9	0.78		0.6	0.41	0.47	0.73	0.93	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina ⁻	T2 (fc	ollow ste	os 3 to 1	7 in Tabl	e 9c)				
(90)m=	18.54	18.75	19.07	19.46	19.77	<u> </u>	9.94	19.99	19.98	19.87	19.46	18.92	18.48		(90)
()												g area ÷ (4		0.16	(91)
												<b>0</b> (	,	0.10	
		<u>i</u>	ature (fo	î	i	<u> </u>	<u> </u>			· ·				ı.	
(92)m=	18.68	18.89	19.21	19.6	19.92		0.1	20.15	20.14	20.03	19.61	19.06	18.62		(92)
Apply	<u> </u>	nent to t	he mear	1	l temper	atur	re fro	m Table	4e, whe	ere appro	opriate			ı.	
(93)m=	18.53	18.74	19.06	19.45	19.77	19	9.95	20	19.99	19.88	19.46	18.91	18.47		(93)
8. Sp	ace hea	ting req	uirement	t i											
						ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the u		1	or gains	<u> </u>		<u> </u>	. 1							l	
1.1612.	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ł	
		i	ains, hm	1	0.77		50	0.44	0.40	0.70	0.00	0.00	0.00	l	(04)
(94)m=	0.99	0.97	0.95	0.89	0.77	0	.59	0.41	0.46	0.72	0.92	0.98	0.99	ł	(94)
		r	W = (9)	<u> </u>	<u> </u>	1 50	0.57	050.00	070.4	500.04	500.40	E 47 00	504.00	l	(05)
(95)m=	557	654.41	728.21	763.92	708.95		3.57	356.98	373.4	532.04	589.42	547.06	524.29	ł	(95)
	r	1	ernal tem	r <u> </u>	r	-		10.0	40.4		10.0	74	10	l	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4	14.1	10.6	7.1	4.2	ł	(96)
		i	an interr	· · ·	i			- ,		r í í				I	(07)
(97)m=		1485.29	1348.29	1132.3	866.38		3.88	364.5	385.23	619.76	950.37	1266.99	1531.48	ł	(97)
•		ř –	ement fo	1	r	-				,	Í	ŕ		I	
(98)m=	721.58	558.36	461.34	265.24	117.13		0	0	0	0	268.55	518.35	749.35		-
									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	3659.89	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/year									37.71	(99)
9a. En	erav rea	nuiremer	nts – Ind	ividual b	eating s	vste	ems ir	ncludina	micro-C	CHP)					
	e heatii				g_0	<i>y</i> .o.c									
-		-	at from s	econdar	y/supple	eme	ntary	system						0	(201)

Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ting syste	əm 1								90.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	า, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		ř	r ·	calculate	r í		1	1				<del></del>	1	
	721.58	558.36	461.34	265.24	117.13	0	0	0	0	268.55	518.35	749.35		
(211)m	1 = {[(98	)m x (20 616.97	04)] } x 1 509.76	100 ÷ (20 293.08	<u> </u>					000 74	570 77	828.01		(211)
	191.32	616.97	509.76	293.08	129.42	0	0	0 Tota	0 I (kWh/vea	296.74 ar) =Sum(2	572.77 211)		4044.07	(211)
Snac	a heatin	a fuel (s	econdar	′y), kWh/	month						/15,1012	!	4044.07	
•			00 ÷ (20	• ·	monur									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
			-			_	-	Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> _{15,1012}	2=	0	(215)
	heating	•												
Output	from w 174.56	ater hea 153.07	ter (calc 158.89	ulated al	bove) 135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49		
Efficier		ater hea							0.0.1				87.3	(216)
(217)m=		89.79	89.66	89.37	88.76	87.3	87.3	87.3	87.3	89.35	89.74	89.89		(217)
Fuel fo	or water	heating,	kWh/m	onth	<u> </u> ]		1	1				<u>,                                    </u>		
(219)m (219)m=		m x 100	) ÷ (217) 177.21	)m 156.47	152.28	135.25	126.96	143.36	144.38	162.43	174.64	188.55		
(219)11=	194.20	170.47	177.21	130.47	152.20	155.25	120.90		l = Sum(2		174.04	100.55	1926.28	(219)
Annua	I totals								,		Wh/year	r	kWh/year	
Space	heating	fuel use	ed, main	system	1								4044.07	7
Water	heating	fuel use	ed										1926.28	Ī
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								_
mech	anical v	entilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Ð			64.97		(230a)
		ng pump					•					30		(230c)
		• · ·	sted flue									45	1	(230e)
								eum	of (230a)	(230g) =		45	400.07	-
	·		above, I	kWh/yea	1.			Sum	01 (2004).	(2009) –			139.97	(231)
	city for I	0 0											416.32	(232)
Electri	city gen	erated b	y PVs										-481.92	(233)
Total d	lelivered	d energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				6044.71	(338)
12a. (	CO2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF	)					
						En	ergy			Emiss	ion fac	tor	Emissions	
							/h/year			kg CO			kg CO2/yea	ar
Space	heating	(main s	system 1	)		(21	1) x			0.2	16	=	873.52	(261)
Space	heating	(second	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

416.08

(264)

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

						User D	etails:						
Assesso Software			n Tunnir oma FS	0,			Strom Softwa	are Ver	sion:			027495 on: 1.0.5.41	
			<b>.</b>	<u> </u>			Address						
Address			Buttercup	o Road ,	, Bishops	s Waltha	am, SOU	THAMP	TON, SO	032 1RJ			
1. Overall	dwelling di	mension	S:				( )			• • • • • •			
Ground floo	or.					<b></b>	a(m²)	(1-)		ight(m)		Volume(m ³ )	
	וכ					4	8.53	(1a) x	2	2.4	(2a) =	116.47	(3a)
First floor						4	8.53	(1b) x	2	.67	(2b) =	129.58	(3b)
Total floor a	area TFA =	(1a)+(1l	o)+(1c)+(	(1d)+(1e	e)+(1r	I) g	7.06	(4)					
Dwelling vo	olume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	(3n) =	246.05	(5)
2. Ventilat	ion rate:												
			main heating		econdar leating	У	other		total			m ³ per hour	
Number of	chimneys	ſ	0	<u>ה</u> + ר	0	+	0	] = [	0	x 4	= 0	0	(6a)
Number of	open flues	Г	0	- 	0	<u> </u> + [	0	] = [	0	x 2	20 =	0	(6b)
Number of	intermittent	fans							3	x 1	0 =	30	(7a)
Number of	passive ver	nts							0	x 1	0 =	0	_ ](7b)
Number of	flueless gas	s fires							0	x 4	40 =	0	_ ](7c)
	U U							L		]		_	
											Air ch	anges per hou	ır
Infiltration of	due to chim								30		÷ (5) =	0.12	(8)
•	of storeys in				ea, proceed	a to (17), (	otherwise	continue in	om (9) to (	16)		0	(9)
	al infiltration		ching (no	')						[(9)-	1]x0.1 =	0	(10)
	al infiltration		r steel or	timber	frame or	0.35 fo	r masoni	v constr	uction	1(-7		0	(11)
if both ty	pes of wall and areas of ope	e present,	use the va	lue corres									
	ided woode	0 //	,		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no drau	ught lobby,	enter 0.0	)5, else e	enter 0								0	(13)
Percenta	ge of windo	ows and	doors dra	aught st	ripped							0	(14)
Window	infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltratio	n rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
-	eability valu	•	•			•		•	etre of e	nvelope	area	5	(17)
If based on	•											0.37	(18)
Air permea Number of	<i>bility value ap</i>		ressurisatio	on test has	s been don	e or a de	gree air pe	rmeability	is being us	sed			(19)
Shelter fac		ereu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration r		rating sh	nelter fac	tor			(21) = (18	) x (20) =				0.32	(21)
Infiltration r	•	•			ł								ц, ,
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly av	erage wind	speed f	rom Tabl	e 7	-			-	-	·			
(22)m= 5.		4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Fa	actor (2	2a)m =	(22)m ÷	- 4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	d infiltra	ation rat	e (allow	ing for sl	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m					
Ī	0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	-	rate for t	he appl	cable ca	ise			•	•	 Г		(00-)
				endix N, (2	¹ 3h) – (23;	a) x Emv (	equation (	N5)) othe	rwise (23	n) – (23a)		L	0	(23a)
			• • •	ciency in %	, ,	, ,				5) = (200)		L	0	(23b)
			-		•					2h)m + (	(23h) x [	L 1 – (23c) -	0 	(23c)
(24a)m=	0	0		0	0	0		0	0	0		0	. 100]	(24a)
	alance	d mech	ı anical v	entilation	without	heat red	covery (	u MV) (24t	)m = (2	1 2b)m + (	23b)	11		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	vhole h	ouse ex	tract ve	ntilation of	r positiv	/e input	ventilati	on from (	utside			J		
if	(22b)m	ו < 0.5 <b>&gt;</b>	(23b),	then (24	c) = (23l	o); other	wise (24	c) = (22	b) m + 0	.5 × (23	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				hole hous										
(24d)m=	(22D)m	1 = 1, m 0.58	en (240	)m = (22 0.56	0.56	0.55	(40)m = 0.55	0.5 + [(2	0.55	0.5	0.56	0.57		(24d)
				nter (24a						0.00	0.00	0.07		()
(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)
· · L						1			1		1	11		
				paramet		Net Ai		U-val		AXU		k-value		AXk
ELEM	ENI	Gros area		Openir m	igs 1 ²	A,i		W/m2		(W/		kJ/m²·K		kJ/K
Doors 7	Type 1					2.1	x	1	=	2.1				(26)
Doors 7	ype 2					2.1	x	1	=	2.1				(26)
Window	vs Type	e 1				5	x1	/[1/( 1.4 )+	0.04] =	6.63				(27)
Window	vs Type	2				8.52	x1	/[1/( 1.4 )+	0.04] =	11.3				(27)
Window	vs Type	3				1.42	x1	/[1/( 1.4 )+	0.04] =	1.88				(27)
Floor						48.5	3 x	0.13	=	6.30889	9			(28)
Walls		101.	29	19.1	4	82.1	5 X	0.18	=	14.79			ĪĒ	(29)
Roof		48.5	53	0		48.5	3 x	0.13	=	6.31			ī —	(30)
Total ar	ea of e	lements	, m²			198.3	5							(31)
Party w	all					42.6	3 x	0	=	0			7 [	(32)
Internal	wall **					43.92	2						ĪĒ	(32c)
Internal	wall **					132							ĪĒ	(32c)
Internal	wall **					39.1	7						ĪĒ	(32c)
Internal	floor					47.9	3						ĪĒ	(32d)
Internal	ceiling					47.9	3						ĪĒ	(32e)
* for wine	lows and	roof wind	0.000	offootivow	indow I I v		lotod unin	a formulo r	1/1/1/1	ua) 10 011	n no aivon ir	naragranh		

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions

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

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

51.41 (33)

Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16739.71	(34)
Therm	al mass	parame	ter (TMF	- = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K						15.42	(36)
			are not kn	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			66.83	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × (	25)m x (5)			
	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 t	ransfer o	coefficier	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 le	oss para	imeter (H	HLP), W	/m²K	-	-	-	-		Average = = (39)m ÷	Sum(39)₁. (4)	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		_
Numb	er of day	/s in moi	nth (Tab	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)
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x (1	ΓFA -13.		71		(42)
Annua	l averag	e hot wa	•		es per da 5% if the a		•	` '	+ 36 a water us	se target o		.58		(43)
not mor	e that 125	litres per	person pei	r day (all w	vater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					-	
(44)m=	108.43	104.49	100.55	96.61	92.66	88.72	88.72	92.66	96.61	100.55	104.49	108.43		
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x D	)Tm / 3600	) kWh/mon		m(44) ₁₁₂ = ables 1b, 1		1182.92	(44)
(45)m=	160.8	140.64	145.13	126.53	121.41	104.76	97.08	111.4	112.73	131.38	143.41	155.73		
lf instan	ntaneous w	vater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1550.99	(45)
(46)m=	24.12	21.1	21.77	18.98	18.21	15.71	14.56	16.71	16.91	19.71	21.51	23.36		(46)
	storage									1			-	
-		. ,					-		ame ves	sel		0		(47)
Other		o stored			velling, e ncludes i			• •	ore) onte	er '0' in (	47)			
	-													
,	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):		ers) erite			0	l	(48)
Tempe					or is kno	wn (kWł	n/day):					0		
Energ	erature f y lost fro	actor fro m water	m Table storage	2b e, kWh/ye		·		(48) x (49)	·			0 0 0		(48) (49) (50)

		-		om Tabl	e 2 (kW	h/litre/da	ıy)					0	]	(51)
	•	eating s		on 4.3									1	
		from Tal										0		(52)
Tempe	erature f	actor fro	m lable	2b								0		(53)
0.			•	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (5	5)									0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m	_	_	_	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	om Table	e 3					-		0		(58)
	•	•	,	for each		59)m = (	(58) ÷ 36	5 × (41)	m				1	
	•			le H5 if t	,		. ,	. ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	month (	(61)m =	(60) ÷ 36	65 x (41)	)m					1	
(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)
	Leat requ	uired for	water h	eating ca	alculated	for eac	n month	(62)m =	0.85 x (	I (45)m +	(46)m +	I (57)m +	ı (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)
``		calculated	usina App	l endix G or	Appendix	H (negativ	ve quantity	(enter '0	if no sola	r contribut	ion to wate	I er heating)	1	
				and/or V								, noating)		
(63)m=	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	I	(63) (G2)
	-	-	-	0	0	Ū	Ū	Ū	Ū	Ū	0	0		(, (,
•		ater hea											1	
(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
											r (annual)₁		2128.85	(64)
-			-	i		-	· , ,	· ,	-	1 /	+ (57)m		] 	(65)
(65)m=	66.21	58.27	61	53.98	52.17	45.77	43.58	48.85	49.39	56.42	60.01	64.52		(65)
inclu	ıde (57)ı	m in calc	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	and 5a	):									
Metabo	olic gain	s (Table	5), Wat	ts									1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53	135.53		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see ⁻	Table 5				-	
(67)m=	23.57	20.94	17.03	12.89	9.64	8.14	8.79	11.43	15.34	19.47	22.73	24.23		(67)
Applia	nces gai	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=	251.49	254.09												
Cookin		204.09	247.52	233.52	215.85	199.24	188.14	185.53	192.11	206.11	223.78	240.39		(68)
				233.52 ppendix							223.78	240.39		(68)
(69)m=											223.78 36.55	240.39 36.55	]	(68)
(69)m=	ng gains 36.55	(calcula	ted in A 36.55	ppendix 36.55	L, equat	ion L15	or L15a)	, also se	e Table	9 5			]	
(69)m=	ng gains 36.55	(calcula 36.55	ted in A 36.55	ppendix 36.55	L, equat	ion L15	or L15a)	, also se	e Table	9 5			] ]	
(69)m= Pumps (70)m=	ng gains 36.55 and far 3	(calcula 36.55 ns gains 3	ted in A 36.55 (Table 5 3	ppendix 36.55 5a) 3	L, equat 36.55 3	ion L15 36.55 3	or L15a) 36.55	, also se 36.55	e Table 36.55	36.55	36.55	36.55	   	(69)
(69)m= Pumps (70)m= Losses	ng gains 36.55 and far 3 s e.g. ev	(calcula 36.55 ns gains 3	ted in A 36.55 (Table 5 3 n (nega	ppendix 36.55 5a) 3 tive valu	L, equat 36.55 3	ion L15 36.55 3	or L15a) 36.55	, also se 36.55	e Table 36.55	36.55	36.55	36.55 3	   	(69)
(69)m= Pumps (70)m= Losses (71)m=	ng gains 36.55 and far 3 s e.g. ev -108.42	(calcula 36.55 ns gains 3 aporatio	ted in A 36.55 (Table 5 3 n (nega -108.42	ppendix 36.55 5a) 3 tive valu	L, equat 36.55 3 es) (Tab	ion L15 36.55 3 le 5)	or L15a) 36.55 3	, also se 36.55 3	ee Table 36.55 3	2 5 36.55 3	36.55 3	36.55 3	   	(69) (70)

Total internal gains =				(66	)m + (67)m	ı + (68	3)m + (69)m +	(70)m +	(71)m + (72)r	n		
(73)m= 430.71 428.4 413	3.19	388.04 362.2	7	337.6	322.17	329.	.27 342.7	368.08	3 396.52	418		(73)
6. Solar gains:					-			-				
Solar gains are calculated using	g solar i	flux from Table 6	Sa and			tions t	to convert to th	ne applic		on.		
Orientation: Access Facto Table 6d	or	Area m²		Flu Ta	ıx ble 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	5	x		11.28	x	0.63	x	0.7	=	17.24	(75)
Northeast 0.9x 0.77	×	5	x		22.97	x	0.63	x	0.7	=	35.09	(75)
Northeast 0.9x 0.77	×	5	x	4	41.38	x	0.63	x	0.7	=	63.23	(75)
Northeast 0.9x 0.77	x	5	x	6	67.96	x	0.63	x	0.7	=	103.84	(75)
Northeast 0.9x 0.77	x	5	x	ę	91.35	x	0.63	x	0.7	=	139.58	(75)
Northeast 0.9x 0.77	x	5	x	ę	97.38	x	0.63	x	0.7	=	148.81	(75)
Northeast 0.9x 0.77	×	5	x		91.1	x	0.63	x	0.7	=	139.21	(75)
Northeast 0.9x 0.77	x	5	x	7	72.63	x	0.63	x	0.7	=	110.98	(75)
Northeast 0.9x 0.77	x	5	x	ŧ	50.42	x	0.63	x	0.7	=	77.05	(75)
Northeast 0.9x 0.77	x	5	x	2	28.07	x	0.63	x	0.7	=	42.89	(75)
Northeast 0.9x 0.77	×	5	x		14.2	x	0.63	x	0.7	=	21.69	(75)
Northeast 0.9x 0.77	x	5	x		9.21	x	0.63	x	0.7	=	14.08	(75)
Southeast 0.9x 0.77	x	1.42	x	:	36.79	x	0.63	x	0.7	=	15.97	(77)
Southeast 0.9x 0.77	x	1.42	x	6	62.67	x	0.63	x	0.7	=	27.2	(77)
Southeast 0.9x 0.77	x	1.42	x	8	35.75	x	0.63	x	0.7	=	37.21	(77)
Southeast 0.9x 0.77	×	1.42	x	1	06.25	x	0.63	x	0.7	=	46.11	(77)
Southeast 0.9x 0.77	×	1.42	x	1	19.01	x	0.63	x	0.7	=	51.65	(77)
Southeast 0.9x 0.77	x	1.42	x	1	18.15	x	0.63	x	0.7	=	51.27	(77)
Southeast 0.9x 0.77	x	1.42	x	1	13.91	x	0.63	x	0.7	=	49.43	(77)
Southeast 0.9x 0.77	×	1.42	x	1	04.39	x	0.63	x	0.7	=	45.3	(77)
Southeast 0.9x 0.77	×	1.42	x	9	92.85	x	0.63	x	0.7	=	40.29	(77)
Southeast 0.9x 0.77	x	1.42	x	6	69.27	x	0.63	x	0.7	=	30.06	(77)
Southeast 0.9x 0.77	x	1.42	x	4	14.07	x	0.63	x	0.7	=	19.13	(77)
Southeast 0.9x 0.77	×	1.42	x	:	31.49	x	0.63	x	0.7	=	13.66	(77)
Southwest0.9x 0.77	x	8.52	x	:	36.79		0.63	x	0.7	=	95.8	(79)
Southwest0.9x 0.77	x	8.52	x	6	62.67		0.63	x	0.7	=	163.19	(79)
Southwest0.9x 0.77	×	8.52	x	8	35.75		0.63	x	0.7	=	223.28	(79)
Southwest0.9x 0.77	×	8.52	x	1	06.25		0.63	x	0.7	=	276.66	(79)
Southwest0.9x 0.77	x	8.52	x	1	19.01		0.63	x	0.7	=	309.88	(79)
Southwest0.9x 0.77	x	8.52	x	1	18.15		0.63	x	0.7	=	307.64	(79)
Southwest0.9x 0.77	x	8.52	x	1	13.91		0.63	x	0.7	=	296.6	(79)
Southwest _{0.9x} 0.77	x	8.52	×	1	04.39		0.63	x	0.7	=	271.81	(79)
Southwest0.9x 0.77	x	8.52	×		92.85		0.63	x	0.7	=	241.77	(79)
Southwest _{0.9x} 0.77	x	8.52	×	6	69.27		0.63	x	0.7	=	180.36	(79)

Southw	est <mark>0.9x</mark>	0.77	x	8.	52	x	4	4.07		0.63	x	0.7	=	114.75	(79)
Southw	est <mark>0.9x</mark>	0.77	x	8.	52	x	3	31.49	i T	0.63	_ × [	0.7	=	81.99	(79)
	-														
Solar g	jains in	watts, ca	alculated	d for eac	h month	n			(83)m = S	um(74)m .	(82)m				
(83)m=	129.01	225.48	323.73	426.61	501.11	5	07.73	485.24	428.1	359.11	253.31	155.57	109.73		(83)
Total g	ains – i	nternal a	ind sola	r (84)m :	- = (73)m	+ (8	83)m	, watts							
(84)m=	559.72	653.89	736.92	814.65	863.38	84	45.33	807.41	757.36	701.81	621.38	552.09	527.73		(84)
7. Me	an inter	nal temp	erature	(heating	n seasor	י ו)									
		during h					area	from Tab	ole 9. Th	1 (°C)				21	(85)
-		ctor for g	• •			-				. ( 0)					
Ounse	Jan	Feb	Mar	Apr	May	T`	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.9	-	0.76	0.59	0.64	0.87	0.98	1	1		(86)
					ļ						0.30		1		(00)
Mean		l temper		<u> </u>	r È	-		i – – – – – – – – – – – – – – – – – – –	in Tabl	e 9c)				I	
(87)m=	19.7	19.86	20.12	20.45	20.74	2	20.93	20.98	20.98	20.85	20.46	20.02	19.68		(87)
Temp	erature	during h	eating p	periods i	n rest of	dw	elling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.94	19.94	19.94	19.95	19.96	1	9.96	19.96	19.97	19.96	19.96	19.95	19.95		(88)
l Itilisa	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	n De Table	9a)			•			
(89)m=	1	0.99	0.99	0.95	0.86	1	0.66	0.46	0.51	0.8	0.97	0.99	1		(89)
	-					I						0.00			(/
1		l temper		1	1	<u> </u>		1	r <u> </u>	1	<u> </u>			I	
(90)m=	18.21	18.44	18.82	19.3	19.7	1	9.92	19.96	19.96	19.83	19.32	18.68	18.18		(90)
										f	fLA = Livir	ng area ÷ (4	1) =	0.16	(91)
Mean	interna	l temper	ature (fo	or the wh	nole dwe	ellin	g) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.45	18.68	19.03	19.48	19.87	2	20.08	20.13	20.12	20	19.51	18.9	18.42		(92)
Apply	adjustr	nent to th	he mear	n interna	l tempe	ratu	ire fro	m Table	4e, whe	ere appro	opriate	I			
(93)m=	18.45	18.68	19.03	19.48	19.87	2	20.08	20.13	20.12	20	19.51	18.9	18.42		(93)
8. Spa	ace hea	iting requ	uiremen	t											
Set Ti	to the	mean int	ernal te	mperatu	re obtai	ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	able 9a				-						
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g		ì										I	
(94)m=	1	0.99	0.98	0.95	0.86	(	0.68	0.48	0.53	0.81	0.96	0.99	1		(94)
Usefu	-	hmGm ,	,	r	r –									I	
(95)m=	557.76	648.82	723	771.46	740.03		71.16	386.36	403.79	565.61	598.25	548.04	526.34		(95)
	<u> </u>	age exte		r – – –	r	-		1						I	
(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)
		e for mea		· · · ·	1	-		<u> </u>		r í í				1	
· · ·		1567.26		1189.08			08.89	391.67	412.77	657.63	998.83	1328.33	1607.45		(97)
· .		g require		1	1	Wh	/mon	th = 0.02	24 x [(97	)m – (95	ŕ	r –		I	
(98)m=	785.87	617.19	520.09	300.68	130.81		0	0	0	0	298.03	561.81	804.35		
									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	4018.83	(98)
Space	e heatin	g require	ement ir	∖kWh/m	²/year									41.41	(99)
9a. En	erav rea	quiremer	nts <u>– Ind</u>	ividual h	eating s	vst	ems i	ncluding	micro-C	CHP)					
	e heatii				g c	9.00									
•		bace hea	t from s	econdai	y/supple	eme	entarv	system						0	(201)
			-				,	•							

Fraction of space heat from main system(s)								1	(202)					
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$												1	(204)	
Efficiency of main space heating system 1													93.4	(206)
Efficiency of secondary/supplementary heating system, %												0	(208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above)	)								
	785.87	617.19	520.09	300.68	130.81	0	0	0	0	298.03	561.81	804.35		
(211)m	n = {[(98	<u> </u>	(4)] } x 1	100 ÷ (20	)6)					r			1	(211)
	841.4	660.8	556.84	321.93	140.05	0	0	0	0	319.09	601.51	861.19		-
= {[(98]	)m x (20	01)]}x1	00 ÷ (20	r í			I				211) _{15,10} 12		4302.82	(211)
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
	heating	•						lota	I (KVVh/yea	ar) =Sum(2	215) _{15,1012}	<u>-</u>	0	(215)
Output	211.76	ater nea 186.67	ter (calc 196.09	ulated a	00VE) 168.63	148.52	142.29	158.62	160.37	182.33	192.72	206.69		
Efficier	L ncy of w	i ater hea	I iter								1		80.3	(216)
(217)m=	88.05	87.83	87.39	86.41	84.42	80.3	80.3	80.3	80.3	86.28	87.59	88.13		」 (217)
		heating, m x 100												
(219)m=	240.51	212.52	224.38	201.55	199.74	184.95	177.2	197.53	199.71	211.33	220.04	234.52		_
								Tota	I = Sum(2 ⁻				2503.98	(219)
	l totals		nd main	cyctom	1					k	Wh/year	•	kWh/year	1
Space heating fuel used, main system 1 Water heating fuel used													4302.82	]
	0												2503.98	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
central heating pump:											30		(230c)	
boiler with a fan-assisted flue											45		(230e)	
Total electricity for the above, kWh/year								sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										416.32	(232)			
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =										7298.12	(338)			
12a. (	CO2 em	issions ·	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHP	1					-
				<b>Energy</b> kWh/year			Emission factor kg CO2/kWh			<b>Emissions</b> kg CO2/yea	r			
Space heating (main system 1)				(21	(211) x			0.2	16	=	929.41	(261)		
Space heating (secondary)					(21	5) x			0.5	19	=	0	(263)	
Water heating					(219	9) x			0.2	16	=	540.86	(264)	
Space and water heating					(26	1) + (262) ·	+ (263) + (	264) =				1470.27	(265)	
Electricity for pumps, fans and electric keep-hot					t (23 ⁻	1) x			0.5	19	=	38.93	(267)	

Electricity for lighting	(232) x	0.519	=	216.07	(268)
Total CO2, kg/year		sum of (265)(271) =		1725.26	(272)
TER =				17.78	(273)