Regulations Compliance Report

roject Informatio	on:				
sessed By:	Ben Tunningley ((STRO027495)	Building Type:	Semi-detached	d House
welling Details:					
W DWELLING	AS BUILT		Total Floor Area: 9	1.72m²	
e Reference :	Albany Farm		Plot Reference:	Plot 018	
dress :	42 Buttercup Roa	ad , Bishops Waltham, SOUTH	AMPTON , SO32 1RJ		
lient Details:					
me:	Bargate Homes				
dress :	The New Barn, V	'icarage Farm Business Par, W	inchester Road, Fair Oak, S	SO50 7HD	
is report cover	s items included	within the SAP calculations.			
s not a comple	te report of regula	ations compliance.			
a TER and DEF					
	ing system: Mains	gas			
el factor: 1.00 (r	mains gas) oxide Emission Rate		17.5 kg/m²		
-	Dioxide Emission Rate		13.22 kg/m ²		ок
TFEE and DF			10.22 Kg/m		
	rgy Efficiency (TFE	E)	50.3 kWh/m ²		
-	nergy Efficiency (DF		43.6 kWh/m²		
		LL)	43.0 KVVI/III-		
0		22)	43.0 KVVII/III-		ОК
Fabric U-value	es estatemente es				OK
Fabric U-value Element	95	Average	Highest		
Fabric U-value Element External	es wall	Average 0.24 (max. 0.30)			ОК
Fabric U-value Element External Party wal	es wall	Average 0.24 (max. 0.30) 0.00 (max. 0.20)	Highest 0.24 (max. 0.70) -		OK
Fabric U-value Element External Party wal Floor	es wall	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70)		OK OK
Fabric U-value Element External Party wal Floor Roof	es wall II	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35)		OK OK OK
Fabric U-value Element External Party wal Floor Roof Openings	es wall ll	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70)		ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid	es wall ll ging	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30)		OK OK OK
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid	es wall ll s ging bridging calculated	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30)		OK OK OK
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili	es wall ll s ging bridging calculated	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55		ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili	es wall ll s ging bridging calculated ty	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction		OK OK OK
Fabric U-value Element External Party wal Floor Roof Openings Thermal hermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0		ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0		ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0	ains gas	ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator Brand name: Ideal	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0 t index 017929):	ains gas	ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0 t index 017929):	ains gas	ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0 t index 017929):	ains gas	ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi)	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0 t index 017929): rs or underfloor heating - ma	ains gas	ОК ОК ОК ОК
Fabric U-value Element External Party wal Floor Roof Openings a Thermal brid Thermal Air permeabili Air permeal Maximum	es wall ll s ging bridging calculated ty bility at 50 pascals ency	Average 0.24 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) 0.11 (max. 0.20) 1.40 (max. 2.00) from linear thermal transmittan Database: (rev 482, product Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35	Highest 0.24 (max. 0.70) - 0.11 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 4.55 10.0 t index 017929): rs or underfloor heating - ma	ains gas	ОК ОК ОК ОК

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	lostat 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 4.49m ² 7.92m ² 0.47m ² 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:						
Assesso Software			n Tunnir oma FS	0,			Strom Softwa	are Vei	rsion:			0027495 on: 1.0.5.41	
							Address						
Address :	1		Buttercup	Road ,	Bishop	s Waltha	am, SOU	JTHAMP	TON , S	032 1R	J		
1. Overall	dwelling di	mension	S:			A	- (m- 2)			: o: la \$ (ma)		\/el.ume/m3)	
Ground floo)r					-	a(m²)	(1a) x		ight(m)	(2a) =	Volume(m ³)	(3a)
	//					4	5.86			2.4	1	110.06	
First floor						4	5.86	(1b) x	2	.67	(2b) =	122.45	(3b)
Total floor a	area TFA =	(1a)+(1l	o)+(1c)+(1d)+(1e)+(1r	1) g	1.72	(4)					
Dwelling vo	lume							(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	232.51	(5)
2. Ventilat	ion rate:												
			main heating		econdar leating	у	other		total			m ³ per hour	
Number of	chimneys	Г	0	+ [0	+	0] = [0	X 4	40 =	0	(6a)
Number of	open flues	Ē	0	_] + [0	_ + _	0] = [0	x2	20 =	0	(6b)
Number of	intermittent	fans						- с Г	0	x	10 =	0](7a)
Number of	passive vei	nts							0	x ^	10 =	0	_](7b)
Number of									0	x 4	40 =	0](7c)
	nucleos ga	5 1105						L	0			0	(/ C)
											Air ch	nanges per hou	ır
Infiltration d	lue to chim	neys, flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	0	<u> </u>	÷ (5) =	0	(8)
lf a pressur	isation test ha	s been ca	rried out or	is intende	ed, procee	d to (17), d	otherwise o	continue fr					
	of storeys i		elling (ns)								0	(9)
	I infiltration									[(9)-	-1]x0.1 =	0	(10)
	l infiltration								uction			0	(11)
-	pes of wall ar g areas of op				ponung ic	i ille great	er wall are	a (allei					
If suspen	ded woode	n floor, o	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no drau	ight lobby,	enter 0.0	05, else e	enter 0								0	(13)
	ge of windo	ows and	doors dra	aught st	ripped							0	(14)
	nfiltration						0.25 - [0.2					0	(15)
		~ ~ 50		مانیم منام	:		(8) + (10)					0	(16)
If based on	ability valu	•						•	etre of e	invelope	area	4.5500001907348	4
	bility value ap								is being u	sed		0.23	(18)
Number of							,	,	0			2	(19)
Shelter fact	or						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration r	ate incorpo	rating sł	nelter fac	tor			(21) = (18) x (20) =				0.19	(21)
Infiltration ra		d for mo	nthly win	d speed	1			1		1		1	
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly ave	erage wind	speed f	rom Table	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 (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltr	ation rat	e (allowi	ng 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 effect		-	rate for t	he appli	cable ca	ISE					I	0.5	(23a)
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23	o) = (23a)		l I	0.5	(23a) (23b)
If balanced with				, ,	, ,				, , ,		l	0.5	(23c)
a) If balance	d mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (23b) × [ا (23c) – 1	-	
(24a)m= 0	0	0	0	0	0	0	0	0	0		0		(24a)
b) If balance	d mech	anical ve	entilation	without	heat red	covery (ч MV) (24t)m = (2	2b)m + (23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				-	-		on from (.c) = (221		5 x (23)				
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural									0.0	0.0	0.0		(- /
,					•		0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	ld) in bo	x (25)	-	-			
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
			•					•					
3. Heat losse	s and he	eat loss	paramete	ər:		•		•					
3. Heat losse	s and he Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł		
	Gros	SS	Openin	gs									
ELEMENT	Gros	SS	Openin	gs	A ,r	m²	W/m2	2K	(W/				ΊK
ELEMENT Doors Type 1	Gros area	SS	Openin	gs	A ,r	m ² x	W/m2	2K = =	(W/ 2.94				′K (26)
ELEMENT Doors Type 1 Doors Type 2	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				Ϋ́Κ (26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 2.1 4.49	m ² x x x 1 x ¹	W/m2 1.4 1.4 /[1/(1.4)+	2K = = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95				K (26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 2.1 4.49 7.92	m ² × × × × × × × × × × × × × × × × × × ×	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95 10.5	к)			K (26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area e 1 e 2	ss (m²)	Openin	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47	m ² x x x1 x1 x1 x1 5 x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95 10.5 0.62	к)	kJ/m²-ł	< kJ/	(26) (26) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Floor	Gros area 9 1 9 2 9 3	ss (m²)	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86	m ² x x x x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	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 5.95 10.5 0.62 5.0446	к)	kJ/m²-ŀ 75	K kJ/	(26) (26) (27) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area 2 2 3 97.4 45.8	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ² × × × × × × × × × × × × × × × × × × ×	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = = = 0.04] = 0.04] = 0.04] = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	к)	kJ/m²-ł 75 60	< kJ/ 3439.5 4821.6	(26) (26) (27) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof	Gros area 2 2 3 97.4 45.8	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x x ² x x ² x x ² x x 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] = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	к)	kJ/m²-ł 75 60	< kJ/ 3439.5 4821.6	 'K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area 2 3 97.4 lements	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ² x x x1 x1 x1 x1 x1 x5 x x6 x x6 x x x6 x x x7 x x1 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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9	< kJ/ 3439.5 4821.6 412.74 2041.6	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area 2 3 97.4 45.8 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ² x x x1 x1 x1 x1 x1 x1 x5 x x5 x x5 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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45	< kJ/ 3439.5 4821.6 412.74	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area 2 3 97.4 45.8 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87	m ² 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	2K = = = 0.04] = 0.04] = = = = = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9	< kJ/ 3439.5 4821.6 412.74 2041.63 286.844	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area 2 3 97.4 45.8 elements	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 189.1 45.37 31.87 126.4	$ m^{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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9 9	< kJ/ 3439.5 4821.6 412.74 2041.64 286.844 1138.06	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (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 **	Gros area 2 3 97.4 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87 126.4	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9 9 9 75	< kJ/ 3439.5 4821.6 412.74 2041.63 286.844 1138.06 3949.2	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (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) =

52.33 (33)

Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17327.82	(34)
Therm	al mass	parame	ter (TMF	- Cm -	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			188.92	(35)
	-	sments wh ad of a de			constructi	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	<						8.21	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			60.54	(37)
Ventila	ation hea	at loss ca	alculated	monthl	у	-		-	(38)m	= 0.33 × (25)m x (5)		_	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36		(38)
Heat ti	ransfer o	coefficier	nt, W/K			-			(39)m	= (37) + (38)m		_	
(39)m=	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91]	
Heat lo	oss para	ımeter (H	· HLP), W/	/m²K						Average = = (39)m ÷	Sum(39)1. • (4)	12 /12=	98.91	(39)
(40)m=	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08]	
Numbe	er of day	/s in moi	nth (Tab	le 1a)	1	<u>.</u>	<u>.</u>	1	,	Average =	Sum(40)1.	12 /12=	1.08	(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	1	(41)
			1	1	1	1		1		1		1	1	
4 \\/														
4. 000	ater nea	ting enei	igy iequ	nement.								kWh/y	ear.	
if TF	A > 13.			[1 - exp	(-0.0003	849 x (TF	- A -13.9))2)] + 0.()013 x (TFA -13		65]	(42)
	A £ 13.9		ator upor	no in litre	o por de	w Vd ov	orogo –	(25 x N)	1.26				1	(40)
								(23 × IN) to achieve		se target o		7.1		(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 T	Table 1c x	(43)		•	-	•	-	
(44)m=	106.81	102.93	99.04	95.16	91.28	87.39	87.39	91.28	95.16	99.04	102.93	106.81]	
											m(44) ₁₁₂ =		1165.23	(44)
Energy	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	-	
(45)m=	158.4	138.54	142.96	124.64	119.59	103.2	95.63	109.73	111.04	129.41	141.26	153.4		_
If incton	topoouou	otor hooti	na of point	of upp /m	hat wata	r otorogo)	ontor 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1527.8	(45)
	r	i	i i	·	i			1			i		1	(10)
(46)m=	23.76 storage	20.78	21.44	18.7	17.94	15.48	14.34	16.46	16.66	19.41	21.19	23.01		(46)
	-		includir	na anv si	olar or M	/WHRS	storage	within sa	ame ves	مما		0	1	(47)
-		. ,			velling, e		-			501		0		(47)
	•	-			-			(47) mbi boil	ers) ente	er '0' in <i>(</i>	47)			
	storage								, 0110		,			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
		actor fro										0	Ī	(49)
-		m water			ear			(48) x (49)) =			0	1	(50)
			-			or is not	known:				L		L	

		-		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
	•	eating s		on 4.3									1	
		from Tal		0								0		(52)
•		actor fro										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	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3					-		0		(58)
	•	•		for each		59)m = ((58) ÷ 36	65 × (41)	m				1	
	-			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	lculated	for each	month ((61)m =	(60) ÷ 36	65 x (41)m		•			I	
(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)
			water h			l for eac	L h month	l (62)m –					I (59)m + (61)m	
(62)m=	172.16	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		(62)
										-		er heating)		(0-)
				and/or \							ION IO Wale	er neating)		
(auu au (63)m=		0							0	0	0	0	I	(63)
		-	-	-	-	-	-	-					l	(63) (G2)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(03) (02)
		ater hea	I	1		1		1					I	
(64)m=	172.16	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		1
								Outp	out from w	ater heate	r (annual)₁	12	1689.78	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	1 + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	56.11	49.17	50.97	44.77	43.2	37.64	35.24	39.93	40.25	46.47	50.3	54.45		(65)
inclu	ıde (57)ı	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fi	rom com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	158.91	158.91	158.91	158.91	158.91	158.91	158.91	158.91	158.91	158.91	158.91	158.91		(66)
Liahtin	a aains	(calcula	ted in Ar	pendix	L. equat	ion L9 o	r L9a), a	lso see ⁻	Table 5	Į	1		1	
(67)m=	55.72	49.49	40.25	30.47	22.78	19.23	20.78	27.01	36.25	46.03	53.72	57.27	1	(67)
				I Append									ł	
(68)m=	361.5	365.25	355.8	335.68	310.27	286.4	270.45	266.7	276.15	296.27	321.68	345.55	1	(68)
				ppendix							1		i	
(69)m=	53.54	53.54	53.54	53.54	53.54	53.54	53.54	53.54	53.54	53.54	53.54	53.54	1	(69)
					55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	l	(00)
		ns gains	r –	<u> </u>									I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		·	· •	tive valu	, `	· · ·		I	i			i	I	
(71)m=	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	ł	(71)
Water	heating	gains (T	able 5)	i	i	i	i	i	i	i	i	1	1	
(72)m=	75.41	73.17	68.51	62.18	58.07	52.28	47.36	53.66	55.9	62.46	69.86	73.18		(72)

(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (73)(73)m= 602.15 597.43 574.07 537.84 500.63 467.42 448.1 456.88 477.81 514.27 554.77 585.51 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 х 11.28 x 0.45 22.8 1 х 4.49 1.11 = Northeast 0.9> (75)1 X 4.49 X 22.97 х 0.45 x 1.11 = 46.4 Northeast 0.9x (75)1 4.49 х 41.38 х 0.45 х 1.11 = 83.61 X Northeast 0.9x (75)1 х 4.49 х 67.96 Х 0.45 х 1.11 = 137.3 Northeast 0.9x 4.49 91.35 x 0.45 х 1.11 184.56 (75)1 x х = Northeast 0.9x 4.49 97.38 X 0.45 х 1.11 = 196.77 (75)1 х х Northeast 0.9x x х (75)1 4.49 х 91.1 0.45 1.11 _ 184.07 Northeast 0.9x 1 146.74 (75)х 4.49 х 72.63 х 0.45 х 1.11 = Northeast 0.9x (75)1 4.49 х 50.42 х 0.45 х 1.11 = 101.87 Northeast 0.9x (75)1 Х 4.49 х 28.07 х 0.45 х 1.11 = 56.71 Northeast 0.9x (75) 1 X 4.49 х 14.2 x 0.45 х 1.11 28.68 Northeast 0.9x (75) 9.21 х 0.45 х = 18.62 1 х 4.49 х 1.11 Southeast 0.9x 1 Х 0.47 X 36.79 x 0.45 х 1.11 7.78 (77) Southeast 0.9x 13.26 (77) 1 x 0.47 х 62.67 x 0.45 х = 1.11 Southeast 0.9x 1 0.47 x 85.75 х 0.45 х 1.11 18.14 (77)X = Southeast 0.9x (77) 0 47 х x х 22 47 1 x 106.25 0 45 1.11 = Southeast 0.9x 1 0.47 х 119.01 x 0.45 х 1.11 25.17 (77)х = Southeast 0.9x (77)1 0.47 x 0.45 x 24.99 X X 118.15 1.11 = Southeast 0.9x x х (77)1 х 0.47 х 113.91 0.45 1.11 = 24.09 Southeast 0.9x (77) 1 x 0.47 x 104.39 x 0.45 x 1.11 = 22.08 Southeast 0.9x 1 0.47 x 92.85 x 0.45 x 1.11 = 19.64 (77)X Southeast 0.9x (77) 1 x 0.47 x 69.27 x 0.45 x 1.11 = 14.65 Southeast 0.9x 1 0.47 x 44.07 x 0.45 х 1.11 = 9.32 (77)x Southeast 0.9x 1 0.47 31.49 x 0.45 1.11 6.66 (77) x x х = Southwesto.9x 1 7.92 x 36.79 0.45 х 1.11 = 131.13 (79)x Southwest0.9x 1 7.92 0.45 1.11 223.37 (79) Х 62.67 х = Southwesto.9x (79) 1 7.92 85.75 0.45 х 1.11 _ 305.62 Х Southwest0.9x (79) 1 Х 7.92 106.25 0.45 х 1.11 = 378.68 Southwest0.9x х (79) 1 Х 7.92 X 424.15 119.01 0.45 1.11 Southwest_{0.9x} (79) 1 7.92 Х 118.15 0.45 x 1.11 = 421.09 Х Southwesto.9x 405.97 (79) 1 7.92 113.91 0.45 1.11 X X х = Southwest_{0.9x} х х (79) 1 7 92 104 39 0 45 1.11 372 05 Х Southwesto.9x (79) 1 7.92 х 92.85 0.45 х 1.11 330.92 X = Southwesto.9x 246.87 1 7.92 69.27 0.45 1.11 (79)х x X =

Southw	/est _{0.9x}	1	x	7.9	92	×Г	44	.07		0.45] × [1.11	=	157.07	(79)
Southw	vest <mark>0.9x</mark>	1	x	7.9	92	хГ	31	.49		0.45	Ξ×Γ	1.11		112.22	(79)
	L				/_	L				0110	L				
Solar	naine in	watte o	alculator	d for eac	h month				(83)m – S	um(74)m .	(82)m				
(83)m=	161.71	283.03	407.36	538.46	633.89	1	2.84	614.13	540.87	452.44	318.23	195.07	137.5	l	(83)
				r (84)m =										i	, í
(84)m=	763.86	880.46	981.44	1076.3	1134.52	r È	· ·	1062.23	997.75	930.25	832.5	749.84	723.01	1	(84)
(04)11-	705.00	000.40	301.44	1070.5	1134.32	[' ' '	10.20	1002.23	331.13	930.23	002.0	743.04	723.01	l	(04)
7. Me	ean inter	nal temp	perature	(heating	season)									
Temp	perature	during h	neating p	periods i	n the livi	ng a	area fr	om Tab	ole 9, Th	1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for	living are	ea, h1,m	ı (se	e Tab	ole 9a)							
	Jan	Feb	Mar	Apr	May	J	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.98	0.96	0.93	0.85	0.72	0.	.55	0.4	0.45	0.67	0.88	0.96	0.98		(86)
Maar		l to rear an	I	l Linin an an				- 0 += 7					I	1	
	r	· · ·	1	living ar	· · · ·	1	i	1			00.00	00.40	40.77	I	(97)
(87)m=	19.83	20.04	20.32	20.64	20.86	20	0.97	20.99	20.99	20.92	20.62	20.16	19.77		(87)
Temp	perature	during h	neating p	periods in	n rest of	dwe	elling f	from Ta	ble 9, T	h2 (°C)				_	
(88)m=	20.02	20.02	20.02	20.02	20.02	20	0.02	20.02	20.02	20.02	20.02	20.02	20.02		(88)
l Itilis:	ation fac	tor for a	iains for	rest of d	welling	h2 n	n (see	Table	9a)					I	
(89)m=	0.97	0.95	0.91	0.82	0.66	1	.47	0.32	0.36	0.59	0.85	0.95	0.98	1	(89)
			Į									0.00	0.00	İ	(00)
Mear	n interna	l temper	rature in	the rest	of dwell	ing T	T2 (fo	llow ste	ps 3 to 3	7 in Tabl	e 9c)	i	i		
(90)m=	18.97	19.17	19.45	19.74	19.93	2	20	20.02	20.01	19.98	19.73	19.29	18.91		(90)
										f	iLA = Livi	ng area ÷ (4) =	0.14	(91)
Mear	, interna	l temper	rature (fo	or the wh	ole dwe	llina	ı) = fl .	A x T1 ·	+ (1 – fl	A) x T2					_
(92)m=	19.1	19.3	19.57	19.87	20.06).14	20.16	20.16	20.11	19.86	19.42	19.04	l	(92)
				n interna										i	
(93)m=	18.95	19.15	19.42	19.72	19.91	1	0.99	20.01	20.01	19.96	19.71	19.27	18.89	1	(93)
. ,			uirement	1	10.01			20.01	20.01	10.00	10.71	10.27	10.00		()
					vo obtoiv		-	- 11 of			4 T: ma	(70)			
				mperatu using Ta		ied a	at ste	p 11 of	Table 9	o, so tha	t II,m=	(76)m an	a re-caid	ulate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
l Itilis:			ains, hr		Iviay			Jui	Aug	Ocp	001		Dee	i	
(94)m=	0.97	0.94	0.9	0.81	0.66	0	.47	0.32	0.35	0.59	0.84	0.94	0.97	1	(94)
				1 0.01 4)m x (8		•		0.02	0.00	0.00	0.01	0.01	0.01		
(95)m=	739.13	831.42	882.41	868.38	744.63	52	20.6	335.21	353.65	547.74	699.22	708.44	703.73	1	(95)
								555.21	333.00	347.74	033.22	700.44	705.75	İ	(00)
	4.3	4.9	1	perature	r	r		16.6	16.4	14.1	10.6	7.1	4.2	I	(96)
(96)m=			6.5	8.9	11.7		4.6	16.6	16.4	14.1		7.1	4.2		(90)
		1	1	nal temp	i	1		- /	- ,	· ,				I	(07)
(97)m=		1409.19	1278.2	1069.71	812.2			336.97	356.57	579.79	901.05		1452.72		(97)
•	-	ř – –	1	or each n	r	1	- 1			,	í · ·	- <u> </u>	1	1	
(98)m=	527.94	388.27	294.47	144.96	50.27		0	0	0	0	150.16	356.45	557.25		_
									Tota	l per year	(kWh/yea	ar) = Sum(9	8)15,912 =	2469.77	(98)
Spac	e heatin	g require	ement in	∙kWh/m²	²/year									26.93	(99)
		• •		ividual h	•	veto	me in	cluding	micro 6	'HP)					
			no – Inu	mudifi	cauny s	yste	1115-111	Giuding							
-	e heatii ion of sr	-	at from s	econdar	v/supple	mer	ntarv «	system						0	(201)
					,,			-,						Ĭ	L''

Fract	ion of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	ion 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	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac		ř – –		calculate	r í								7	
	527.94	388.27	294.47	144.96	50.27	0	0	0	0	150.16	356.45	557.25]	
(211)n	n = {[(98 583.36	6)m x (20 429.02)4)] } x 1 325.38	100 ÷ (20 160.17	06) 55.55	0	0	0	0	165.93	393.87	615.75	1	(211)
	565.50	429.02	325.36	100.17	55.55	0	0			ar) =Sum(2			2729.03	(211)
Spac	e heatin	a fuel (s	econdar	′y), kWh/	month					, ,	/15,101	2	2123.03](=)
•		•	00 ÷ (20	• ·										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,101}	2=	0	(215)
	heating	-	(L)									
Output	172.16	ater nea 150.96	156.72	ulated al	bove) 133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16	1	
Efficie	ncy of w	i ater hea	i ater	<u> </u>									87.3	(216)
(217)m=	89.69	89.58	89.36	88.91	88.15	87.3	87.3	87.3	87.3	88.91	89.51	89.74		(217)
		-	, kWh/m										-	
(219)m (219)m=		m x 100 168.52	0 ÷ (217) 175.37)m 155.15	151.27	133.46	125.3	141.46	142.45	161.03	172.7	186.27	1	
(,									I = Sum(2				1904.91	(219)
Annua	al totals	;								k	Wh/yea	r	kWh/year	
Space	heating	fuel use	ed, main	system	1								2729.03]
Water	heating	fuel use	•d										1904.91]
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								_
mech	anical v	rentilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Ð			61.39	1	(230a)
centra	al heatir	ng pump	:									30	1	(230c)
boiler	with a	fan-assis	sted flue									45]	(230e)
				kWh/yea	ır			sum	of (230a).	(230g) =			136.39	(231)
	city for I			, in the second	•				. ,	(0,			393.64	(232)
														4
		erated b	-) (004)	. (004)	. (000)	(0071)					-553.98	(233)
				ises (211		+ (231)	+ (232).	(237b)	=				4610	(338)
10a.	Fuel cos	sts - indi	vidual he	eating sy	stems:									
						Fu kW	i el /h/year			Fuel P (Table			Fuel Cost £/year	
Space	heating	j - main :	system 1	1		(21	1) x			3.4	8	x 0.01 =	94.97	(240)
Space	heating	, - main :	system 2	2		(21:	3) x			0		x 0.01 =	0	(241)

(215) x

Space heating - secondary

13.19 × 0.01 = 0 (242)

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	66.29 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	17.99 (249)
(if off-peak tariff, list each of (230a) to (230g)			
Energy for lighting	(232)	13.19 × 0.01 =	51.92 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01 =	-73.07 (252)
Appendix Q items: repeat lines (253) and (25 Total energy cost (245)	4) as needed (247) + (250)(254) =		278.1 (255)
11a. SAP rating - individual heating systems	3		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255]) x (256)] ÷ [(4) + 45.0] =		0.85 (257)
SAP rating (Section 12)			88.08 (258)
12a. CO2 emissions – Individual heating sys	stems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	589.47 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	411.46 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	1000.93 (265)
Electricity for pumps, fans and electric keep-h	not (231) x	0.519 =	70.79 (267)
Electricity for lighting	(232) x	0.519 =	204.3 (268)
Energy saving/generation technologies Item 1		0.519 =	-287.51 (269)
Total CO2, kg/year		sum of (265)(271) =	988.5 (272)
CO2 emissions per m ²		(272) ÷ (4) =	10.78 (273)
El rating (section 14)			90 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	3329.41 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2323.99 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	5653.4 (265)
Electricity for pumps, fans and electric keep-h	not (231) x	3.07 =	418.73 (267)
Electricity for lighting	(232) x	0 =	1208.47 (268)
Energy saving/generation technologies Item 1		3.07 =	-1700.7 (269)

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

(272) ÷ (4) =

5579.9	(272)
60.84	 (273)

					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 :			o Road ,	, Bishops	s Waltha	am, SOU	ЛТНАМР	TON, S	032 1R	J		
1. Overall dwelling dim	iension	S:			•	- (2)		A 11	·			
Ground floor						a(m²)	(1a) x		ight(m)	(20) -	Volume(m ³)	(3a)
						15.86	1		2.4	(2a) =	110.06]
First floor						15.86	(1b) x	2	.67	(2b) =	122.45	(3b)
Total floor area TFA = (1a)+(1b	o)+(1c)+((1d)+(1e	e)+(1r	i) g	91.72	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	232.51	(5)
2. Ventilation rate:												
		main neating		econdar leating	У	other		total			m ³ per hour	
Number of chimneys		0	+	0] + [0	=	0	x 4	40 =	0	(6a)
Number of open flues	Γ	0	+ [0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent	ans						- F	0	x 1	0 =	0	(7a)
Number of passive vent	ts						Γ	0	x 1	0 =	0	(7b)
Number of flueless gas	fires						Г	0	x 4	40 =	0	(7c)
							L					4
										Air ch	anges per hou	ır
Infiltration due to chimn	•							0		÷ (5) =	0	(8)
If a pressurisation test has Number of storeys in				ed, procee	d to (17),	otherwise o	continue fr	om (9) to ((16)		0	(9)
Additional infiltration			·)						[(9)-	1]x0.1 =	0	(10)
Structural infiltration:	0.25 foi	r steel or	timber f	frame or	0.35 fo	r masoni	ry constr	uction			0	(11)
if both types of wall are				ponding to	the great	ter wall are	ea (after]
deducting areas of open If suspended wooder	• /	•		ed) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, e				00,010	(oould	<i>, 0.00</i>					0	(13)
Percentage of window				ripped							0	(14)
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value	•	•				•	•	etre of e	envelope	area	4.55000019073486	s (17)
If based on air permeat											0.23	(18)
Air permeability value app. Number of sides shelte		essurisatio	on test has	s been don	e or a de	gree air pe	rmeability	is being us	sed			(19)
Shelter factor	eu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorpora	ating sh	elter fac	tor			(21) = (18) x (20) =				0.19	(21)
Infiltration rate modified	for mo	nthly win	d speed	ł							L	-
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed fr	om 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 (2	22a)m =	(22)m ÷	4										
<mark>(22a)m=</mark> 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltr	ation rat	e (allowi	ng 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 effect		-	rate for t	he appli	cable ca	ISE					I	0.5	(23a)
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23	o) = (23a)		l I	0.5	(23a) (23b)
If balanced with				, ,	, ,				, , ,		l	0.5	(23c)
a) If balance	d mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (23b) × [ا (23c) – 1	-	
(24a)m= 0	0	0	0	0	0	0	0	0	0		0		(24a)
b) If balance	d mech	anical ve	entilation	without	heat red	covery (ч MV) (24t)m = (2	2b)m + (23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				-	-		on from (.c) = (221		5 x (23)				
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural									0.0	0.0	0.0		(- /
,					•		0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	ld) in bo	x (25)		-			
(25)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
			•					•					
3. Heat losse	s and he	eat loss	paramete	ər:		•		•					
3. Heat losse	s and he Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł		
	Gros	SS	Openin	gs									
ELEMENT	Gros	SS	Openin	gs	A ,r	m²	W/m2	2K	(W/				ΊK
ELEMENT Doors Type 1	Gros area	SS	Openin	gs	A ,r	m ² x	W/m2	2K = =	(W/ 2.94				′K (26)
ELEMENT Doors Type 1 Doors Type 2	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				Ϋ́Κ (26) (26)
ELEMENT Doors Type 1 Doors Type 2 Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 2.1 4.49	m ² x x x 1 x ¹	W/m2 1.4 1.4 /[1/(1.4)+	2K = = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95				K (26) (26) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.1 2.1 4.49 7.92	m ² × × × × × × × × × × × × × × × × × × ×	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+	2K = = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95 10.5	к)			K (26) (26) (27) (27) (27)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type	Gros area e 1 e 2	ss (m²)	Openin	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47	m ² x x x1 x1 x1 x1 5 x	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K = = = • 0.04] = • 0.04] =	(W/ 2.94 2.94 5.95 10.5 0.62	к)	kJ/m²-ł	< kJ/	(26) (26) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Floor	Gros area 9 1 9 2 9 3	ss (m²)	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86	m ² x x x x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	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 5.95 10.5 0.62 5.0446	к)	kJ/m²-ŀ 75	K kJ/	(26) (26) (27) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls	Gros area 2 2 3 97.4 45.8	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ² × × × × × × × × × × × × × × × × × × ×	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.24	2K = = = 0.04] = 0.04] = 0.04] = = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	к)	kJ/m²-ł 75 60	< kJ/ 3439.5 4821.6	(26) (26) (27) (27) (27) (27) (28)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof	Gros area 2 2 3 97.4 45.8	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36	m ² x x x ¹ x ¹ x ¹ x ¹ x ² x x ² x x ² x x ² x x 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] = = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29	к)	kJ/m²-ł 75 60	< kJ/ 3439.5 4821.6	 'K (26) (27) (27) (27) (28) (29) (30) (31)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	Gros area 2 3 97.4 lements	ss (m ²) 14 36	Openin m	gs 2	A ,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ² x x x1 x1 x1 x1 x1 x5 x x6 x x6 x x x6 x x x7 x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9	< kJ/ 3439.5 4821.6 412.74 2041.6	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Floor Walls Roof Total area of e Party wall	Gros area 2 3 97.4 45.8	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1	m ² x x x1 x1 x1 x1 x1 x1 x5 x x5 x x5 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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45	< kJ/ 3439.5 4821.6 412.74	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area 2 3 97.4 45.8 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87	m ² 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	2K = = = 0.04] = 0.04] = = = = = = = =	(W/ 2.94 2.94 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9	< kJ/ 3439.5 4821.6 412.74 2041.63 286.844	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c)
ELEMENT Doors Type 1 Doors Type 2 Windows Type Windows Type Vindows Type Floor Walls Roof Total area of e Party wall Internal wall **	Gros area 2 3 97.4 45.8 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87 126.4	$ m^{2} \\ $	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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9 9	< kJ/ 3439.5 4821.6 412.74 2041.64 286.844 1138.06	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (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 **	Gros area 2 3 97.4 elements	ss (m ²) 14 36	Openin m	gs 2	A,r 2.1 2.1 4.49 7.92 0.47 45.86 80.36 45.86 189.1 45.37 31.87 126.4	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	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 5.95 10.5 0.62 5.0446 19.29 5.04	к)	kJ/m²-ł 75 60 9 45 9 9 9 75	< kJ/ 3439.5 4821.6 412.74 2041.63 286.844 1138.06 3949.2	 'K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (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) =

52.33 (33)

Heat ca	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17327.82	(34)
Therma	al mass	parame	eter (TMI	- = Cm -	- TFA) in	ı kJ/m²K			= (34)	÷ (4) =			188.92	(35)
-	-	sments wh ad of a de			constructi	ion are noi	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix I	<						8.21	(36
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)						I		
Total fa	abric he	at loss							(33) +	(36) =			60.54	(37
Ventila	tion hea	at loss ca	alculated	monthl	y		-	-	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m=	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36	38.36		(38
leat tra	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
39)m=	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91		
leat lo	oss para	ameter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	98.91	(39
40)m=	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08		
Numbe	er of day	, /s in mo	nth (Tab	le 1a)				•	,	Average =	Sum(40)1	12 /12=	1.08	(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. vva	iter nea	ung ene	rgy requ	irement:								kWh/ye	ear:	
		upancy, 9, N = 1		: [1 - exp	(-0.0003	49 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	TFA -13		65		(42
		9, N = 1				\/.L								
								(25 x N) to achieve		se target o		7.1		(43
not more	e that 125	litres per	person pe	r day (all w	rater use, h	not and co	ld)			-				
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
44)m=	106.81	102.93	99.04	95.16	91.28	87.39	87.39	91.28	95.16	99.04	102.93	106.81		
L											m(44) ₁₁₂ =		1165.23	(44
Energy c	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
45)m=	158.4	138.54	142.96	124.64	119.59	103.2	95.63	109.73	111.04	129.41	141.26	153.4		_
finatant	ionoouo u	votor booti	na ot poin	t of upp (pr	hot wator	toraga	ontor 0 in	havaa (16		Total = Su	m(45) ₁₁₂ =	=	1527.8	(45
г		. <u> </u>	- ·	·				boxes (46)		i	1			
46)m=	23.76 storage	20.78	21.44	18.7	17.94	15.48	14.34	16.46	16.66	19.41	21.19	23.01		(46
	•		includir	na anv si	alar or M	////HRS	storane	within sa	ame ves	مما		0		(47
-							-			501		0		(47
Otherw		o stored			velling, e Icludes i			ombi boil	ers) ente	er '0' in (47)			
	•		eclared I	oss facto	or is kno	wn (k\//ŀ	ı/dav).					0		(48
		actor fro					"uuy).							
					aar			(48) v (40)) –			0		(49
•••			-	e, kWh/ye cylinder⊺	ear loss facte	or is not		(48) x (49)	, =			0		(50

Hot wa	tor stor	عمو امدد	factor fr	om Tabl	a 2 (k\M	h/litre/da)					0		(51)
		leating s				n/ntre/ua	iy)					0		(51)
	•	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m water	storage	, 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 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 dedicate	d solar sto	rage, (57)	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	• 3							0		(58)
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m		L			
	•				,	,	. ,	• •		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 × (41))m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	172.16	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		(62)
Solar DH	-W input o	calculated	using App	endix G or	I Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	r heating)		
						applies						0,		
(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=	172.16	150.96	156.72	137.95	133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		
								Outp	out from w	ater heate	ı r (annual)₁	12	1689.78	(64)
Heat g	ains froi	m 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	1	-
(65)m=		49.17	50.97	44.77	43.2	37.64	35.24	39.93	40.25	46.47	50.3	54.45		(65)
inclu	ude (57)i	m in calo	ulation (u of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	u vater is fr	om com	nunity h	leating	
	. ,	ains (see		. ,	,	,		5				,	5	
		s (Table			/-									
Melabl	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43		(66)
						ion L9 o				<u> </u>	1			
(67)m=	23.15	20.56	16.72	12.66	9.46	7.99	8.63	11.22	15.06	19.12	22.32	23.79		(67)
						L uation L								
(68)m=	242.21	244.72	238.39	224.9	207.88	191.89	181.2	178.69	185.02	198.5	215.52	231.52	l	(68)
				I		tion L15	I	I		I				
(69)m=	36.24	36.24	36.24	36.24	2, equal 36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24	l	(69)
					00.27	00.27	00.27	00.27	00.27	00.24	00.24	00.24		V 1
(70)m=		ns gains 3		3	3	3	3	3	3	3	3	3		(70)
									5					()
	s e.g. ev -105.94	aporatio -105.94	n (nega -105.94	105.94	es) (Tab -105.94	le 5) -105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	l	(71)
				-103.94	-105.94	-105.94	-105.94	-105.94	-105.94	-103.94	-103.94	-103.94		(11)
		gains (T	,	00.40	50.07	50.00	47.00	50.00	FF0	00.40	00.00	70.40	l	(72)
(72)m=	75.41	73.17	68.51	62.18	58.07	52.28	47.36	53.66	55.9	62.46	69.86	73.18		(72)

(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (73)(73)m= 406.5 404.18 389.35 365.47 341.14 317.88 302.92 309.3 321.71 345.81 373.43 394.22 6. Solar gains Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. FF Gains Orientation: Access Factor Area Flux g_ Table 6a Table 6b Table 6d m² Table 6c (W) Northeast 0.9x (75) x 0.77 х 11.28 x 0.45 17.55 х 4.49 1.11 = Northeast 0.9> (75)0.77 X 4.49 X 22.97 х 0.45 x 1.11 = 35.73 Northeast 0.9x (75)0.77 4.49 х 41.38 х 0.45 х 1.11 = 64.38 X Northeast 0.9x (75)0.77 х 4.49 х 67.96 Х 0.45 х 1.11 = 105.72 Northeast 0.9x 0.77 4.49 91.35 x 0.45 х 1.11 142.11 (75)х х = Northeast 0.9x 0.77 4.49 97.38 X 0.45 х 1.11 = 151.51 (75)х х Northeast 0.9x x х (75)0.77 4.49 х 91.1 0.45 1.11 _ 141.73 Northeast 0.9x 112.99 (75)0.77 х 4.49 х 72.63 х 0.45 х 1.11 = Northeast 0.9x (75)0.77 4.49 х 50.42 х 0.45 х 1.11 = 78.44 Northeast 0.9x (75)0.77 х 4.49 х 28.07 х 0.45 х 1.11 = 43.67 Northeast 0.9x (75) 0.77 Х 4.49 х 14.2 x 0.45 х 1.11 22.09 Northeast 0.9x (75) 9.21 х 0.45 х = 0.77 Х 4.49 х 1.11 14.34 Southeast 0.9x 0.77 Х 0.47 X 36.79 x 0.45 х 1.11 5.99 (77) Southeast 0.9x (77) 0.77 x 0.47 х 62.67 x 0.45 х = 10.21 1.11 Southeast 0.9x 0.77 0.47 x 85.75 х 0.45 х 1.11 13.97 (77)X = Southeast 0.9x (77) х x х 17.3 0.77 x 0 47 106.25 0 45 1.11 = Southeast 0.9x 0.77 0.47 х 119.01 x 0.45 х 1.11 19.38 (77)х = Southeast 0.9x (77)0.47 x 0.45 x 19.24 0.77 X X 118.15 1.11 = Southeast 0.9x x х (77)0.77 х 0.47 х 113.91 0.45 1.11 = 18.55 Southeast 0.9x 17 (77) 0.77 x 0.47 x 104.39 x 0.45 x 1.11 = Southeast 0.9x 0.77 0.47 x 92.85 x 0.45 x 1.11 = 15.12 (77)X Southeast 0.9x (77) 0.77 x 0.47 x 69.27 x 0.45 x 1.11 = 11.28 Southeast 0.9x 0.77 0.47 x 44.07 x 0.45 х 1.11 = 7.18 (77)х Southeast 0.9x 0.77 0.47 31.49 x 0.45 1.11 5.13 (77) x х = Southwesto.9x 0.77 7.92 x 36.79 0.45 х = 100.97 (79)х 1.11 Southwest0.9x 0.77 7.92 0.45 1.11 171.99 (79) Х 62.67 х = Southwesto.9x (79) 0.77 Х 7.92 85.75 0.45 х 1.11 _ 235.33 Southwest0.9x (79) 0.77 Х 7.92 106.25 0.45 х 1.11 = 291.58 Southwest0.9x 0.77 х (79) Х 7.92 X 326.6 119.01 0.45 1.11 Southwest_{0.9x} (79) 0.77 7.92 Х 118.15 0.45 x 1.11 = 324.24 Х Southwesto.9x (79) 0.77 7.92 0.45 1.11 312.6 X X 113.91 х = Southwest_{0.9x} х х (79) 077 Х 7 92 104 39 0 45 1.11 286 48 Southwesto.9> (79) 0.77 7.92 х 92.85 0.45 х 1.11 254.81 X = Southwesto.9x 0.77 7.92 69.27 0.45 1.11 190.09 (79)x x X

Southwe	est <mark>0.9x</mark>	0.77	x	7.9	92	×	4	4.07		0.45	x	1.11	=	120.94	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	7.9	92	× [3	1.49		0.45	x	1.11	=	86.41	(79)
			alculated	î					· ,	um(74)m .		i		1	(22)
· ·	124.52	217.93	313.67	414.61	488.09		4.99	472.88	416.47	348.38	245.04	150.21	105.87		(83)
Ē			and sola I	<u>, ,</u>	· ,	r Ì	·							1	(2.1)
(84)m=	531.02	622.11	703.02	780.08	829.24	812	2.87	775.8	725.77	670.09	590.85	523.64	500.1	l	(84)
7. Mea	an inter	nal temp	perature	(heating	season)									
Tempe	erature	during h	neating p	periods in	n the livi	ng a	area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisat	tion fac	tor for g	ains for	living are	ea, h1,m	(se	e Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	J	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.94	0.85	0).7	0.54	0.59	0.82	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollov	v stej	ps 3 to 7	in Table	e 9c)					
(87)m=	19.55	19.74	20.03	20.4	20.72	20).91	20.98	20.97	20.83	20.4	19.9	19.5		(87)
Tempe	erature	durina t	neating p	Deriods in	n rest of	dwe	ı naille	from Ta		h2 (°C)					
(88)m=	20.02	20.02	20.02	20.02	20.02	1).02	20.02	20.02	20.02	20.02	20.02	20.02		(88)
						I								I	
			ains for	1	<u> </u>	1	<u> </u>		,	0.75	0.04	0.00	0.00	1	(89)
(89)m=	0.99	0.99	0.97	0.92	0.81	0.	.62	0.43	0.48	0.75	0.94	0.99	0.99	Į	(09)
Mean		l temper	ature in	the rest	of dwell	ing ⁻	T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	1		1	
(90)m=	18.69	18.88	19.17	19.52	19.82	19	9.97	20.01	20.01	19.91	19.53	19.04	18.64		(90)
										f	LA = Livir	ig area ÷ (4	4) =	0.14	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fL	_A × T1	+ (1 – fL	A) × T2					
(92)m=	18.82	19	19.3	19.65	19.95	20).11	20.15	20.15	20.04	19.66	19.16	18.77		(92)
Apply	adjustn	nent to t	he mear	n interna	l temper	atur	e fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.67	18.85	19.15	19.5	19.8	19	9.96	20	20	19.89	19.51	19.01	18.62		(93)
8. Spa	ice hea	ting requ	uirement	t											
						ned a	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the util			or gains			<u> </u>		l. d	A	0	0.4	Nex	Dee		
	Jan tion foo	Feb	Mar	Apr	May	J	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(94)m=	0.99	0.98	ains, hm 0.96	0.91	0.8	0	.61	0.43	0.48	0.74	0.93	0.98	0.99		(94)
L			, W = (9			0.	.01	0.40	0.40	0.74	0.00	0.00	0.00		
_	525.89	610.32	674.96	707.83	659.32	49	6.44	330.78	346.58	496.75	550.16	514.19	496.28		(95)
Ľ			ernal terr											I	
(96)m=	4.3	4.9	6.5	8.9	11.7	r	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	e for me	an interr	al temp	erature,	Lm .	, W =	=[(39)m :	x [(93)m	– (96)m	1			I	
	1420.99		1250.77	1048.49	i	-	, 0.04	336.34	355.57	573.09	881.24	1178.03	1425.8		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	∎ Wh/i	mont	h = 0.02	4 x [(97))m – (95)m] x (4	1)m		1	
	665.96	517.36	428.4	245.27	105.48	1	0	0	0	0	246.32	477.97	691.57		
–									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	3378.32	(98)
Space	heatin	a reauire	ement in	kWh/m	²/vear									36.83	(99)
-					•	vote	mo i	مايطنمه	miere 6	<u>ישט</u>					` ´
			nts – Ind	muual n	eating s	yste	ans lí	Teruaing	-micro-C						
-	e heatir on of so	-	at from s	econdar	v/supple	mer	ntarv	system						0	(201)
. 10010	01 04			20011001	,		y	5,50011						Ŭ	()

Fract	ion of s	pace hea	at from n	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	ion of to	otal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	ency of	main spa	ace heat	ting syste	em 1							İ	90.5	(206)
Effici	ency of	seconda	ry/suppl	ementar	y heating	g system	ז, %					İ	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Spac	e heatir	ř – –	ement (o	calculate	d above)		i	1			1			
	665.96	517.36	428.4	245.27	105.48	0	0	0	0	246.32	477.97	691.57		
(211)n	r	<u>i</u>	1	100 ÷ (20	-									(211)
	735.87	571.67	473.37	271.01	116.56	0	0	0 Tota	0 L (kWh/ve	272.17	528.14 211) _{15,1012}	764.16	2722.05	(211)
Space	o hoatir	a fuol (c	ocondor	ry), kWh/	month			1010				2	3732.95	(211)
•		01)] } x 1		• ·	monun									
(215)m=	· · · ·	0	0	0	0	0	0	0	0	0	0	0		
				-			-	Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	-	0	(215)
	heating													
Outpu	t from w	vater hea 150.96	ter (calc 156.72	ulated a	00 ve) 133.35	116.51	109.38	123.49	124.36	143.17	154.58	167.16		
Efficie		ater hea		101100	100100								87.3	(216)
(217)m=	<u> </u>	89.76	89.62	89.32	88.68	87.3	87.3	87.3	87.3	89.3	89.7	89.86		(217)
Fuel fo	or water	heating,	kWh/m	onth				1						
(219)n (219)m=) <u>m x 10(</u> 168.19) ÷ (217 174.87)m 154.44	150.36	133.46	125.3	141.46	142.45	160.33	172.33	186.02		
(219)11-	191.00	100.19	174.07	134.44	150.50	133.40	125.5		I = Sum(2)		172.33	100.02	1900.87	(219)
Annua	al totals	5									Wh/year	. l	kWh/year	
Space	heating	g fuel use	ed, main	system	1								3732.95	7
Water	heating	fuel use	ed										1900.87	Ī
Electri	city for	oumps, f	ans and	electric	keep-ho	t						ľ		_
mech	nanical v	ventilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Э			61.39		(230a)
		ng pump			·		•					30		(230c)
		fan-assis										45		(230e)
					-			cum	of (230a).	(230a) -		43	400.00	_
			above,	kWh/yea	ſ			Sum	01 (2004).	(2009) –			136.39	(231)
	city for I												408.83	(232)
Electri	city gen	erated b	y PVs										-553.98	(233)
Total o	delivere	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				5625.07	(338)
12a.	CO2 en	nissions	– Individ	lual heati	ng syste	ems inclu	uding mi	cro-CHF)					
						En	ergy			Emiss	ion fac	tor	Emissions	
							/h/year			kg CO	2/kWh		kg CO2/yea	ar
Space	heating	g (main s	ystem 1)		(217	1) x			0.2	16	=	806.32	(261)
Space	heating	g (secon	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

410.59

(264)

Space and water heating	(261) + (262) + (263) + (264)	4) =	1216.9	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	70.79	(267)
Electricity for lighting	(232) x	0.519 =	212.18	(268)
Energy saving/generation technologies Item 1		0.519 =	-287.51	(269)
Total CO2, kg/year		sum of (265)(271) =	1212.36	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	13.22	(273)
EI rating (section 14)			88	(274)

						User D	etails:						
Assessor Software			n Tunniı oma FS	•••			Strom Softwa	are Vei	rsion:			027495 on: 1.0.5.41	
							Address						
Address :			Buttercu	p Road ,	, Bishop	s Waltha	am, SOU	THAMP	TON , S	032 1R	J		
1. Overall c	welling di	mension	IS:										
0 14							a(m²)	I	Av. He	ight(m)	1	Volume(m ³)	-
Ground floor						4	5.86	(1a) x	2	2.4	(2a) =	110.06	(3a)
First floor						4	5.86	(1b) x	2	.67	(2b) =	122.45	(3b)
Total floor a	ea TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r	n) g	1.72	(4)			-		_
Dwelling vol	ume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	232.51	(5)
2. Ventilatio	on rate:												
			main heating		econdar leating	у	other		total			m ³ per hour	
Number of c	himneys		0] + [0	+	0] = [0	x 4	40 =	0	(6a)
Number of o	pen flues	Γ	0] + [0	+	0] = [0	x 2	20 =	0	(6b)
Number of ir	termittent	fans						Ē	3	x 1	10 =	30	(7a)
Number of p	assive vei	nts						Г	0	x 1	10 =	0	(7b)
Number of fl	ueless ga	s fires						Ē	0	x 4	40 =	0	(7c)
											Air ch	nanges per ho	ır
Infiltration du	ie to chim	neys, flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	30	<u> </u>	÷ (5) =	0.13	(8)
If a pressuris								continue fr				0110	
Number of	f storeys i	n the dw	elling (ne	s)								0	(9)
Additional	infiltration	1								[(9)-	-1]x0.1 =	0	(10)
Structural									ruction			0	(11)
	es of wall ar areas of op				ponding to	the great	er wall are	a (after					
If suspend	ed woode	en floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draug	ght lobby,	enter 0.0	05, else e	enter 0								0	(13)
Percentag	e of windo	ows and	doors dr	aught st	ripped							0	(14)
Window in	filtration						0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration							(8) + (10)					0	(16)
Air perme	•	•	•			•	•	•	etre of e	nvelope	area	5	(17)
If based on a		-							ia haina u	and		0.38	(18)
Air permeable Number of s			ressunsau	on lest nas	s been don	le or a deg	gree all pe	rmeability	is being us	seu		2	(19)
Shelter facto		lica					(20) = 1 -	[0.075 x (1	9)] =			0.85	(13)
Infiltration ra	te incorpo	rating sh	nelter fac	tor			(21) = (18) x (20) =				0.32	(21)
Infiltration ra	•	-			ł							<u> </u>	_] · ´
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly ave	rage 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 F	actor (22	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	ed infiltra	tion rat	e (allow	ing for sł	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m					
[0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
	ate effec chanica		-	rate for t	he appl	cable ca	ise						0	(23a)
				endix N, (2	(23a) = (23a	a) × Fmv (equation	(N5)) , othe	rwise (23t	o) = (23a)			0	(23b)
				ciency in %						, , ,			0	(23c)
a) If I	balanced	d mecha	anical v	entilation	with he	at recov	ery (MV	′HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	-	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	-	(24a)
b) If I	balance	d mecha	anical v	entilation	without	heat red	covery (MV) (24t)m = (2	2b)m + (23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
'				ntilation of	•	•								
г	<u> </u>		· /·	then (24	, `	1	ı È	, ``	ŕ	. ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` `	ŕ			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				nole hous)m = (22l		•				0.51				
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effec	tive air d	change	rate - e	nter (24a) or (24	b) or (24	c) or (24	4d) in box	x (25)					
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
3. Hea	at losses	and he	at loss	paramete	er:									
ELEM		Gros area	s	Openin rr	gs	Net Ar ۱, A		U-val W/m2		A X U (W/		k-value kJ/m²⋅ł		A X k kJ/K
Doors ⁻	Type 1					2.1	x	1	=	2.1				(26)
Doors ⁻	Type 2					2.1	x	1	=	2.1				(26)
Windov	vs Type	1				4.49	x	1/[1/(1.4)+	0.04] =	5.95				(27)
Windov	vs Type	2				7.92	x	1/[1/(1.4)+	0.04] =	10.5				(27)
Windov	vs Type	3				0.47	· x	1/[1/(1.4)+	0.04] =	0.62				(27)
Floor						45.86	6 X	0.13	=	5.9618	3			(28)
Walls		97.4	4	17.0	8	80.36	6 X	0.18	=	14.46				(29)
Roof		45.8	6	0		45.86	6 X	0.13	=	5.96				(30)
Total a	rea of el	ements	, m²			189.1	6							(31)
Party w	all					45.3	7 X	0	=	0				(32)
Interna	l wall **					31.87	7				[(32c)
											r			<u> </u>
Interna	l wall **					126.4	5				l			(32c)
Interna Interna						126.4 52.60					[(32c) (32c)
	l wall **						6				 [[
Interna Interna	l wall **					52.66	6 6				 [[(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) =

47.66 (33)

Heat c	capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17327.82	(34)
Therm	al mass	parame	ter (TMF	- Cm -	- TFA) ir	n kJ/m²K	,		Indica	tive Value	Medium		250	(35)
	-	sments wh ad of a dei			construct	ion are no	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	ĸ						9.91	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			57.57	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)		_	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	44.84	44.59	44.34	43.18	42.97	41.96	41.96	41.77	42.35	42.97	43.4	43.86]	(38)
Heat t	ransfer o	coefficier	nt, W/K	-	-				(39)m	= (37) + (3	- 38)m		-	
(39)m=	102.41	102.16	101.91	100.76	100.54	99.53	99.53	99.35	99.92	100.54	100.98	101.44]	
Heat lo	oss para	imeter (H	HLP), W	/m²K		1				Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	100.76	(39)
(40)m=	1.12	1.11	1.11	1.1	1.1	1.09	1.09	1.08	1.09	1.1	1.1	1.11]	
Numb	er of day	/s in moi	nth (Tab	le 1a)	<u> </u>	I			/	Average =	Sum(40) _{1.}	12 /12=	1.1	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	1	(41)
. ,													J	
4 \\/	at an la a a													
4. VVä	ater nea	ting ener	igy requ	irement.								kWh/y	ear.	
		upancy, I 9, N = 1		:[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.(0013 x (1	FFA -13.		65]	(42)
	FA £ 13.9												-	
							erage = designed t			se target o	97 f	7.1		(43)
		litres per p				-	-				-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wat	er usage i	n litres per	day for ea	<u> </u>	Vd,m = fa	ctor from	Table 1c x						3	
(44)m=	106.81	102.93	99.04	95.16	91.28	87.39	87.39	91.28	95.16	99.04	102.93	106.81]	
									-	Fotal = Su	m(44) ₁₁₂ =		1165.23	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	158.4	138.54	142.96	124.64	119.59	103.2	95.63	109.73	111.04	129.41	141.26	153.4		
										Fotal = Su	m(45) ₁₁₂ =	-	1527.8	(45)
lf instan	itaneous w	vater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)				-	
(46)m=	23.76	20.78	21.44	18.7	17.94	15.48	14.34	16.46	16.66	19.41	21.19	23.01		(46)
	storage												_	
		e umesi	ingludir		alor or M		otorogo	within or						(47)
-		. ,					storage		ame ves	sel		0]	(47)
lf com	munity h	neating a	ind no ta	ink in dw	velling, e	nter 110) litres in	(47)				0]	(47)
lf com Otherv	munity h wise if no	neating a stored	ind no ta	ink in dw	velling, e	nter 110	-	(47)				0]	(47)
lf com Otherv Water	munity h wise if no storage	neating a stored	ind no ta hot wate	nk in dw er (this ir	velling, e ncludes i	nter 110 nstantar) litres in neous co	(47)			47)	0]	(47)
lf com Otherv Water a) If n	munity h wise if no storage nanufact	neating a o stored loss: curer's de	ind no ta hot wate eclared l	ank in dw er (this ir oss facte	velling, e ncludes i	nter 110 nstantar) litres in neous co	(47)			47)	0]]	(48)
If com Otherv Water a) If n Tempe	munity h wise if no storage nanufact erature f	neating a o stored loss:	nd no ta hot wate eclared I m Table	ank in dw er (this ir oss facto 2b	velling, e ncludes i or is kno	nter 110 nstantar) litres in neous co n/day):	(47)	ers) ente		47)]]]	

		-			e 2 (kW	h/litre/da	ay)					0		(51)
	•	eating s		on 4.3									l .	
		from Tal										0		(52)
•		actor fro										0		(53)
		m water	•	, 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	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	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	om Table	e 3							0		(58)
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fr	om Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	50.96	46.03	50.47	46.93	46.51	43.1	44.53	46.51	46.93	50.47	49.32	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 x	1 (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	209.36	184.57	193.43	171.56	166.1	146.3	140.16	156.25	157.97	179.88	190.58	204.36	(00)	(62)
											ion to wate			
						applies				il contribut		/ neuting/		
(63)m=									0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
	-	-	-	0	0	0	0	0	0	0	0	0		(00) (02)
		ater hea				1		1			1	1	l	
(64)m=	209.36	184.57	193.43	171.56	166.1	146.3	140.16	156.25	157.97	179.88	190.58	204.36		1
											r (annual)₁		2100.53	(64)
-	ains froi	i		1		<u> </u>	<u> </u>	ı + (61)m	n] + 0.8 x	1	+ (57)m]	
(65)m=	65.41	57.57	60.15	53.17	51.39	45.09	42.93	48.11	48.65	55.65	59.3	63.75		(65)
inclu	ıde (57)ı	m in calc	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fi	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43	132.43		(66)
Liahtin	a aains	(calculat	ted in Ar	pendix	L. equat	ion L9 o	r L9a), a	lso see ⁻	Table 5					
(67)m=	23.15	20.56	16.72	12.66	9.46	7.99	8.63	11.22	15.06	19.12	22.32	23.79		(67)
						L uation L								
(68)m=	242.21	244.72	238.39	224.9	207.88	191.89	181.2	178.69	185.02	198.5	215.52	231.52		(68)
Cookir	na aains	(calcula	ted in A	npendix	L equat	tion L15	u or I 15a	i) also se	e Table	.5		1		
(69)m=	36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24	36.24		(69)
					00.27	00.27		00.24	00.24	00.27	00.24	00.27	l	x = = /
		ns gains	· · · · · · · · · · · · · · · · · · ·	, 									I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		aporatio	· •		<i>,</i> ,	· · · · ·	i			i	i	· · · · ·	l .	
(71)m=	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94	-105.94		(71)
Water	heating	gains (T	able 5)	-										
(72)m=	87.91	85.67	80.85	73.85	69.08	62.62	57.7	64.67	67.58	74.79	82.36	85.68		(72)

(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (73)(73)m= 419 416.68 401.69 377.14 352.15 328.22 313.26 320.31 333.38 358.15 385.93 406.72 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 0.77 х 11.28 x 0.63 0.7 15.48 х 4.49 = Northeast 0.9> (75)0.77 X 4.49 X 22.97 х 0.63 x 0.7 = 31.52 Northeast 0.9x (75)0.77 4.49 х 41.38 х 0.63 х 0.7 = 56.78 X Northeast 0.9x (75)0.77 х 4.49 х 67.96 Х 0.63 х 0.7 = 93.25 Northeast 0.9x 0.77 4.49 91.35 x 0.63 х 0.7 125.35 (75)х х = Northeast 0.9x 0.77 4.49 97.38 X 0.63 x 0.7 133.63 (75)х х = Northeast 0.9x x х 125.01 (75)0.77 4.49 х 91.1 0.63 0.7 _ Northeast 0.9x (75)0.77 х 4.49 х 72.63 х 0.63 х 0.7 = 99.66 Northeast 0.9x (75)0.77 4.49 х 50.42 х 0.63 х 0.7 _ 69.19 Northeast 0.9x (75)0.77 Х 4.49 х 28.07 х 0.63 х 0.7 = 38.51 Northeast 0.9x (75) 0.77 X 4.49 х 14.2 x 0.63 х 0.7 19.48 Northeast 0.9x (75) 9.21 х x = 0.77 Х 4.49 х 0.63 0.7 12.64 Southeast 0.9x 0.77 X 0.47 X 36.79 х 0.63 х 0.7 5.28 (77)Southeast 0.9x (77) 0.77 x 0.47 х 62.67 х 0.63 х 0.7 = 9 Southeast 0.9x 0.77 0.47 x 85.75 х 0.63 х 0.7 12.32 (77)X = Southeast 0.9x 15.26 (77) 0 47 х х х 0.77 x 106.25 0.63 0.7 = Southeast 0.9x 0.77 0.47 х 119.01 х 0.63 х 0.7 17.09 (77)х = Southeast 0.9x (77)0.47 x x 0.7 16.97 0.77 X X 118.15 0.63 = Southeast 0.9x х х (77)0.77 х 0.47 х 113.91 0.63 0.7 = 16.36 Southeast 0.9x (77) 0.77 x 0.47 x 104.39 x 0.63 x 0.7 = 14.99 Southeast 0.9x 0.77 0.47 x 92.85 x 0.63 x 0.7 = 13.34 (77)X Southeast 0.9x (77) 0.77 x 0.47 x 69.27 x 0.63 x 0.7 = 9.95 Southeast 0.9x 0.77 0.47 x 44.07 х 0.63 х 0.7 = 6.33 (77)x Southeast 0.9x 0.77 0.47 31.49 x 0.63 x 0.7 4.52 (77) x = Southwesto.9x 0.77 7.92 x 36.79 0.63 x 0.7 = 89.06 (79)х Southwest0.9x 0.77 7.92 0.63 0.7 151.7 (79) х 62.67 х = Southwesto.9x (79) 0.77 Х 7.92 85.75 0.63 х 0.7 _ 207.56 Southwest0.9x (79) 0.77 Х 7.92 106.25 0.63 х 0.7 = 257.18 Southwest0.9x 0.77 х (79) X 7.92 X 288.06 119.01 0.63 0.7 Southwest_{0.9x} (79) 0.77 7.92 Х 118.15 0.63 x 0.7 285.98 Х Southwesto.9x (79) 0.77 7.92 113.91 0.7 275.71 X X 0.63 х = Southwest_{0.9x} х х (79) 077 X 7 92 104 39 07 252 67 0.63 Southwesto.9> (79) 0.77 7.92 х 92.85 0.63 х 0.7 224.74 X = Southwesto.9x 0.77 7.92 69.27 0.63 0.7 167.66 (79)x x X

Southw	est <mark>0.9x</mark>	0.77	x	7.	92	x	4	14.07		0.63	x	0.7	=	106.67	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.	92	x	3	31.49		0.63	x	0.7	=	76.21	(79)
Solar g	gains in	watts, ca	alculated	d for eac	h month	۱ <u> </u>		-	(83)m = S	um(74)m .	(82)m	-		_	
(83)m=	109.83	192.22	276.66	365.69	430.5	43	36.58	417.08	367.33	307.27	216.12	132.48	93.38		(83)
Total g	jains – i	nternal a	and sola	r (84)m	= (73)m	+ (8	83)m	, watts				-		-	
(84)m=	528.82	608.9	678.34	742.83	782.65	7	64.8	730.34	687.63	640.65	574.27	518.41	500.1		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	า)		•	-	-	-	-	-		
		during h					area	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living ar	ea, h1,n	י ו (se	ее Та	ble 9a)							
	Jan	Feb	Mar	Apr	May	T`	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m=	1	1	0.99	0.97	0.9	-	0.75	0.58	0.64	0.87	0.98	1	1		(86)
				P. 1				I	.					1	
		l temper	r	<u> </u>	r ·	-		i – – – – – – – – – – – – – – – – – – –	1	, 	00.5	00.00	40.70	1	(97)
(87)m=	19.78	19.93	20.17	20.48	20.76	2	0.94	20.99	20.98	20.86	20.5	20.08	19.76	J	(87)
Temp	erature	during h	neating p	periods i	n rest of	dw	elling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.99	19.99	19.99	20	20	2	0.01	20.01	20.01	20.01	20	20	20		(88)
Utilisa	ation fac	ctor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.96	0.87	1	0.67	0.46	, 0.51	0.8	0.97	1	1]	(89)
Maan	interne	l tompor	l Intura in	the reat	I of dwoll	ling	TO /f			l 7 in Tahl		1		1	
(90)m=	18.36	l temper	18.93	19.38	19.77	<u> </u>	9.97	20.01	20.01	19.9	19.42	18.81	18.33	1	(90)
(90)11=	10.30	10.50	10.95	19.30	19.77	<u> </u>	9.91	20.01	20.01			ng area ÷ (4		0.44	
												ig alea ÷ (-	+)	0.14	(91)
Mean		l temper	ature (fo	or the wh	nole dwe	llin	g) = fl	$LA \times T1$	+ (1 – fL	A) × T2					
(92)m=	18.56	18.77	19.1	19.54	19.91	2	20.11	20.15	20.15	20.03	19.57	18.99	18.53		(92)
Apply	adjustr	nent to t	he meai	n interna	l tempe	ratu	ire fro	m Table	4e, whe	· · ·	opriate			,	
(93)m=	18.56	18.77	19.1	19.54	19.91	2	0.11	20.15	20.15	20.03	19.57	18.99	18.53		(93)
8. Spa	ace hea	ting requ	uiremen	t											
						ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
the ut		factor fo	<u> </u>	<u> </u>	1									1	
1.1411.4	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g	i	ì	0.00		0.69	0.49	0.52	0.01	0.00	0.00	4	1	(94)
(94)m=			0.98	0.95	0.86		0.68	0.48	0.53	0.81	0.96	0.99	1	J	(34)
	527.01	hmGm 604.42	, VV = (9 666.29	4)m x (8 705.35	r –	5	17 64	240.00	265.24	516.00	552.20	514.67	400.04	1	(95)
(95)m=				I	673.67		17.64	349.23	365.34	516.26	553.28	514.07	498.81		(55)
(96)m=	11y aver 4.3	age exte	6.5	8.9	11.7	-	е 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
												7.1	4.2]	(30)
пеаі (97)m=	1460.85	e for me		1072.37	1	-	48.38	353.26	372.19	- (96)m 592.98	902.02	1200.95	1454.02	1	(97)
													1454.02	J	(37)
	694.77	g require	460.04	264.25	1	T		11 = 0.02	<u>4 X [(97</u>)m – (95 0	259.47	ŕ	710.68	1	
(98)m=	094.77	540.17	400.04	204.23	112.85		0		_	-		494.12	710.68	0540.04	
									Tota	i per year	(KVVh/yea	r) = Sum(9	8) 15,912 =	3542.34	(98)
Space	e heatin	g require	ement ir	kWh/m	²/year									38.62	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating s	syste	ems i	ncluding	micro-C	CHP)					
Spac	e heatii	ng:													
Fracti	on of sp	bace hea	at from s	econdai	y/supple	eme	entary	y system						0	(201)

Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space			· ·	alculate	i – – – – –								1	
	694.77	546.17	460.04	264.25	112.85	0	0	0	0	259.47	494.12	710.68	J	
(211)m	1 = {[(98 743.87)m x (20 584.76	4)] } x 1 492.55	00 ÷ (20 282.92)6) 120.82	0	0	0	0	277.8	529.03	760.9	1	(211)
	743.07	564.70	492.55	202.92	120.02	0	0				211) _{15,1012}		3792.66	(211)
= {[(98)m x (20	g fuel (s)1)] } x 1		y), kWh/)8)	· · · · ·		I				× 15, 1012	<u>.</u> I](,
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
	heating		t (h a a)			lota	I (KVVh/yea	ar) =Sum(2	2 15) _{15,1012}	<u>-</u>	0	(215)
Output	209.36	ater nea 184.57	ter (caic 193.43	ulated a	166.1	146.3	140.16	156.25	157.97	179.88	190.58	204.36]	
Efficier	L Cy of w	ater hea	iter		I		1			I	I	I	80.3	(216)
(217)m=	87.84	87.62	87.16	86.14	84.1	80.3	80.3	80.3	80.3	85.97	87.34	87.93		(217)
		heating, m x 100								-	-		-	
. ,	238.34	210.65	221.94	199.18	197.5	182.19	174.55	194.58	196.73	209.23	218.2	232.41]	
								Tota	I = Sum(2	19a) ₁₁₂ =			2475.5	(219)
	I totals									k	Wh/year		kWh/year	- -
•	-			system	1								3792.66	ļ
Water	heating	fuel use	d										2475.5	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	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) =			75	(231)
Electric	city for li	ghting											408.83	(232)
Total d	lelivered	l energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				6751.99	(338)
12a. (CO2 em	issions -	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHP)					
							e rgy /h/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space	heating	(main s	ystem 1)		(21	1) x			0.2	16	=	819.21	(261)
Space	heating	(second	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(219	9) x			0.2	16	=	534.71	(264)
Space	and wa	ter heati	ng			(26	1) + (262) ·	+ (263) + (264) =				1353.92	(265)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t (23 ⁻	1) x			0.5	19	=	38.93	(267)

Electricity for lighting	(232) x	0.519 =	212.18	(268)
Total CO2, kg/year		sum of (265)(271) =	1605.03	(272)
TER =			17.5	(273)