Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 Printed on 26 August 2021 at 08:51:50 Project Information: Assessed By: Ben Tunningley (STRO027495) **Building Type:** Semi-detached House Dwelling Details: **NEW DWELLING AS BUILT** Total Floor Area: 97.06m² Site Reference : **Plot Reference:** Albany Farm Plot 048 54 Buttercup Road, Bishops Waltham, SOUTHAMPTON, SO32 1RJ Address : Client Details: Name: **Bargate Homes** Address : The New Barn, Vicarage Farm Business Par, Winchester Road, Fair Oak, SO50 7HD

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER			
uel for main heating system: Ma	ains gas		
uel factor: 1.00 (mains gas)			
arget Carbon Dioxide Emission	Rate (TER)	17.92 kg/m²	
welling Carbon Dioxide Emission	on Rate (DER)	13.84 kg/m²	OK
1b TFEE and DFEE			
arget Fabric Energy Efficiency ((TFEE)	54.3 kWh/m²	
welling Fabric Energy Efficienc	y (DFEE)	44.8 kWh/m ²	
welling Fabric Energy Efficienc	y (DFEE)	44.8 kWh/m²	ок
welling Fabric Energy Efficienc	y (DFEE)	44.8 kWh/m²	ОК
с <i>и</i>	y (DFEE) Average	44.8 kWh/m² Highest	OK
2 Fabric U-values			ок
2 Fabric U-values Element	Average	Highest	
2 Fabric U-values Element External wall	Average 0.24 (max. 0.30)	Highest	ок
2 Fabric U-values Element External wall Party wall	Average 0.24 (max. 0.30) 0.00 (max. 0.20)	Highest 0.24 (max. 0.70) -	ок ок

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability		
Air permeability at 50 pascals	4.25	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:Database: (rev 481, product index 017929):Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)Efficiency 89.6 % SEDBUK2009
Minimum 88.0 %

Secondary heating system: None

OK

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 w 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:	land):	Slight	ОК
Overshading: Windows facing: North East Windows facing: South Wes Windows facing: North Wes Ventilation rate: Blinds/curtains:	t	Very Little ^{5m²} 8.52m ² 1.42m 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:						
Assessor Software I			n Tunnir oma FS	0,			Strom Softwa	are Vei	rsion:			027495 on: 1.0.5.41	
							Address						
Address :			Buttercu	o Road ,	Bishop	s Waltha	am, SOL	JTHAMP	TON, SO	032 1RJ			
1. Overall d	welling di	mension	S:			A	n (ma 2)			aub (/ ma)			
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 are	ea TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r	n) g	97.06	(4)					
Dwelling volu	ime							(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 ch	nimneys	Г	0	+	0] + [0] = [0	x 4	40 =	0	(6a)
Number of op	oen flues	Ē	0	- - + -	0	<u> </u> + [0] = [0	x 2	20 =	0	(6b)
Number of in	termittent	fans						- с Г	0	x 1	0 =	0	(7a)
Number of pa	assive ver	nts							0	x 1	0 =	0	 (7b)
Number of flu									0	x 4	40 =	0	 (7c)
	leieee gu	5 1105						L	0			0	(70)
											Air ch	anges per ho	ur
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	s 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 i	nfiltration es of wall an							•	uction			0	(11)
	areas of ope				ponung ic	i ille great	er wall are	a (allei					
If suspende	ed woode	n 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)
Percentage		ows and	doors dr	aught st	ripped							0	(14)
Window inf							0.25 - [0.2					0	(15)
		~ ~ 50		مانية مناه	:				2) + (13) -			0	(16)
Air permea If based on a	•	•	•				•		etre of e	nvelope	area	4.25	(17)
Air permeabil	•	•							is being u	sed		0.21	(18)
Number of si						·		,	0			2	(19)
Shelter factor	r						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rat	e incorpo			(21) = (18) x (20) =				0.18	(21)			
Infiltration rat			nthly win	d speed	1			1				1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly aver	age wind	speed f	rom Tabl	e 7								L	
(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	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		
Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.23	0.23	0.22	0.2	0.19	0.17	0.17	0.17	0.18	0.19	0.2	0.21		
Calculate effect		-	rate for t	he appli	cable ca	se	•	•	-	-	 Г		
If exhaust air he			endix N (2	3b) = (23;	a) x Emv (e	equation (N5)) othe	rwise (23	h) = (23a)		L	0.5	(23a) (23b)
If balanced with									0) = (200)		Ĺ	0.5	(23b) (23c)
a) If balance		-	-	-					2h)m + ((23b) x l	L [1 – (23c)	-	(200)
(24a)m = 0	0		0	0	0		0	0	0	0		. 100]	(24a)
b) If balance	d mech	ı anical ve	ntilation	without	heat red	L Coverv (I	u 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 he	ouse ex	tract ver	tilation of	or positiv	/e input v	ventilatio	on from o	utside			_!J		
if (22b)m	n < 0.5 >	< (23b), t	hen (24	c) = (23k	o); other	wise (24	c) = (22	b) m + 0).5 × (23	o)			
(24c)m= 0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If natural v					•				0 51				
if (22b)m	n = 1, tn	en (24d)	m = (22)	$\frac{1}{0}$	erwise (2	$\frac{24a}{m} =$	$\frac{0.5 + [(2)]}{0.5}$	2b)m² x		0	0		(24d)
(,	-		-	_		_	-	-	0	0	0		(240)
Effective air (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)
		I		l					0.0	0.0			(- /
3. Heat losses					N 1 4 A				• >/ 1			•	
ELEMENT	Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²⋅K		X k /K
Doors Type 1					2.1	x	1.4	=	2.94				(26)
Doors Type 2					2.1	x	1.4	=	2.94				(26)
Windows Type	1				5	x1	/[1/(1.4)+	0.04] =	6.63				(27)
Windows Type	2				8.52	x1	/[1/(1.4)+	0.04] =	11.3				(27)
Windows Type	3				1.42	x1	/[1/(1.4)+	0.04] =	1.88				(27)
Floor					48.53	3 X	0.11	=	5.3383	3	75	3639.7	5 <mark>(28</mark>)
Walls	101.	29	19.14	4	82.15	5 X	0.24	=	19.72		60	4929	(29)
Roof	48.5	53	0		48.53	3 x	0.11	=	5.34		9	436.77	7 (30)
Total area of e	lements	s, m²			198.3	5							(31)
Party wall					42.63	3 X	0	=	0		45	1918.3	5 <mark>(32</mark>)
Internal wall **					43.92	2					9	395.28	3 (32c)
Internal wall **					132						9	1188.04	13 (32c)
Internal wall **					39.17	7					75	2937.6	3 (32c)
Internal floor					47.96	3					18	863.28	3 (32d)
Internal ceiling					47.96	3					9	431.64	1 (32e)
											n naraaranh		

* 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]	
()											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 ene	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											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		2 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	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 11.28 х 0.45 25.39 1 х 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 5 97.38 X 0.45 х 1.11 = 219.12 (75)1 х х Northeast 0.9x 5 х х (75)1 X х 91.1 0.45 1.11 _ 204.98 Northeast 0.9x 1 5 163.41 (75)Х х 72.63 х 0.45 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 X 14.2 х 0.45 х 1.11 31.94 Northeast 0.9x (75) 9.21 х 0.45 х = 1 х 5 х 1.11 20.73 Southwest0.9x (79) 1 X 8.52 Х 36.79 0.45 х 1.11 141.07 = Southwest_{0.9x} (79) 1 x 8.52 х 62.67 0.45 х = 240.29 1.11 Southwest_{0.9x} 1 8.52 x 85.75 0.45 х 1.11 328.78 (79) X = Southwest_{0.9x} (79) х х 1 x 8 52 106.25 0 45 1.11 = 407.37 Southwesto.9x (79) 1 8.52 х 119.01 0.45 х 1.11 456.29 х = Southwesto.9x (79) 1 0.45 x 452.99 X 8.52 X 118.15 1.11 = Southwest_{0.9x} (79) х 1 х 8.52 х 113.91 0.45 1.11 = 436.73 Southwesto.9x (79) 1 x 8.52 x 104.39 0.45 x 1.11 = 400.23 Southwest_{0.9x} (79) 1 8.52 x 92.85 0.45 x 1.11 = 355.99 X Southwesto.9x (79) 1 x 8.52 x 69.27 0.45 x 1.11 = 265.57 Southwest0.9x 1 8.52 x 44.07 0.45 х 1.11 = 168.97 (79)x Southwest_{0.9x} 1 8.52 31.49 0.45 x 1.11 120.72 (79) x x = Northwest 0.9x (81)1 x х 0.45 х 1.11 = 7.21 x 1.42 11.28 Northwest 0.9x 1 1.42 22.97 0.45 1.11 14.68 (81) х х х = Northwest 0.9x (81) 1 1.42 41.38 х 0.45 х 1.11 _ 26.44 Х Northwest 0.9x (81) 1 Х 1.42 67.96 х 0.45 х 1.11 = 43.42 Northwest 0.9x (81) х х 1 X X 0.45 58.37 1.42 91.35 1.11 Northwest 0.9x (81) 1 1.42 Х 97.38 х 0.45 x 1.11 = 62.23 Х Northwest 0.9x (81) 1 1.42 91.1 0.45 1.11 58.21 X х х х = Northwest 0.9x (81) х х х 72 63 0 45 1.11 46 41 1 Х 1 4 2 Northwest 0.9x (81) 1 1.42 х 50.42 х 0.45 х 1.11 32.22 X = Northwest 0.9x 1 1.42 28.07 0.45 1.11 17.93 (81) х x x X

Northwe	est 0.9x	1	×	1.4	12	x [1	4.2	x	0.45	☐ ×	Г	1.11	=	9.07	(81)
Northw	est 0.9x	1	×	1.4	12	x [g).21	x	0.45	× ٦	F	1.11	=	5.89	(81)
	L				<u>-</u>	^ L			~	0.40	^	L			0.00	(0.)
Solar	naine in	watte c	alculated	t for eac	h month				(83)m – S	um(74)m .	(82)n	n				
(83)m=	173.66	306.64	448.32	603.69	720.19	73	34.33	699.92	610.05	501.66	346.6	-	209.98	147.34	Г	(83)
			and solar]	
(84)m=	793.67	921.9	1	1157.63	1235.7	<u>`</u>	· · ·	1161.17	1080.18	993.33	875.8	88	780.96	750.11	ר	(84)
. ,		I	I	Į			10.00	1101.17	1000.10	000.00	070.0		100.00	700.11		(0.)
			perature													_
Temp	erature	during h	neating p	periods ir	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	(se	e Ta	ble 9a)							-	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oc	x	Nov	Dec		
(86)m=	0.98	0.96	0.92	0.84	0.7	0).54	0.4	0.44	0.67	0.88	3	0.96	0.98		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollov	w ster	os 3 to 7	í in Table	e 9c)					_	
(87)m=	19.68	19.91	20.22	20.58	20.83	1	0.96	20.99	20.98	20.9	20.5	5	20.04	19.62	1	(87)
			ļ	ļ		L										
	r	<u> </u>	neating p	1	i		<u> </u>	i		, ,					7	(00)
(88)m=	20	20	20	20	20		20	20	20	20	20		20	20		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						_	
(89)m=	0.97	0.95	0.9	0.81	0.65	0).46	0.31	0.35	0.59	0.85	5	0.95	0.98		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ina	T2 (fc	ollow ste	ns 3 to 7	7 in Tabl	e 9c)				-	
(90)m=	18.81	19.03	19.34	19.66	19.88	<u> </u>	9.97	19.99	19.99	19.94	19.6	5	19.16	18.75	1	(90)
()													area ÷ (4		0.16	(91)
												Ŭ		,	0.10	
	r	· · ·	ature (fo	î	i	lling	g) = fL			A) × T2					-	
(92)m=	18.95	19.17	19.48	19.81	20.04		0.13	20.15	20.15	20.09	19.8		19.31	18.89		(92)
Apply	<u> </u>	i	he mear	1	· · ·	-	Î	1	4e, whe	· · ·	·				7	
(93)m=	18.8	19.02	19.33	19.66	19.89	1	9.98	20	20	19.94	19.6	5	19.16	18.74		(93)
8. Sp	ace hea	ting requ	uirement	t												
			ternal ter			ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m	n=(7	6)m an	d re-cal	culate	
the ut		r	or gains	<u> </u>		<u> </u>	. 1		•			.		-	7	
L LCP -	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oc	x	Nov	Dec	J	
			ains, hm	I	0.04			0.04	0.05	0.50	0.07		0.04	0.07	7	(94)
(94)m=	0.96	0.94	0.89	0.79	0.64).46	0.31	0.35	0.59	0.83	3	0.94	0.97	J	(94)
	<u> </u>	i	W = (94)	r `	·		0.40	202 55	204.04	500.00	730.7	74	700.40	700.00	7	(95)
(95)m=	764.23	864.6	925.23	919.7	795.53		60.42	362.55	381.91	583.92	730.1	/1	733.46	726.89]	(93)
	<u> </u>	<u> </u>	ernal tem	r i		<u> </u>		40.0	40.4	444	40.0		74	4.0	7	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4	14.1	10.6	2	7.1	4.2	J	(96)
		i	an intern	· · ·	i	<u> </u>	Î		- ,	· , ,			1000 74	4500.00	-	(07)
(97)m=		1515.45	1376.78		878.61		77.67	365.35	386.5	627.15	970.8		1293.74	1560.22		(97)
	r	ř	ement fo	1	i	/Vh/	- 1	i			Í	<u> </u>			7	
(98)m=	589.32	437.37	335.95	169.25	61.81		0	0	0	0	178.		403.4	620		_
									Tota	l per year	(kWh/y	vear)	= Sum(98	B) _{15,912} =	2795.8	(98)
Space	e heatin	g require	ement in	kWh/m²	/year										28.8	(99)
9a. En	erav rea	uir <u>eme</u> r	nts – Indi	ividual h	eating s	vste	ems ir	ncludina	micro-C	CHP)						
	e heatir							3								
		-	at from s	econdar	y/supple	me	ntary	system							0	(201)

Fracti	on of sp	bace hea	at from n	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	em 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
Space		ř. – –	r	calculate)	1						7	
	589.32	437.37	335.95	169.25	61.81	0	0	0	0	178.7	403.4	620		
(211)m		i i	1	100 ÷ (20						407.40		005.00	1	(211)
	651.19	483.28	371.22	187.02	68.3	0	0	0 Tota	0 al (kWh/yea	197.46	445.74	685.08	3089.28	(211)
Snac	o hootin	a fuol (c	acandar	·y), kWh/	month			1010			- ' ' /15,1012	2	3069.26	
•		-	00 ÷ (20	• /	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0]	
								Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	<i>;</i> =	0	(215)
Water	heating	9												-
Output	from w	ater hea	ter (calc 158.89	ulated a	bove) 135.16	118.08	110.84	125.16	126.04	145.13	156.72	169.49	1	
Efficier		ater hea		133.04	133.10	110.00	110.04	123.10	120.04	140.10	130.72	103.43	87.3	(216)
(217)m=	-	89.65	89.45	89.02	88.28	87.3	87.3	87.3	87.3	89.04	89.58	89.79	01.5	(217)
Fuel fo		L heating,	ı kWh/mo	onth									1	
(219)m	<u>n = (64)</u>	<u>)m x 100</u>) ÷ (217)) <u>m</u>				1	1	1		1	1	
(219)m=	194.5	170.74	177.63	157.08	153.11	135.25	126.96	143.36	144.38	163	174.95	188.75		п
A n n	l totals							TOLA	al = Sum(2		Nhhaar		1929.72	(219)
			ed, main	system	1					K	Wh/year		kWh/year 3089.28	1
	-	fuel use											1929.72	i
	-			electric	keen-ho	t								J
				nced, ext			nnut fron	n outcid	•			04.07	1	(2202)
				iceu, exi	ract of p	USILIVE I	nput non		e			64.97]	(230a)
		ng pump										30]	(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			139.97	(231)
Electric	city for I	ighting											402.56	(232)
Electric	city gen	erated b	y PVs										-481.92	(233)
Total d	lelivered	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				5079.61	(338)
10a. I	- uel cos	sts - indiv	vidual he	eating sy	stems:									_
						г.,	al							
						Fu kW	l ei /h/year			Fuel P (Table			Fuel Cost £/year	
Space	heating	ı - main s	system 1	1			1) x			3.4	·	x 0.01 =	107.51	(240)
	-		system 2			(21:	3) x					x 0.01 =	0	(241)
		,	-, -: -: -: -: -: -: -: -: -: -: -: -: -:	_		× **	1.00			1 0				1()

(215) x

Space heating - secondary

(242)

x 0.01 = ____0

13.19

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	67.15 (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 (257) Total energy cost (245)	54) as needed 5)(247) + (250)(254) =		302.66 (255)
11a. SAP rating - individual heating system	S		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(25	5) x (256)] ÷ [(4) + 45.0] =		0.89 (257)
SAP rating (Section 12)			87.52 (258)
12a. CO2 emissions – Individual heating sy	vstems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	667.29 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	416.82 (264)
Space and water heating	(261) + (262) + (263) + (264) =	1084.1 (265)
Electricity for pumps, fans and electric keep-	-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) =	1115.56 (272)
CO2 emissions per m ²		(272) ÷ (4) =	11.49 (273)
El rating (section 14)			89 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	3768.93 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2354.26 (264)
Space and water heating	(261) + (262) + (263) + (264) =	6123.18 (265)
Electricity for pumps, fans and electric keep-	-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) =

(272) ÷ (4) =

6309.25	(272)
65	(273)

					User D	Details:						
Assessor Name: Software Name:		n Tunnir oma FS	•••			Softwa	a Num are Vei	rsion:			TRO027495 ersion: 1.0.5.41	
						Address						
Address :		Buttercu	p Road ,	, Bishops	s Waltha	am, SOU	ITHAMP	TON, SO	032 1RJ			
1. Overall dwelling di	mension	IS:			_							
One word flager						a(m²)			ight(m)	1	Volume(m ³)	٦
Ground floor					4	18.53	(1a) x	2	2.4	(2a) =	116.47	(3a)
First floor					4	18.53	(1b) x	2	.67	(2b) =	129.58	(3b)
Total floor area TFA =	(1a)+(1l	b)+(1c)+((1d)+(1e	e)+(1n	ı) 🧧	97.06	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	246.05	(5)
2. Ventilation rate:												
		main heating		econdar leating	У	other		total			m ³ per hour	
Number of chimneys	ſ	0	<u></u> ד ר	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	Ē	0	<u> </u> + [0	- +	0	- -	0	x 2	20 =	0	(6b)
Number of intermitten	t fans						- L	0	x 1	0 =	0	(7a)
Number of passive ve	nts						Ē	0	x 1	0 =	0	(7b)
Number of flueless ga	s fires						Г	0	x 4	40 =	0	(7c)
							L					1
										Air ch	anges per ho	ır
Infiltration due to chim	•							0		÷ (5) =	0	(8)
If a pressurisation test ha				ed, proceed	d to (17),	otherwise of	continue fr	om (9) to ((16)			
Number of storeys i Additional infiltratior		eiing (ns	5)						[(0)]	1]x0.1 =	0	(9) (10)
Structural infiltration		r steel or	timber t	frame or	0 35 fo	r masoni	w constr	uction	[(9)-	· 1]x0. i =	0	(10)
if both types of wall a	re present,	use the va	lue corres				•	uction			0	
deducting areas of op	•	•		ed) or 0	1 (seale	ad) else	enter ()				0	(12)
If no draught lobby,			•		r (Scar	50), 0130					0	(12)
Percentage of wind				ripped							0	(14)
Window infiltration			J			0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability valu	ue, q50,	expresse	d in cub	oic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.25	(17)
If based on air permea	ability va	lue, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.21	(18)
Air permeability value ap	plies if a p	ressurisatio	on test has	s been don	e or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelt	ered					(20) 1	[0.075 v (4	0)1			2	(19)
Shelter factor			1				[0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpo	J		(21) = (18) x (20) =				0.18	(21)			
Infiltration rate modifie	Mar	<u> </u>		i	Jul	A	Son	Oct	Nov	Dec	1	
LI	1	Apr	May	Jun	Jui	Aug	Sep			Dec	l	
Monthly average wind (22)m= 5.1 5	speed fi	4.4	e / 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
	1 7.5	ا	1.0	0.0	0.0	L ^{0.}		I ^{4.5}	,	T.]	

Wind F	actor (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		
Adjuste	ed infiltr	ation rate	e (allow	ing for sh	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
	0.23	0.23	0.22	0.2	0.19	0.17	0.17	0.17	0.18	0.19	0.2	0.21		
		<i>ctive air (</i> al ventila	-	rate for t	he appl	icable ca	se	-	-	-	-	 Г		
				endix N, (2	3b) = (23	a) x Emv (e	equation (N5)) othe	rwise (23	(23a) = (23a)			0.5	(23a)
			• • •	ciency in %	, ,	, ,				o) = (200)			0.5	(23b) (23c)
				-	•					2h)m + (23h) x [∟ ÷ (23c) –	0	_(230)
(24a)m=	0	0		0	0	0			0	0			100]	(24a)
ı b) lf	balance	ed mecha	anical v	entilation	without	heat red	covery (I	u MV) (24t)m = (2	2b)m + (23b)	11		
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	whole h	iouse ex	tract ve	ntilation of	or positiv	ve input	ventilatio	on from o	outside			· · · · ·		
i	f (22b)r	n < 0.5 ×	(23b),	then (24	c) = (23l	o); other	wise (24	c) = (22	o) m + 0	.5 × (23t	o)	·		
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
,				nole hous)m = (22						0.51				
(24d)m=	0	n = 1, une		$\int 0$				$\frac{0.5 + [(2)]}{0.5}$			0	0		(24d)
	-	-	-	nter (24a	Ĵ	-				Ů	Ů	ů		
(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	1	1	1	1			
		s and ne Gros		paramete Openin		Net Ar	200	U-val		AXU		k-value	AX	(k
ELEN		area		r	-	A,r		W/m2		(W/		kJ/m ² ·K	kJ/	
Doors	Туре 1					2.1	x	1.4	=	2.94				(26)
Doors ⁻	Type 2					2.1	x	1.4	=	2.94				(26)
Window	ws Type	e 1				5	x1	/[1/(1.4)+	0.04] =	6.63				(27)
Window	ws Type	e 2				8.52	x1	/[1/(1.4)+	0.04] =	11.3				(27)
Window	ws Type	e 3				1.42	x1	/[1/(1.4)+	0.04] =	1.88				(27)
Floor						48.53	3 x	0.11	=	5.3383	3	75	3639.75	5 (28)
Walls		101.3	29	19.14	4	82.15	5 X	0.24	=	19.72		60	4929	(29)
Roof		48.5	53	0		48.53	3 X	0.11	=	5.34		9	436.77	(30)
Total a	rea of e	elements	, m²			198.3	5							(31)
Party w	vall					42.63	3 X	0	=	0		45	1918.35	5 (32)
Interna	l wall *'					43.92	2					9	395.28	(32c)
Interna	l wall *'					132						9	1188.043	3 (32c)
Interna	l wall *'					39.17	7					75	2937.6	(32c)
Interna	l floor					47.96	3					18	863.28	(32d)
Interna	l ceiling	J				47.96	3					9	431.64	(32e)
												•	a <u> </u>	_

* 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	or 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	=			(6	6)m + (67)n	า + (68)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m= 418.21 415.9	400.69	376.12	351.02	327.03	311.6	318.	02 330.78	355.5	7 384.01	405.5		(73)
6. Solar gains:												
Solar gains are calculate	d using sola	r flux from	Table 6a			ations t	o convert to the	he applic		on.		
Orientation: Access Table 6		Area m²			ux able 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North cost o			.]			1 . [_		_	. ,	
		5		×	11.28	X V	0.45		1.11	=	19.55	(75)
			5	×	22.97	X]	0.45		1.11	=	39.79	(75)
		5		x	41.38	X X	0.45	x x	1.11	= =	71.69	(75)
Northeast 0.9x 0.7 Northeast 0.9x 0.7		5	5	x	67.96 91.35	」~ [] x [0.45		1.11	=	117.73	(75)
Northeast 0.9x 0.7				x	97.38	」 ^ [] x [0.45		1.11	=	168.72	(75)
Northeast 0.9x 0.7				x	91.1) ×	0.40	x	1.11		157.83	(75)
Northeast 0.9x 0.7		5		×	72.63	」 [] x [0.45	×	1.11		125.83	(75)
Northeast 0.9x 0.7		5		x	50.42	」 x [0.45	×	1.11	=	87.35	(75)
Northeast 0.9x 0.7		5		x	28.07) x	0.45	×	1.11	=	48.63	(75)
Northeast 0.9x 0.7	7 ×	5	5	x	14.2	x	0.45	×	1.11	=	24.6	(75)
Northeast 0.9x 0.7	7 X	5	5	x	9.21	x	0.45	x	1.11		15.96	(75)
Southwest0.9x 0.7	7 ×	8.5	52	x	36.79	i i	0.45	x	1.11	=	108.62	(79)
Southwest0.9x 0.7	7 ×	8.5	52	x	62.67	ĪĪ	0.45	x	1.11	=	185.02	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	85.75] [0.45	x	1.11	=	253.16	(79)
Southwest _{0.9x} 0.7	7 ×	8.5	52	x	106.25] [0.45	x	1.11	=	313.67	(79)
Southwest _{0.9x} 0.7	7 ×	8.5	52	x	119.01] [0.45	x	1.11	=	351.34	(79)
Southwest _{0.9x} 0.7	7 ×	8.5	52	x	118.15] [0.45	x	1.11	=	348.8	(79)
Southwest0.9x 0.7	7 ×	8.5	52	x	113.91] [0.45	x	1.11	=	336.28	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	104.39] [0.45	x	1.11	=	308.18	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	92.85] [0.45	x	1.11	=	274.12	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	69.27] [0.45	x	1.11	=	204.49	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	44.07] [0.45	x	1.11	=	130.1	(79)
Southwest0.9x 0.7	7 X	8.5	52	x	31.49] [0.45	x	1.11	=	92.96	(79)
Northwest 0.9x 0.7	7 X	1.4	42	x	11.28	x	0.45	x	1.11	=	5.55	(81)
Northwest 0.9x 0.7	7 ×	1.4	42	x	22.97	x	0.45	x	1.11	=	11.3	(81)
Northwest 0.9x 0.7	7 ×	1.4	12	x	41.38	x	0.45	x	1.11	=	20.36	(81)
Northwest 0.9x 0.7	7 ×	1.4	42	x	67.96	x	0.45	x	1.11	=	33.44	(81)
Northwest 0.9x 0.7	7 ×	1.4	42	x	91.35	x	0.45	x	1.11	=	44.94	(81)
Northwest 0.9x 0.7	7 ×	1.4	42	x	97.38	x	0.45	x	1.11	=	47.92	(81)
Northwest 0.9x 0.7	7 ×	1.4	12	x	91.1	x	0.45	x	1.11	=	44.82	(81)
Northwest 0.9x 0.7	7 ×	1.4	42	x	72.63	x	0.45	x	1.11	=	35.73	(81)
Northwest 0.9x 0.7	7 ×	1.4	12	x	50.42	x	0.45	x	1.11	=	24.81	(81)
Northwest 0.9x 0.7	7 X	1.4	42	x	28.07	x	0.45	x	1.11	=	13.81	(81)

Northwe	est 0.9x	0.77	×	1.4	2	× [14.2	x	0.45	_ ,	×٢	1.11	=	6.99	(81)
Northw	est 0.9x	0.77	×	1.4	12	x [(9.21	x	0.45	╡,	<	1.11	=	4.53	(81)
		0.11			2	^ I		5.21	~	0.40		Ľ			4.00	
Solar	noine in	watte or	alculator	l for ood	h month				(83)m = S	um(74)m .	(92)	m				
(83)m=	133.72	watts, ca 236.11	345.21	464.84	554.54	1	65.43	538.94	469.74	386.28	266		161.69	113.46	I	(83)
		nternal a							100.11	000.20	200	.00	101.00	110.10	i	(/
(84)m=	551.93	652.02	745.89	840.97	905.56	r`	92.47	850.54	787.76	717.06	622	2.5	545.7	518.95	1	(84)
			I	I			52.47	000.04	101.10	/1/.00	022	2.0	545.7	510.55	l	(01)
7. Me	an inter	nal temp	perature	(heating	season	ı)										_
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	area f	from 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	0	ct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.93	0.83	C).68	0.53	0.58	0.81	0.9	95	0.99	0.99		(86)
Mean	interna	l temper	ature in	livina ar		പിറ	w sta	ns 3 to 7	in Tabl						I	
(87)m=	19.39	19.59	19.92	20.33	20.68	1	20.9	20.97	20.96	20.79	20.	32	19.77	19.33	I	(87)
						I						02	10.11	10.00	i	(-)
		during h	i <u> </u>	1		1									1	()
(88)m=	20	20	20	20	20		20	20	20	20	2	0	20	20	İ	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	0.99	0.98	0.96	0.91	0.79		0.6	0.42	0.47	0.74	0.9	94	0.98	0.99		(89)
Moon	intorna	l temper	aturo in	the rest	of dwoll	ina	T2 (f		ns 3 to ⁻	7 in Tabl		 -)			1	
(90)m=	18.52	18.73	19.05	19.44	19.77	<u> </u>	9.94	19.99	19.98	19.87	19.	<u> </u>	18.9	18.47	I	(90)
(50)11-	10.02	10.75	10.00	10.44	10.11		5.54	10.00	15.50				g area ÷ (4		0.10	(91)
														., –	0.16	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	g) = fl	LA × T1	+ (1 – fL	A) × T2						
(92)m=	18.66	18.87	19.19	19.59	19.92	2	20.1	20.15	20.14	20.02	19.	59	19.04	18.61		(92)
Apply	[,] adjustr	nent to t	he mear	n interna	temper	atu	re fro	m Table	4e, whe	ere appro	opria	ite			_	
(93)m=	18.51	18.72	19.04	19.44	19.77	1	9.95	20	19.99	19.87	19.	44	18.89	18.46		(93)
8. Sp	ace hea	ting requ	uirement	t												
		mean int		•		ned	at ste	əp 11 of	Table 9	b, so tha	t Ti,r	m=(7	76)m and	d re-calc	ulate	
the ut	tilisation	factor fo	<u> </u>	using Ta	ble 9a										1	
	Jan	Feb	Mar	Apr	May	ļ.	Jun	Jul	Aug	Sep	0	ct	Nov	Dec	l	
	r	tor for g	ains, hm	1											1	
(94)m=	0.99	0.98	0.95	0.89	0.78	(0.6	0.42	0.47	0.73	0.9	92	0.98	0.99	İ	(94)
Usefu	-	hmGm ,	· · · ·	r i	· · · · · · · · · · · · · · · · · · ·	-					·				1	
(95)m=	545.12	636.78	710.41	751.83	703.75	53	32.15	356.61	372.55	525.73	574	.79	533.71	513.81	j	(95)
	<u> </u>	age exte	r	r <u> </u>		-				r					1	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	14.1	10	.6	7.1	4.2	j	(96)
Heat		e for mea	i	· · · ·		-		=[(39)m >	k [(93)m	– (96)m	ř – –					
(97)m=	1525.18	1482.78	1345.72	1130.55	865.63	57	73.68	364.44	385.1	618.85	948	.25	1265.09	1530		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	4 x [(97))m – (95	i)m]	x (41)m			
(98)m=	729.17	568.51	472.68	272.68	120.44		0	0	0	0	277	.85	526.6	756.05		_
									Tota	l per year	(kWh	/year) = Sum(98	3) _{15,912} =	3723.98	(98)
Space	e heatin	g require	ement in	kWh/m²	/year										38.37	(99)
		quiremen			•	vet	omei	ncluding	micro-C	<u>`</u> ЦD\						
				muuarn	eanny s	yste	enis i	nciuuling								
-	e heati i ion of sp	n g: bace hea	at from s	econdar	y/supple	eme	entary	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) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ting syste	em 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	· · ·	calculate	d above))	1	1				1		
	729.17	568.51	472.68	272.68	120.44	0	0	0	0	277.85	526.6	756.05		
(211)m		· · · · ·	T	100 ÷ (20						0.07.00	504.07	005.44	l	(211)
	805.71	628.19	522.29	301.3	133.08	0	0	0 Tota	0 II (kWh/yea	307.02	581.87	835.41	4114.89	(211)
Space	- hoatin	a fuol (c	ocondar	αλ k\Λ/b/	month			1010				2	4114.89	
•		• ·	00 ÷ (20	ry), kWh/)8)	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
	heating													_
Output	from w	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		100.04	100.10	110.00	110.04	120.10	120.04	140.10	100.72	100.40	87.3	(216)
(217)m=		89.8	89.67	89.39	88.78	87.3	87.3	87.3	87.3	89.38	89.75	89.9		(217)
Fuel fo	r water	ı heating,	kWh/m	onth				1						
(219)m	n = (64)	<u>m x 100</u>) ÷ (217))m									l	
(219)m=	194.25	170.45	177.18	156.44	152.25	135.25	126.96	143.36	144.38 Il = Sum(2	162.38	174.63	188.54	4000.07	
Δnnua	l totals							1010	ii – Ourii(2		Wh/yeaı	•	1926.07 kWh/year	(219)
			ed, main	system	1					ĸ	, yca		4114.89	1
Water	heating	fuel use	d										1926.07	1
	•			electric	keep-ho	t								J
				nced, ext			nnut fror	n outside	2			64.97		(230a)
		ig pump		1000, 0/1			input iron	in outorat	5					(230c)
		• • •										30		
			sted flue							(222.)		45		(230e) ¬
Total e	lectricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			139.97	(231)
Electric	city for l	ighting											416.32	(232)
Electric	city gen	erated b	y PVs										-481.92	(233)
Total d	elivered	l energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				6115.33	(338)
12a. (CO2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF)					
						Fn	ergy			Fmiss	ion fac	tor	Emissions	
							/h/year			kg CO			kg CO2/yea	ar
Space	heating	(main s	ystem 1)		(21	1) x			0.2	16	=	888.82	(261)
Space	heating	(second	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

416.03

(264)

Space and water heating	(261) + (262) + (263) + (264)	4) =	1304.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	72.64	(267)
Electricity for lighting	(232) x	0.519 =	216.07	(268)
Energy saving/generation technologies Item 1		0.519 =	-250.12	(269)
Total CO2, kg/year		sum of (265)(271) =	1343.44	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	13.84	(273)
EI rating (section 14)			87	(274)

							User D	etails:						
Asses Softwa				n Tunnii oma FS	•••			Strom Softwa	are Ver	sion:			027495 on: 1.0.5.41	
								Address						
Addres					p Road ,	, Bishops	s Waltha	am, SOU	THAMP	TON, SO	032 1RJ			
1. Ove	rall dwe	elling dir	mension	S:										
• •								a(m²)	I	Av. Hei	ight(m)	1	Volume(m ³)	-
Ground	floor						4	8.53	(1a) x	2	2.4	(2a) =	116.47	(3a)
First floo	or						4	8.53	(1b) x	2	.67	(2b) =	129.58	(3b)
Total flo	or area	TFA =	(1a)+(1l	o)+(1c)+	(1d)+(1e	e)+(1r	I) g	7.06	(4)			-		_
Dwelling	g volum	е							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	246.05	(5)
2. Vent	tilation I	rate:												
				main heating		econdar leating	у	other		total			m ³ per hour	
Number	of chin	nneys	Ĺ	0	+	0	+	0] = [0	x 4	40 =	0	(6a)
Number	of ope	n flues	Γ	0	+	0	+	0] = [0	x 2	20 =	0	(6b)
Number	of inter	rmittent	fans							3	x 1	10 =	30	(7a)
Number	of pase	sive ver	nts						Γ	0	x 1	10 =	0	(7b)
Number	of flue	ess gas	s fires						Ē	0	x 4	40 =	0	(7c)
												Air ch	nanges per ho	Jr
Infiltratio	on due 1	to chimi	neys, flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	30	<u> </u>	÷ (5) =	0.12	(8)
				rried out o					continue fr				0.1.2	
Numb	er of st	oreys ir	n the dw	elling (na	5)								0	(9)
Additi	onal inf	iltration									[(9)-	-1]x0.1 =	0	(10)
				r steel oi						uction			0	(11)
				use the va equal user		ponding to	the great	er wall are	a (after					
If susp	pended	woode	n floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no c	draught	lobby,	enter 0.0)5, else e	enter 0								0	(13)
Perce	entage o	of windo	ws and	doors dr	aught st	ripped							0	(14)
Windo	ow infilt	ration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
	ation rat							(8) + (10)					0	(16)
•		•	•	•			•	•	•	etre of e	nvelope	area	5	(17)
If based			-							ia haina w	aad		0.37	(18)
Number	-			ressurisatio	on test nas	s been aon	e or a deg	gree air pe	rmeability	is being us	sea		2	(19)
Shelter f		o onone						(20) = 1 -	[0.075 x (1	9)] =			0.85	(13)
Infiltratio	on rate i	incorpo	rating sh	nelter fac	tor			(21) = (18) x (20) =				0.32	(21)
Infiltratio		-	-			ł							<u> </u>	_] · ´
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly	averag	e wind	speed fi	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 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 >	(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 regi	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)

(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (73)(73)m= 430.71 428.4 413.19 388.04 362.27 337.6 322.17 329.27 342.7 368.08 396.52 418 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 5 х 11.28 х 0.63 0.7 17.24 х = Northeast 0.9> (75)0.77 X 5 X 22.97 х 0.63 x 0.7 = 35.09 Northeast 0.9x (75)0.77 5 х 41.38 х 0.63 х 0.7 = 63.23 X Northeast 0.9x (75)0.77 х 5 х 67.96 Х 0.63 х 0.7 = 103.84 Northeast 0.9x 0.77 5 91.35 x 0.63 х 0.7 139.58 (75)х х = Northeast 0.9x 0.77 5 97.38 X 0.63 x 0.7 148.81 (75)х Х = Northeast 0.9x 5 x х (75)0.77 X х 91.1 0.63 0.7 _ 139.21 Northeast 0.9x 5 110.98 (75)0.77 х х 72.63 х 0.63 х 0.7 = Northeast 0.9x (75)0.77 Х 5 х 50.42 х 0.63 х 0.7 _ 77.05 Northeast 0.9x (75)0.77 Х 5 х 28.07 х 0.63 х 0.7 = 42.89 Northeast 0.9x (75) 0.77 X 5 х 14.2 х 0.63 х 0.7 21.69 Northeast 0.9x (75) х x = 0.77 х 5 х 9.21 0.63 0.7 14.08 Southwest0.9x (79) 0.77 X 8.52 х 36.79 х 0.7 95.8 0.63 Southwest_{0.9x} (79) 0.77 8.52 х 62.67 0.63 х 0.7 = 163.19 х Southwest_{0.9x} 0.77 8.52 x 85.75 0.63 х 0.7 223.28 (79) X = Southwest_{0.9x} (79) х х 0.77 x 8 52 106.25 0.63 0.7 = 276.66 Southwesto.9x (79) 0.77 8.52 х 119.01 0.63 х 0.7 309.88 х = Southwesto.9x (79) x 0.7 307.64 0.77 X 8.52 X 118.15 0.63 = Southwest_{0.9x} (79) х 0.77 х 8.52 х 113.91 0.63 0.7 = 296.6 Southwesto.9x (79) 0.77 x 8.52 x 104.39 0.63 x 0.7 = 271.81 Southwest_{0.9x} (79)0.77 8.52 x 92.85 0.63 x 0.7 = 241.77 X Southwesto.9x (79) 0.77 x 8.52 x 69.27 0.63 x 0.7 = 180.36 Southwest0.9x 0.77 8.52 x 44.07 0.63 х 0.7 = 114.75 (79)x Southwest_{0.9x} 0.77 8.52 31.49 0.63 x 0.7 = 81.99 (79) x x Northwest 0.9x (81) 0.77 x x х 0.7 = 4.9 х 1.42 11.28 0.63 Northwest 0.9x 0.77 1.42 22.97 0.63 x 0.7 9.97 (81) Х х х = Northwest 0.9x (81) 0.77 Х 1.42 41.38 х 0.63 х 0.7 _ 17.96 Northwest 0.9x х (81) 0.77 Х 1.42 67.96 х 0.63 0.7 = 29.49 Northwest 0.9x (81) 0.77 x х Х 1.42 Х 0.7 39.64 91.35 0.63 Northwest 0.9x (81) 0.77 1.42 Х 97.38 х 0.63 x 0.7 = 42.26 Х Northwest 0.9x (81) 1.42 91.1 0.63 0.7 39.54 0.77 X х х х = Northwest 0.9x (81) х x х 0.77 Х 72 63 0.63 07 31 52 1 4 2 Northwest 0.9 (81) 0.77 1.42 х 50.42 х 0.63 х 0.7 21.88 X = Northwest 0.9x 0.77 1.42 28.07 0.63 0.7 12.18 (81) х x x X

Northwe	est <mark>0.9x</mark>	0.77	X	1.4	42	x		14.2	x	0.63	x	0.7	=	6.16	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	1.4	42	x		9.21	x	0.63	x	0.7	=	4	(81)
Solar g	ains in	watts, ca	alculated	for eac	h month	<u>۱</u>			(83)m = 8	Sum(74)m .	(82)m				
(83)m=	117.94	208.25	304.47	409.99	489.11		98.71	475.34	414.31	340.7	235.43	142.61	100.07		(83)
Total g	ains – i	nternal a	ind solar	: (84)m =	= (73)m	+ (83)m	, watts							
(84)m=	548.65	636.66	717.66	798.03	851.37	8	36.32	797.51	743.58	683.4	603.5	539.12	518.06		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)									
Temp	erature	during h	eating p	eriods i	n the liv	ing	area	from Tal	ole 9, Tł	n1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,n	n (s	ee Ta	able 9a)							
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.91	-	0.76	0.59	0.65	0.88	0.98	1	1		(86)
	interne			l Liudina ar	L				l 7 in Tab			I		I	
		l temper			r È	-		i	I	1	00.45	00.04	40.07	1	(87)
(87)m=	19.69	19.85	20.1	20.43	20.74	4	20.93	20.98	20.97	20.84	20.45	20.01	19.67		(87)
Temp	erature	during h	eating p	eriods i	n rest of	f dw	/elling	from Ta	able 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)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2	,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.96	0.87	-	0.67	0.46	0.52	0.81	0.97	1	1		(89)
Moon	intorno	L tompor	oturo in	the reat		ling	T2 /f			I 7 in Tabl		1		1	
(90)m=	18.2	18.42	18.79	19.28	19.69	<u> </u>	12 (I 19.91	19.96	19.96	7 in Tabl 19.82	19.3	18.66	18.16	1	(90)
(90)11=	10.2	10.42	10.79	19.20	19.09		19.91	19.90	19.90			ng area ÷ (4			
												iy alea ÷ (*	+) —	0.16	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = f	$LA \times T1$	+ (1 – f	_A) × T2					
(92)m=	18.44	18.65	19	19.47	19.86	2	20.08	20.13	20.12	19.99	19.49	18.88	18.41		(92)
Apply	adjustr	nent to th	he mear	interna	l tempe	ratu	ure fro	m Table	4e, wh	ere appro	opriate	-			
(93)m=	18.44	18.65	19	19.47	19.86	2	20.08	20.13	20.12	19.99	19.49	18.88	18.41		(93)
8. Spa	ace hea	iting requ	uirement												
				•		ned	l at st	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calo	culate	
the ut		factor fo		<u> </u>	i i	_		r		1		i		1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g		i	1	-			1	1		1		1	
(94)m=	1	0.99	0.98	0.95	0.86		0.68	0.48	0.54	0.82	0.97	0.99	1		(94)
	-	hmGm ,	· ·	r i	r Ó	-			1	1	1	1		1	
(95)m=	546.89	632.23	705.38	758.46	733.93		69.59	386.04	403.01	558.37	583.19	535.53	516.8		(95)
	-	age exte		İ.	-	-		r		i		r	r	1	()
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		1		· · · ·	1			1 /	<u>, ,</u>	n– (96)m	r .	1		1	
(97)m=	1612.37		1419.31	1187.07	914.93		08.68	391.63	412.66	656.59	996.51	1326.42	1606		(97)
		ř i		i	1	Wh	n/mon	th = 0.02	24 x [(97	<u>')m – (95</u>	í - ·	ŕ		1	
(98)m=	792.72	626.62	531.16	308.59	134.67		0	0	0	0	307.51	569.44	810.36		
									Tot	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	4081.08	(98)
Space	e heatin	g require	ement in	kWh/m ²	²/year									42.05	(99)
9a En	erav rea	quiremer	nts – Indi	ividual b	eating	svst	ems i	ncluding	micro-	CHP)				L	
	e heatir		no ma		outing	5,01	STIC I	Hordanny							
-		bace hea	t from s	econdar	v/supple	eme	entarv	v system						0	(201)
	2 0 , 0p	200 1100			,		y	0,00011						Ĺ	(=•.)

								(000) 4	(004)					
Fraction of space heat from main system(s)							(202) = 1 - (201) =						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)		
Efficie	ency of a	seconda	ry/suppl	ementar	y heating	g system	ז, % י						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin 792.72	g require 626.62	531.16	alculate 308.59	d above) 134.67	0	0	0	0	307.51	569.44	810.36	1	
(011)						0	0	0	0	307.51	509.44	010.30		(014)
(211)11	848.74	670.9	568.7	00 ÷ (20 330.4	144.18	0	0	0	0	329.24	609.68	867.63]	(211)
					_			Tota			211) _{15,1012}		4369.46	(211)
Space	e heatin	a fuel (s	econdar	y), kWh/	month], ,
•)1)]}x1		• ·				-						
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	<u>_</u>	0	(215)
	heating	-	to::/oolo		hava)									
Output	211.76	ater nea 186.67	ter (caic 196.09	ulated a	168.63	148.52	142.29	158.62	160.37	182.33	192.72	206.69]	
Efficier	L Cy of w	i ater hea	iter										80.3	(216)
(217)m=	88.06	87.86	87.43	86.48	84.49	80.3	80.3	80.3	80.3	86.36	87.61	88.15		 (217)
		heating,											1	
(219)m (219)m=		m x 100) ÷ (217) 224.27	m 201.41	199.58	184.95	177.2	197.53	199.71	211.14	219.97	234.48	1	
(213)11-	240.40	212.43	224.27	201.41	199.00	104.95	111.2		I = Sum(2		219.97	234.40	2503.15	(219)
Annua	I totals								,		Wh/year	•	kWh/year	
			ed, main	system	1						,, ,		4369.46]
Water	heating	fuel use	d										2503.15	ī
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								4
centra	al heatir	ng pump:										30]	(230c)
												45]	(230e)
boiler with a fan-assisted flue							eum	of (230a)	(230g) =		40	75	-	
Total electricity for the above, kWh/year								Sum	01 (2008).	75	(231)			
Electricity for lighting										416.32	(232)			
Total d	lelivered	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				7363.93	(338)
12a. (CO2 em	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHP						
					En	ergy		Emission factor			Emissions			
			kΜ	kWh/year				2/kWh		kg CO2/yea	ar			
Space heating (main system 1)					(21	(211) x			0.2	16	=	943.8	(261)	
Space heating (secondary)						(21	(215) x			0.5	19	=	0	(263)
Water heating						(219	9) x			0.2	16	=	540.68	(264)
Space and water heating					(26	1) + (262) ·	+ (263) + (264) =				1484.49	(265)	
Electricity for pumps, fans and electric keep-hot					t (23 ⁻	1) x			0.5	19	=	38.93	(267)	
	2 1	• '	-	-						L			00.00	_`` ′

Electricity for lighting	(232) x	0.519 =	216.07 (268)
Total CO2, kg/year		sum of (265)(271) =	1739.48 (272)
TER =			17.92 (273)