Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 *Printed on 22 July 2021 at 10:15:35*

Project Informatic	on:				
Assessed By:	Ben Tunningley (STRO027495)	Building Type:	End-terrace House	
Dwelling Details:					
NEW DWELLING	AS BUILT		Total Floor Area: 7	7.44m²	
Site Reference :	Albany Farm		Plot Reference:	Plot 033	
Address :	17 Buttercup Roa	d , Bishops Waltham, SOUTH	AMPTON, SO32 1RF		
Client Details:					
Name:	Bargate Homes				
Address :	The New Barn, V	icarage Farm Business Par, W	/inchester Road, Fair Oak, S	SO50 7HD	
-		vithin the SAP calculations. tions compliance.			
1a TER and DER		FF			
	ing system: Mains g	las			
Fuel factor: 1.00 (r	• • •	,			
-	xide Emission Rate	. ,	18.59 kg/m²		
	Dioxide Emission Ra	ite (DER)	13.87 kg/m²	OK	,
1b TFEE and DF	EE rgy Efficiency (TFEI	=)	51.9 kWh/m²		
-	nergy Efficiency (DF		44.0 kWh/m²		
Divoling Pabrio Er		/		OK	,
2 Fabric U-value	s				
Element		Average	Highest		
External		0.24 (max. 0.30)	0.24 (max. 0.70)	OK	
Party wal	l	0.00 (max. 0.20)	-	OK	
Floor		0.11 (max. 0.25)	0.11 (max. 0.70)	OK	
Roof Openings		0.11 (max. 0.20) 1.40 (max. 2.00)	0.11 (max. 0.35) 1.40 (max. 3.30)	OK OK	
2a Thermal bridg		1.40 (Max. 2.00)	1.40 (max. 5.50)	UK	•
		from linear thermal transmittan	ces for each junction		
3 Air permeabili					
	pility at 50 pascals		3.92		
Maximum			10.0	OK	, k
4 Heating efficie	ncy				
Main Heatir	ng system:	Database: (rev 479, produc	t index 017929):		
		Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi) Efficiency 89.6 % SEDBUK Minimum 88.0 %	rs or underfloor heating - ma	ains gas OK	ſ
Secondary	heating system:	None			

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ylinder insulation			
Hot water Storage:	No cylinder		
ontrols			
Space heating controls Hot water controls:	Programmer, room therm No cylinder thermostat No cylinder	ostat 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
ummertime temperature			
Overheating risk (South Enged on:	land):	Slight	OK
Overshading: Windows facing: North East Windows facing: South Wes Windows facing: South East Ventilation rate: Blinds/curtains:		Very Little 3.72m ² 7.39m ² 0.66m ² 4.00 None	
Key features			
Air permeablility Roofs U-value Party Walls U-value		3.9 m³/m²h 0.11 W/m²K 0 W/m²K	
Floors U-value Photovoltaic array		0.11 W/m²K	

						User D	etails:						
Assessor Software			n Tunnir oma FS	•••			Softwa	a Num are Vei	rsion:			027495 on: 1.0.5.41	
							Address						
Address :			Buttercup	Road ,	Bishop	s Waltha	am, SOL	ITHAMP	TON, SO	032 1RF	-		
1. Overall of	lwelling di	mension	S:			•	- (2)		A 11	·) (- l (?)	
Ground floo							a(m²)	(10) ×		ight(m)		Volume(m ³)	
							38.72	(1a) x	2	.46	(2a) =	95.25	(3a)
First floor						3	88.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor a	rea TFA =	(1a)+(1l	o)+(1c)+(1d)+(1e)+(1r	1) 7	7.44	(4)					
Dwelling vol	ume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	202.51	(5)
2. Ventilation	on rate:												
			main heating		econdar leating	у	other		total			m ³ per hour	
Number of c	himneys	Г	0	+ [0] + [0	=	0	X 4	40 =	0	(6a)
Number of c	pen flues	Ē	0	<u> </u> + [0	<u> </u> + [0] = [0	x2	20 =	0	(6b)
Number of i	ntermittent	fans							0	x ′	10 =	0	(7a)
Number of p	assive vei	nts							0	x ^	10 =	0	_ (7b)
Number of f									0	x 4	40 =	0](7c)
	delete ga	5 11 00						L	0			0	
											Air ch	hanges per hou	ır
Infiltration d	ue to chim	neys, flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	0	<u> </u>	÷ (5) =	0	(8)
lf a pressuri	sation test ha	s been ca	rried out or	is intende	ed, procee	d to (17),	otherwise	continue fr				-	
Number o	•		elling (ns	5)								0	(9)
Additional										[(9)-	-1]x0.1 =	0	(10)
Structural									uction			0	(11)
	es of wall an areas of op				ponung ic	i ille great	er wall are	a (allel					
If suspend	led woode	n floor, o	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no drau	ght lobby,	enter 0.0	05, else e	enter 0								0	(13)
Percentag		ows and	doors dra	aught st	ripped							0	(14)
Window ir								2 x (14) ÷ 1		(4.5)		0	(15)
				ما : م	·			+ (11) + (1				0	(16)
Air perme	•	•	•				•	•	etre of e	nvelope	area	3.9200000762939	4
Air permeab	•								is beina u	sed		0.2	(18)
Number of s								,	J			2	(19)
Shelter facto	or						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration ra	te incorpo	rating sł	nelter fac	tor			(21) = (18) x (20) =				0.17	(21)
Infiltration ra	te modifie	d for mo	nthly win	d speed	1							1	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
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 (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 rat	e (allowi	ing for sl	nelter an	d wind s	speed)	= (21a) x	(22a)m					
[0.21	0.21	0.2	0.18	0.18	0.16	0.16	0.15	0.17	0.18	0.19	0.2		
			•	rate for t	he appli	cable ca	ise		•		•	 Г		
		al ventila		andix N (2	'3h) - (23a) × Emv (a	acuation	ı (N5)) , othe	nwise (23	h) - (23a)		Ļ	0.5	(23a)
								om Table 4h		0) = (200)		L	0.5	(23b)
			-	-	_					$(2h)m \pm ($	23h) 🗸 [L 1 – (23c)	0 - 1001	(23c)
(24a)m=	0			0	0	0				0			. 100]	(24a)
	balance	d mech	ı anical ve	I entilation	without	heat red	coverv	 (MV) (24	1 = (2)	 2b)m + (1 23b)	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	whole h	use ex	tract ver	ntilation of	or positiv	re input v	ventila	tion from	outside	Į		1		
,								24c) = (22).5 × (23b))			
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
								tion from = 0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	tive air:	change	rate - er	nter (24a) or (24b	o) or (24	c) or (2	24d) 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. Hea	at losse	s and he	eat loss i	paramet	er:									
ELEN		Gros		Openin		Net Ar	rea	U-val	ue	ΑXU		k-value	A X	k
		area	(m²)	'n	1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙K	kJ/ł	<
Doors						2.1	:	× 1.4	=	2.94				(26)
Window	vs Type	e 1				3.72		x1/[1/(1.4)+	- 0.04] =	4.93				(27)
Window	vs Type	2				7.39		x1/[1/(1.4)+	- 0.04] =	9.8				(27)
Window	vs Type	93				0.66		x1/[1/(1.4)+	- 0.04] =	0.88				(27)
Floor						38.7		× 0.11	=	4.257		75	2902.5	(28)
Walls		91.9	96	13.8	7	78.09)	x 0.24	=	18.74		60	4685.4	(29)
Roof		38.7	72	0		38.72	2	× 0.11	=	4.26		9	348.48	(30)
Total a	rea of e	lements	, m²			169.3	8							(31)
Party w	all					45.67	7	× 0	=	0		45	2055.15	(32)
Interna	l wall **					69.98	3				_	9	629.856	(32c)
Interna	l wall **					73.74	4					9	663.6366	6 (32c)
Interna	l floor					38.72	2					18	696.96	(32d)
Interna	l ceiling	l				38.72	2					9	348.48	(32e)
* for wind	dows and	roof wind	ows, use e	effective wi	ndow U-va	lue calcul	ated usi	ing formula	1/[(1/U-val	ue)+0.04] a	as given ir	n paragraph	3.2	-

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

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

((28)...(30) + (32) + (32a)...(32e) =

 $= (34) \div (4) =$

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

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

45.8

12330.46

159.23

(33)

(34)

(35)

can be ι	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix I	<						7.45	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			53.25	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			ī	(38)m	= 0.33 × (25)m x (5)		L	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66		
								1		-	Sum(39)1.	12 /12=	86.66	(39)
	<u> </u>	· · · ·	HLP), W/	i						= (39)m ÷			I	
(40)m=	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
Numbe	er of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.12	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
		ļ	ļ	Į										
1 \\/c	tor boo	ting one	rgy requ	iromont								kWh/ye	oor:	
4. 000	ater nea	ung ene	igy iequ	nement.								KVV1//yt	5al.	
		upancy,										41		(42)
		9, N = 1 9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
			ater usad	ne in litre	es per da	av Vd av	erage =	(25 x N)	+ 36			1.5		(43)
								to achieve		se target o		1.0		(40)
not mor	e that 125	litres per	person pei	r day (all w	ater use, l	hot and co	ld)	-			_			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
_											m(44) ₁₁₂ =		1097.96	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55		
If in atom	tonoouou	votor booti	ng of point	efuna (na	botwata	, otorogol	ontor 0 in	haven (16		Total = Su	m(45) ₁₁₂ =	-	1439.6	(45)
	r	. <u> </u>	- ·	· ·		·		boxes (46)		1	1		I	
(46)m=	22.39 storage	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
	0) includir	na anv so	alar or M	///HRS	storade	within sa	me ves	ما		0		(47)
-			and no ta				-			501		0		(47)
		•			•			ombi boil	ers) ente	er '0' in <i>(</i>	47)			
	storage		not nat		1010000	notanta				0 (,			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			r storage		ear			(48) x (49)	=			0		(50)
			eclared o	-		or is not	known:					•		(/
		-	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
			see secti	on 4.3									1	
		from Ta		Oh								0		(52)
i empe	erature f	actor tro	m Table	∠D								0		(53)

		m water	-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
	. ,	(54) in (5	,	far aaab				((EC)) ~ (EE) (44)	~		0	I	(55)
vvater	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m •			1	
(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	()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)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	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=	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 h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		(62)
Solar Dł	-IW input of	calculated	using App	endix G or	· Appendix	H (negati [,]	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(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	t from w	ater hea	ter											
(64)m=		142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
								Outp	out from wa	ater heate	r (annual)₁	12	1601.57	(64)
Heat q	ains fro	m water	heating.	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	۲ [(46)m	+ (57)m	+ (59)m	1	-
(65)m=	53.07	46.51	48.23	42.38	40.91	35.66	33.4	37.82	38.12	43.98	47.59	51.5	-	(65)
inclu	L Ide (57)	n in calc	ulation	u of (65)m	only if c	ı vlinder i	s in the a	u dwellina	or hot w	ater is fr	om com	munitv h	eating	
	. ,	ains (see		. ,	-	,						,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,	g	
ivietad	Jan	s (Table Feb	5), vvat Mar	ts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75		(66)
Ì,										144.75	144.70	1.75		(00)
(67)m=	<u> </u>	(calcula 43.15	35.09	26.57	L, equat 19.86	16.77	18.12	23.55	31.61	40.13	46.84	49.94		(67)
											40.04	49.94		(07)
•••		ins (calc		· · ·	· ·	i	i	, ·			004.00	005.00		(69)
(68)m=		322.73	314.38	296.59	274.15	253.05	238.96	235.64	244	261.78	284.22	305.32	I	(68)
	<u> </u>	(calcula			· · ·	r	, 	1					1	
(69)m=		51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	I	(69)
Pumps	s and fai	ns gains	(Table &	5a)	r								l .	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	I	(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)	-	-	_	-				
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
Water	heating	gains (T	able 5)											
(72)m=	71.33	69.21	64.82	58.86	54.98	49.53	44.89	50.83	52.94	59.12	66.09	69.22		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	542.46	538.23	517.43	485.16	452.13	422.49	405.11	413.16	431.69	464.17	500.3	527.61		(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

0	e calculated using Access Facto Table 6d		Area m ²	a anu	Flux Table 6a	lions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	1	x	3.72	x	11.28	x	0.45	×	1.11	=	18.89	(75)
Northeast 0.9x	1	x	3.72	x	22.97	x	0.45	×	1.11	=	38.45	(75)
Northeast 0.9x	1	x	3.72	x	41.38	x	0.45	x	1.11	=	69.27	(75)
Northeast 0.9x	1	x	3.72	x	67.96	x	0.45	x	1.11	=	113.76	(75)
Northeast 0.9x	1	x	3.72	x	91.35	x	0.45	x	1.11	=	152.91	(75)
Northeast 0.9x	1	x	3.72	x	97.38	x	0.45	×	1.11	=	163.02	(75)
Northeast 0.9x	1	x	3.72	x	91.1	x	0.45	×	1.11	=	152.5	(75)
Northeast 0.9x	1	x	3.72	x	72.63	x	0.45	x	1.11	=	121.58	(75)
Northeast 0.9x	1	x	3.72	×	50.42	x	0.45	x	1.11	=	84.4	(75)
Northeast 0.9x	1	x	3.72	x	28.07	x	0.45	x	1.11	=	46.98	(75)
Northeast 0.9x	1	x	3.72	×	14.2	x	0.45	x	1.11	=	23.77	(75)
Northeast 0.9x	1	x	3.72	x	9.21	x	0.45	x	1.11	=	15.42	(75)
Southeast 0.9x	1	x	0.66	x	36.79	x	0.45	x	1.11	=	10.93	(77)
Southeast 0.9x	1	x	0.66	x	62.67	x	0.45	x	1.11	=	18.61	(77)
Southeast 0.9x	1	x	0.66	x	85.75	x	0.45	x	1.11	=	25.47	(77)
Southeast 0.9x	1	x	0.66	x	106.25	x	0.45	×	1.11	=	31.56	(77)
Southeast 0.9x	1	x	0.66	x	119.01	x	0.45	×	1.11	=	35.35	(77)
Southeast 0.9x	1	x	0.66	x	118.15	x	0.45	x	1.11	=	35.09	(77)
Southeast 0.9x	1	x	0.66	x	113.91	x	0.45	x	1.11	=	33.83	(77)
Southeast 0.9x	1	x	0.66	x	104.39	x	0.45	×	1.11	=	31	(77)
Southeast 0.9x	1	x	0.66	x	92.85	x	0.45	×	1.11] =	27.58	(77)
Southeast 0.9x		x	0.66	x	69.27	x	0.45	×	1.11	=	20.57	(77)
Southeast 0.9x		x	0.66	x	44.07	x	0.45	×	1.11	=	13.09	(77)
Southeast 0.9x		x	0.66	×	31.49	x	0.45	×	1.11	=	9.35	(77)
Southwest0.9x		x	7.39	x	36.79		0.45	x	1.11	=	122.36	(79)
Southwest0.9x	1	x	7.39	×	62.67		0.45	x	1.11	=	208.42	(79)
Southwest0.9x	1	x	7.39	x	85.75		0.45	x	1.11	=	285.17	(79)
Southwest0.9x		x	7.39	×	106.25		0.45	x	1.11	=	353.34	(79)
Southwest0.9x	1	x	7.39	×	119.01		0.45	x	1.11	=	395.77	(79)
Southwest0.9x		x	7.39	×	118.15		0.45	x	1.11	=	392.91	(79)
Southwest0.9x		x	7.39	×	113.91		0.45	x	1.11	=	378.81	(79)
Southwest0.9x	1	x	7.39	x	104.39		0.45	x	1.11	=	347.15	(79)
Southwest0.9x		x	7.39	x	92.85		0.45	×	1.11	=	308.78	(79)
Southwest _{0.9x}		x	7.39	×	69.27		0.45	×	1.11	=	230.35	(79)
Southwest _{0.9x}		x	7.39	×	44.07		0.45	×	1.11	=	146.56	(79)
Southwest _{0.9x}	1	x	7.39	×	31.49		0.45	×	1.11	=	104.71	(79)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	152.17	265.48	379.91	498.65	584.03	591.02	565.14	499.73	420.76	297.91	183.41	129.49		(83)
Total g	ains – ir	nternal a	and solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	694.64	803.71	897.34	983.81	1036.16	1013.51	970.25	912.9	852.45	762.07	683.71	657.1		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.89	0.81	0.68	0.52	0.38	0.42	0.63	0.84	0.94	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.67	19.9	20.22	20.57	20.82	20.95	20.99	20.98	20.9	20.56	20.04	19.6		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	uble 9, Tl	h2 (°C)					
(88)m=	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for a	ains for	rest of dy	welling	h2 m (se	e Table	9a)						
(89)m=	0.96	0.93	0.87	0.77	0.62	0.45	0.3	0.34	0.56	0.81	0.93	0.96		(89)
			ature in											
(90)m=	18.79	19.02	19.33	19.65	19.86	19.96	19.98	19.98	19.93	19.65	19.16	18.72		(90)
(00)11-	10.75	10.02	10.00	10.00	10.00	10.00	10.00	10.00			g area ÷ (4		0.21	(91)
											9 0. 00 . (,	0.21	
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	<i>,</i>					
(92)m=	18.97	19.2	19.51	19.84	20.06	20.17	20.19	20.19	20.13	19.84	19.34	18.91		(92)
Apply			he mear	i				i		opriate				
(93)m=	18.82	19.05	19.36	19.69	19.91	20.02	20.04	20.04	19.98	19.69	19.19	18.76		(93)
8. Sp	ace hea	ting requ	uirement	:										
			ternal ter	•		ed at ste	əp 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains	r - T		luna	ll	A	0.0.0	Ort	Neur	Dee		
Litilion	Jan tion foo	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.94	0.91	ains, hm 0.86	. 0.76	0.62	0.45	0.3	0.34	0.56	0.8	0.91	0.95		(94)
			, W = (94			0.43	0.5	0.54	0.50	0.0	0.91	0.35		(04)
(95)m=	656.33	734.34	, <u>vv – (</u> 9.	751.44	642.77	453.54	295.35	310.89	474.67	607.35	625.31	626.19		(95)
			ernal tem				200.00	010.00	-11-1.07	007.00	020.01	020.10		()
(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)
	loss rate	e for mea	an intern	al tempe	erature.	Lm . W =	=[(39)m :	∟ x [(93)m·	– (96)m	1				
(97)m=			1114.76	<u> </u>	711.8	, 469.33	298.19	315.25	509.41	787.6	1047.88	1261.48		(97)
Space	e heatin	a require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4 ⁻	L1)m			
(98)m=	448.21	330.84	255.08	132.07	51.36	0	0	0	0	134.1	, 304.25	472.66		
			1					Tota	l per year	(kWh/year) = Sum(98	B) _{15,912} =	2128.58	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								27.49	(99)
			nts – Indi		•	vetomo i	ncluding	micro G	` ЦD)				-	
			115 - 1110	Muual N	eating s	ystems I	nciuuling		<u>лп-) —</u>					
-	e heatir on of sp	-	at from s	econdar	v/supple	mentarv	system						0	(201)
					,	y	-,						v	

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	ing syste	em 1								90.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	r – – – – – – – – – – – – – – – – – – –	alculate	d above)		i				1	-	-	
	448.21	330.84	255.08	132.07	51.36	0	0	0	0	134.1	304.25	472.66		
(211)m		i · · ·	r	100 ÷ (20				-	-				1	(211)
	495.26	365.57	281.85	145.94	56.75	0	0	0 Tota	0	148.18	336.19 211) _{15,1012}	522.28	2352.02	(211)
•)m x (20	g fuel (s 01)] } x 1 0		ry), kWh/ 08) 0	month	0	0	0	0	0	0	0]], ,
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water	heating	9												4
Output	from w	ater hea 142.97	ter (calc 148.46	ulated a	bove) 126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3	1	
Efficier		ater hea		130.75	120.44	110.55	103.00	117.10	117.95	155.7	140.42	100.0	87.3	(216)
(217)m=	-	89.51	89.3	88.88	88.2	87.3	87.3	87.3	87.3	88.86	89.43	89.68	01.5	(217)
``´		I heating,	L kWh/m	onth			1				1		1	. ,
(219)m	<u>1 = (64)</u>	<u>m x 100</u>) ÷ (217))m									1	
(219)m=	181.88	159.72	166.26	147.11	143.36	126.63	118.97	134.2	135.1 I = Sum(2	152.71	163.72	176.53	4000.0	
Annua	l totals							Tota	r = Oun(2		Wh/year	•	1806.2 kWh/year	(219)
			ed, main	system	1					ĸ	wii/yeai		2352.02	1
Water	heating	fuel use	d										1806.2	i i
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								J
		•		nced, ext			nput fron	n outside	ż			52.27	1	(230a)
		ng pump							-			30]	(230c)
		• · ·]	
		an-assis							((000))	(222.)		45		(230e)
			above,	kWh/yea	r			sum	of (230a).	(230g) =			127.27	(231)
Electric	city for I	ighting											343.21	(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)	=				4146.78	(338)
10a. I	-uel cos	sts - indiv	vidual he	eating sy	stems:									
						Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
Space	heating	- main s	system 2	1		(21	1) x			3.4	8	x 0.01 =	81.85	(240)
Space	heating	- main s	system 2	2		(213	3) x			0		x 0.01 =	0	(241)
Space	heating	- secon	dary			(21	5) x			13.	19	x 0.01 =	0	(242)

Water heating cost (other fuel)	(219)	3.48 × 0.01	= 62.86 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 16.79 (249)
(if off-peak tariff, list each of (230a) to (230g Energy for lighting	g) separately as applicable a	and apply fuel price according to 13.19×0.01	
Additional standing charges (Table 12)	()	13.19	40.27
Additional standing charges (Table 12)			
	one of (233) to (235) x)	13.19 × 0.01	= -63.57 (252)
Appendix Q items: repeat lines (253) and (2 Total energy cost (24	254) as needed 5)(247) + (250)(254) =		263.2 (255)
11a. SAP rating - individual heating system	ns		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(25	55) x (256)] ÷ [(4) + 45.0] =		0.9 (257)
SAP rating (Section 12)			87.41 (258)
12a. CO2 emissions – Individual heating s	ystems including micro-CH	Ρ	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	508.04 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	390.14 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	898.17 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	0.519 =	66.06 (267)
Electricity for lighting	(232) x	0.519 =	178.13 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year		sum of (265)(271) =	892.24 (272)
CO2 emissions per m ²		(272) ÷ (4) =	11.52 (273)
EI 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 =	2869.46 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2203.56 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	5073.02 (265)
Electricity for pumps, fans and electric keep	o-hot (231) x	3.07 =	390.73 (267)
Electricity for lighting	(232) x	0 =	1053.67 (268)
Energy saving/generation technologies Item 1		3.07 =	-1479.49 (269)

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

5037.93	(272)
65.06	(273)

(272) ÷ (4) =

					User D	etails:						
Assessor Name: Software Name:		n Tunnir oma FS	0,			Strom Softwa	are Ver	rsion:			027495 on: 1.0.5.41	
		_				Address						
Address :		Buttercup	o Road ,	, Bishops	s Waltha	am, SOU	THAMP	TON, SO	032 1RF			
1. Overall dwelling d	imension	S:				()						
Ground floor						a(m²)			ight(m)		Volume(m ³)	
					3	38.72	(1a) x	2	.46	(2a) =	95.25	(3a)
First floor					3	88.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor area TFA =	: (1a)+(1l	b)+(1c)+(1d)+(1e	e)+(1r	I) 7	7.44	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	(3n) =	202.51	(5)
2. Ventilation rate:												
		main heating		econdar leating	у	other		total			m ³ per hour	
Number of chimneys	Г	0	<u> </u> + ר	0] + [0] = [0	x 4	= 0	0	(6a)
Number of open flues	Γ	0	<u>-</u>	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermitten	∟ t fans						 -	0	x 1	0 =	0	(7a)
Number of passive ve	nts						Г	0	x 1	0 =	0	(7b)
Number of flueless ga	s fires						Γ	0	x 4	= 0	0	(7c)
										A :=		
Infiltration due to shim	novo flu	oo ood fr	ano - (6)	a)+(6b)+(7	a)+(7b)+(7c) -	Г				hanges per hou	-
Infiltration due to chim	•						continue fr	0 om (9) to (÷ (5) =	0	(8)
Number of storeys	n the dw	elling (ns	;)					.,	,		0	(9)
Additional infiltration	า								[(9)-	1]x0.1 =	0	(10)
Structural infiltration	n: 0.25 fo	r steel or	timber f	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall a deducting areas of op				ponding to	the grea	ter wall are	a (after					
If suspended wood	• ,	•		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby,	enter 0.0	05, else e	enter 0								0	(13)
Percentage of wind	ows and	doors dra	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)					0	(16)
Air permeability val	•	•				•	•	etre of e	nvelope	area	3.9200000762939	(17)
If based on air perme	•										0.2	(18)
Air permeability value ap Number of sides shell		ressurisatio	on test has	s been don	e or a de	gree air pe	rmeability	is being us	sed			(19)
Shelter factor	ereu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorpo	orating sh	nelter fac	tor			(21) = (18) x (20) =				0.17	(21)
Infiltration rate modifie	-			ł								J` ´
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average 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 (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 rat	e (allowi	ing for sl	nelter an	d wind s	speed)	= (21a) x	(22a)m					
	0.21	0.21	0.2	0.18	0.18	0.16	0.16	0.15	0.17	0.18	0.19	0.2		
			-	rate for t	he appli	cable ca	ise	•	•	•		 Г		
		al ventila		ondiv N (2	(22) - (22c		oquation	n (N5)) , othe	nuico (22)	(222)		Ļ	0.5	(23a)
								r (NS)) , ourie		5) – (258)		Ļ	0.5	(23b)
			-		-					2h)m (00h) I	[1 (22a)	0	(23c)
a) II (24a)m=									$\frac{a}{1} = \frac{2}{2}$			$\begin{bmatrix} 1 - (23c) \\ 0 \end{bmatrix}$	÷ 100]	(24a)
	-				-			(MV) (24	-			Ŭ		(210)
(24b)m=									$\frac{1}{0}$			0		(24b)
	-				-			tion from	-	Ů	Ů	Ŭ		(,
,					•	•		24c) = (22		.5 × (23b))			
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
d) If	natural	ventilatio	n or wh	lole hous	e positiv	/e input	ventila	tion from	loft	!				
í	f (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	24d)m	= 0.5 + [(2	22b)m² x	0.5]		. <u></u>		
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (2	24d) 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. Hea	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros		Openin		Net Ar		U-val		ΑXU		k-value		X k
_		area	(m²)	r	1 ²	A ,r	<u> </u>	W/m2	2K	(W/I	K)	kJ/m²∙K	K kJ,	/K
Doors						2.1		x 1.4	=	2.94				(26)
Window	ws Type	e 1				3.72		x1/[1/(1.4)-	+ 0.04] ₌	4.93				(27)
Window	ws Type	e 2				7.39		x1/[1/(1.4)-	+ 0.04] =	9.8				(27)
Window	ws Type	e 3				0.66		x1/[1/(1.4)-	+ 0.04] =	0.88				(27)
Floor						38.7		× 0.11	=	4.257		75	2902.5	5 (28)
Walls		91.9	96	13.8	7	78.09	9	x 0.24		18.74		60	4685.4	4 (29)
Roof		38.7	2	0		38.72	2	× 0.11	=	4.26		9	348.48	3 (30)
Total a	rea of e	elements	, m²			169.3	8							(31)
Party v	vall					45.67	7	x 0	=	0		45	2055.1	5 (32)
Interna	l wall **					69.98	3					9	629.85	6 (32c)
Interna	l wall **					73.74	4					9	663.636	6 (32c)
Interna	l floor					38.72	2					18	696.96	=
Interna	l ceiling	1				38.72						9	348.48	=
	-		ows, use e	effective wi	ndow U-va			ing formula	1/[(1/U-val	ue)+0.04] a	as given ii	n paragraph		`` <i>`</i>

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

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

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

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

((28)...(30) + (32) + (32a)...(32e) =

 $= (34) \div (4) =$

45.8

12330.46

159.23

(33)

(34)

(35)

can be l	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						7.45	(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) =			53.25	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			-	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66		
Heat lo	oss para	ameter (H	HLP), W	/m²K				•		Average = = (39)m ÷	Sum(39)1. · (4)	₁₂ /12=	86.66	(39)
(40)m=	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
			I	I		I	I	I		Average =	Sum(40)1.	₁₂ /12=	1.12	(40)
Numb	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	ater hea	ting enei	rgy requ	irement:								kWh/ye	ear:	
A													1	
if TF				[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		41		(42)
Annua	l averag	e hot wa						(25 x N) to achieve		se taraet o		1.5]	(43)
		litres per				-	-			0				
	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	-					1	
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
		Į	Į	I		I	Į	ļ		Total = Su	n(44) ₁₁₂ =	=	1097.96	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55		
lf instan	taneous v	vətor hoati	na at noint	of use (no	hot water	r storage)	ontor () in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1439.6	(45)
	r									40.00	40.07	04.00	1	(AC)
(46)m= Water	22.39 storage	19.58 loss:	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
	•		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
-		neating a					-					-	1	
		-			-			mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
a) If m	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
		om water	-					(48) x (49)) =			0]	(50)
,		turer's de											1	
		age loss neating s			e ∠ (KVV	n/iitre/08	iy)					0		(51)
		from Ta		0.1 1.0								0]	(52)
		actor fro		2b								0		(53)

		m water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54) (55)
	. ,	loss cal		for each	month			((56)m = (55) × (41)	m		<u> </u>		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	l	(56)
		-							-	m where (-	 ix H	()
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
						Ů	Ŭ	0		Ů				
		loss (an loss cal				50)m - ((EQ) · 26	5 ~ (11)	~			0		(58)
	•				`	,	· ·	. ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
		l culated	for oach	month ((61)m –	(60) · 20	$\frac{1}{25 \times (41)}$	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)
													(50) m + (61) m	(01)
(62)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	(62)m = 117.16	0.65 × (135.7	(40)III + 146.42	(57)11 +	(59)m + (61)m	(62)
		_								r contributi				(02)
		l lines if								r contribut	UN IO WAIE	i neating)		
(63)m=		0			0				0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
	from w	ater hea												
(64)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
(0.)										ater heater			1601.57	(64)
Heat a	ains fro	m water	heating	kWh/m	onth 0.24	5 ´ [0 85	x (45)m			k [(46)m], ,
(65)m=	53.07	46.51	48.23	42.38	40.91	35.66	33.4	37.82	38.12	43.98	47.59	51.5	1	(65)
										ater is fr			leating	
	. ,	ains (see		. ,	-	Synnach is	5 11 110 0	wennig				interney i	leating	
).									
Metabo		<u>s (Table</u> Feb	5), Wat Mar	ts Apr	May	lup	lul	Δυσ	Son	Oct	Nov	Dec		
(66)m=	Jan 120.62	120.62	120.62	120.62	120.62	Jun 120.62	Jul 120.62	Aug 120.62	Sep 120.62	Oct 120.62	Nov 120.62	Dec 120.62		(66)
		(calcula								120.02	120.02	120.02		(00)
(67)m=	20.11	(Calcula 17.86	14.53	11	8.22	6.94	7.5	9.75	13.08	16.61	19.39	20.67	l	(67)
											10.00	20.07		(07)
••		ins (calc 216.23	210.63	198.72	183.68	169.55	160.1	3a), aisc 157.88	163.48	175.39	190.43	204.56	l	(68)
(68)m=											190.43	204.30		(00)
	<u> </u>	(calcula			· ·	r	, I		·	r	25.00	25.00	l	(60)
(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06		(69)
-		ns gains	· · · · · · · · · · · · · · · · · · ·	· ·									I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
	-	aporatio	· •	· · · · · ·	· · · ·	· · ·							I	
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
		gains (T	,	i									l	
(72)m=	71.33	69.21	64.82	58.86	54.98	49.53	44.89	50.83	52.94	59.12	66.09	69.22		(72)
Total i		gains =				(66)	m + (67)m		+ (69)m + ((70)m + (7	1)m + (72)	m	I	
(73)m=	367.63	365.49	352.17	330.76	309.07	288.2	274.68	280.65	291.69	313.31	338.1	356.65		(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	 calculated using Access Facto Table 6d 		Area m ²	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.72	×	11.28	x	0.45	×	1.11	=	14.54	(75)
Northeast 0.9x	0.77	x	3.72	×	22.97	x	0.45	x	1.11	=	29.6	(75)
Northeast 0.9x	0.77	x	3.72	x	41.38	x	0.45	x	1.11	=	53.34	(75)
Northeast 0.9x	0.77	x	3.72	×	67.96	x	0.45	×	1.11	=	87.59	(75)
Northeast 0.9x	0.77	x	3.72	×	91.35	x	0.45	x	1.11	=	117.74	(75)
Northeast 0.9x	0.77	x	3.72	×	97.38	x	0.45	x	1.11	=	125.53	(75)
Northeast 0.9x	0.77	x	3.72	×	91.1	x	0.45	×	1.11	=	117.43	(75)
Northeast 0.9x	0.77	x	3.72	×	72.63	x	0.45	x	1.11	=	93.61	(75)
Northeast 0.9x	0.77	x	3.72	x	50.42	x	0.45	x	1.11	=	64.99	(75)
Northeast 0.9x	0.77	x	3.72	×	28.07	x	0.45	x	1.11	=	36.18	(75)
Northeast 0.9x	0.77	x	3.72	×	14.2	x	0.45	x	1.11	=	18.3	(75)
Northeast 0.9x	0.77	x	3.72	×	9.21	x	0.45	x	1.11	=	11.88	(75)
Southeast 0.9x	0.77	x	0.66	×	36.79	x	0.45	×	1.11	=	8.41	(77)
Southeast 0.9x	0.77	x	0.66	×	62.67	x	0.45	x	1.11	=	14.33	(77)
Southeast 0.9x	0.77	x	0.66	×	85.75	x	0.45	x	1.11	=	19.61	(77)
Southeast 0.9x	0.77	x	0.66	×	106.25	x	0.45	×	1.11	=	24.3	(77)
Southeast 0.9x	0.77	x	0.66	×	119.01	x	0.45	x	1.11	=	27.22	(77)
Southeast 0.9x	0.77	x	0.66	x	118.15	x	0.45	x	1.11	=	27.02	(77)
Southeast 0.9x	0.77	x	0.66	×	113.91	x	0.45	x	1.11	=	26.05	(77)
Southeast 0.9x	0.77	x	0.66	×	104.39	x	0.45	×	1.11	=	23.87	(77)
Southeast 0.9x	0.77	x	0.66	×	92.85	x	0.45	x	1.11	=	21.23	(77)
Southeast 0.9x	0.77	x	0.66	×	69.27	x	0.45	×	1.11	=	15.84	(77)
Southeast 0.9x	0.77	x	0.66	×	44.07	x	0.45	×	1.11	=	10.08	(77)
Southeast 0.9x	0.77	x	0.66	×	31.49	x	0.45	×	1.11	=	7.2	(77)
Southwest0.9x	0.77	x	7.39	x	36.79		0.45	x	1.11	=	94.22	(79)
Southwest0.9x	0.77	x	7.39	×	62.67		0.45	×	1.11	=	160.48	(79)
Southwest0.9x	0.77	x	7.39	×	85.75		0.45	×	1.11	=	219.58	(79)
Southwest0.9x		x	7.39	×	106.25		0.45	x	1.11	=	272.07	(79)
Southwest0.9x	0.77	x	7.39	×	119.01		0.45	×	1.11	=	304.74	(79)
Southwest0.9x	0.77	x	7.39	x	118.15		0.45	x	1.11	=	302.54	(79)
Southwest0.9x	0.77	x	7.39	×	113.91		0.45	×	1.11	=	291.68	(79)
Southwest0.9x	0.77	x	7.39	×	104.39		0.45	×	1.11	=	267.31	(79)
Southwest0.9x		x	7.39	×	92.85		0.45	×	1.11	=	237.76	(79)
Southwest0.9x	0.77	x	7.39	×	69.27		0.45	×	1.11	=	177.37	(79)
Southwest0.9x		x	7.39	×	44.07		0.45	×	1.11	=	112.85	(79)
Southwest0.9x	0.77	x	7.39	×	31.49		0.45	×	1.11	=	80.63	(79)

Solar g	gains in	watts, ca	alculated	for eacl	n month			(83)m = S	um(74)m .	(82)m				
(83)m=	117.17	204.42	292.53	383.96	449.7	455.09	435.16	384.79	323.99	229.39	141.23	99.71		(83)
Total g	jains – ii	nternal a	and sola	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	484.81	569.91	644.7	714.72	758.77	743.29	709.84	665.44	615.68	542.7	479.33	456.35		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livii	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)							-
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.95	0.9	0.81	0.66	0.51	0.56	0.77	0.93	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.34	19.56	19.9	20.31	20.67	20.89	20.97	20.95	20.79	20.32	19.74	19.28		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	n2 (°C)					
(88)m=	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina.	h2,m (se	e Table	9a)						
(89)m=	0.98	0.97	0.94	0.88	0.76	0.58	0.4	0.45	0.71	0.91	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.47	18.69	19.03	19.42	19.75	19.92	19.97	19.97	19.86	, 19.44	18.87	18.41		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.21	(91)
Moon	intorno	Itomnor	oturo (fo	r tho wh	olo dwo	lling) – fl	Δ	. (1 fl	A) v T2			I		J
(92)m=	18.65	18.87	19.21	19.61	19.94	lling) = fl 20.12	20.18	+ (1 – 1L 20.17	20.05	19.62	19.05	18.59		(92)
						ature fro					10.00	10.00		(02)
(93)m=	18.5	18.72	19.06	19.46	19.79	19.97	20.03	20.02	19.9	19.47	18.9	18.44		(93)
	ace hea	tina reau	uirement											• •
					e obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti.m=(76)m an	d re-calc	ulate	
				using Ta					,		-,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.98	0.96	0.93	0.87	0.75	0.58	0.41	0.46	0.7	0.9	0.97	0.98		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	474.74	549.18	601.73	621.2	570.71	429.87	289.88	302.82	430.23	486.52	462.63	448.55		(95)
	<u> </u>	-	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			r	· · · ·		Lm , W =	- ,	<u> </u>	<u>, ,</u>	-	r			()
(97)m=		1198.11	1088.38	914.83	700.97	465.79	297.32	313.98	502.7	768.85	1022.78	1234.37		(97)
•		<u> </u>	· · · · · ·	· · · · · ·		Wh/mont		<u> </u>	`	<u> </u>	r í			
(98)m=	562.64	436.08	362.07	211.42	96.91	0	0	0	0	210.05	403.31	584.65		1
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	2867.13	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								37.02	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	e heatir	-												7
Fract	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)

Fractio	n of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	n of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of r	nain spa	ace heat	ting syste	em 1								90.5	(206)
Efficier	ncy of s	seconda	ry/suppl	ementar	y heating	g systen	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· –			r ·	calculate	i – – – – –				-	1	1	i	I	
L	562.64	436.08	362.07	211.42	96.91	0	0	0	0	210.05	403.31	584.65		
· · -	= {[(98 621.7)m x (20 481.85	04)] } x 1 400.08	100 ÷ (20 233.61)6) 107.08	0	0	0	0	232.1	445.65	646.03	l	(211)
	021.7	401.05	400.00	233.01	107.00	0	0		-		211) _{15,1012}		3168.1	(211)
Space	heatin	a fuel (s	econdar	′y), kWh/	month					, ,	* 10,1012	-	0100.1	
•			00 ÷ (20	• ·										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water h	-		(
· -	<u>rom w</u> 163.01	ater nea 142.97	ter (caic 148.46	ulated a	00VE) 126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
L Efficienc	cy of w	ater hea	iter	<u> </u>									87.3	(216)
(217)m=	89.76	89.69	89.55	89.25	88.66	87.3	87.3	87.3	87.3	89.22	89.62	89.8		(217)
		-	kWh/m											
· · -	= (64) 181.61	m x 100 159.4) ÷ (217) 165.8)m 146.5	142.61	126.63	118.97	134.2	135.1	152.1	163.37	176.29		
									I = Sum(2				1802.59	(219)
Annual	totals									k	Wh/year		kWh/year	
Space h	eating	fuel use	ed, main	system	1								3168.1	
Water h	eating	fuel use	d										1802.59	
Electrici	ty for p	umps, f	ans and	electric	keep-ho	t								
mecha	nical v	entilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	e			52.27		(230a)
central	heatin	g pump	:									30		(230c)
boiler v	vith a f	an-assis	sted flue									45		(230e)
				kWh/yea	r			sum	of (230a).	(230g) =			127.27	(231)
Electrici	•		a, .	, in the second					. ,	(0,			355.2	(232)
Electrici														4
) (004)	. (004)	. (000)	(007h)					-481.92	(233)
				ses (211	, , ,		. ,	. ,					4971.24	(338)
12a. C	O2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHP)					
							ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space h	eating	(main s	ystem 1)		(21	1) x			0.2	16	=	684.31	(261)
Space h	eating	(second	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

389.36

(264)

Space and water heating	(261) + (262) + (263) + (264)	4) =	1073.67	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	66.06	(267)
Electricity for lighting	(232) x	0.519 =	184.35	(268)
Energy saving/generation technologies Item 1		0.519 =	-250.12	(269)
Total CO2, kg/year		sum of (265)(271) =	1073.96	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	13.87	(273)
EI rating (section 14)			88	(274)

						User D	etails:						
Assessor I Software N			n Tunnir oma FS	• •			Strom Softwa	are Ver	sion:			027495 on: 1.0.5.41	
							Address						
Address :			Buttercu	o Road ,	, Bishops	s Waltha	am, SOU	THAMP	TON, SO	032 1RF			
1. Overall dv	velling di	mension	S:			_							
One on a flager							a(m²)		Av. Hei		1	Volume(m ³)	
Ground floor						3	8.72	(1a) x	2	.46	(2a) =	95.25	(3a)
First floor						3	8.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor are	a TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r	I) 7	7.44	(4)					
Dwelling volu	me							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	202.51	(5)
2. Ventilation	n rate:												
			main heating		econdar leating	у	other		total			m ³ per hour	
Number of ch	imneys	Γ	0] + [0	+	0	=	0	x 4	40 =	0	(6a)
Number of op	en flues	Г	0	<u> </u> + [0	- +	0		0	x 2	20 =	0	(6b)
Number of int	ermittent	fans						- <u> </u>	3	x 1	0 =	30	(7a)
Number of pa	ssive ver	nts						Г	0	x 1	0 =	0	(7b)
Number of flu	eless gas	s fires						Γ	0	x 4	40 =	0	(7c)
											Air ch	anges per hou	
Infiltration due	to ohim	novo flu	oo ond f	ono - (6	a)+(6b)+(7	a)+(7b)+(7c) -	Г					-
If a pressurisa								continue fr	30 om (9) to (÷ (5) =	0.15	(8)
Number of												0	(9)
Additional in	nfiltration									[(9)-	1]x0.1 =	0	(10)
Structural in	nfiltration	: 0.25 fo	r steel or	timber	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both type deducting a					ponding to	the great	er wall are	a (after					
If suspende	,	0 //	,		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draugh	nt lobby,	enter 0.0)5, else e	enter 0								0	(13)
Percentage	of windo	ws and	doors dr	aught st	ripped							0	(14)
Window inf	iltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration r	ate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeal	•	•	-			•	•	•	etre of e	nvelope	area	5	(17)
If based on ai	-	-										0.4	(18)
Air permeabilit			ressurisatio	on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed			
Shelter factor		ereu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate		rating sh	nelter fac	tor			(21) = (18					0.34	(21)
Infiltration rate	•	-			ł							0.04	,,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly avera	age wind	speed fi										ı	
(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 (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 rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
Coloul	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
		<i>ctive air c</i> al ventila	-	ale ior l	ne appli	capie ca	Se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
lf bala	anced with	n heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If	balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	anical ve	entilation	without	heat rec	overy (N	MV) (24b)m = (22	2b)m + (23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•			on from c c) = (22t		.5 × (23k	D)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from l 0.5 + [(2		0.5]				
(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in bo	k (25)	-	-	-		
(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros	SS	Openin	as	Net Ar	~~	LL					. ^	Xk
		area	(m²)	. m	-	A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²∙ł		J/K
Doors		area	(m²)	•	-									
	ws Type		(m²)	•	-	A ,r	n²	W/m2	2K	(W/				J/K
Window		e 1	(m²)	•	-	A ,r	m ² x	W/m2	2K = 0.04] =	(W/ 2.1				J/K (26)
Windov Windov	ws Type	e 1 e 2	(m²)	•	-	A ,r 2.1 3.72	n ² x x x ¹ x ¹	W/m2 1 /[1/(1.4)+	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.1 4.93				J/K (26) (27)
Windov Windov	ws Type ws Type	e 1 e 2	(m²)	•	-	A ,r 2.1 3.72 7.39	n ² x x x ¹ x ¹	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.1 4.93 9.8				J/K (26) (27) (27)
Windov Windov Windov	ws Type ws Type	e 1 e 2		•		A ,r 2.1 3.72 7.39 0.66	n ² x x ¹ . x ¹ . x ¹ . x ¹ . x ¹ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] =	(W/ 2.1 4.93 9.8 0.88				J/K (26) (27) (27) (27)
Windov Windov Windov Floor	ws Type ws Type	≥ 1 ≥ 2 ≥ 3	16	. m		A ,r 2.1 3.72 7.39 0.66 38.7	n ² x x ¹ . x ¹ . x ¹ . x ¹ . x ¹ . x ² . x ² .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	2K 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 2.1 4.93 9.8 0.88 5.031				J/K (26) (27) (27) (27) (28)
Windov Windov Windov Floor Walls Roof	ws Type ws Type ws Type	≥ 1 ≥ 2 ≥ 3 91.9	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09	n ² x x ¹ . x ² .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	2K 0.04] = 0.04] = 0.04] = 0.04] = = =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06				J/K (26) (27) (27) (27) (28) (29)
Windov Windov Windov Floor Walls Roof	ws Type ws Type ws Type ws of e	e 1 e 2 e 3 91.9 38.7	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72	n ² x x ¹ . x ² . x x ² . x ² . x ³	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	2K 0.04] = 0.04] = 0.04] = 0.04] = = =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06				J/K (26) (27) (27) (27) (28) (28) (29) (30)
Windov Windov Floor Walls Roof Total a Party v	ws Type ws Type ws Type ws of e	e 1 e 2 e 3 91.9 38.7 elements	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3	n ² x x ¹ . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 1 = 1 = 1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (27) (28) (28) (29) (30) (31)
Windov Windov Floor Walls Roof Total a Party w Interna	ws Type ws Type ws Type rea of e vall	 1 2 3 91.9 38.7 elements 	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67	n ² x x1. x1. x1. x1. x1. x1. x2. x2. x3. x3. x3. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 1 = 1 = 1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (27) (28) (29) (30) (31) (32)
Windov Windov Floor Walls Roof Total a Party w Interna	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall **	 1 2 3 91.9 38.7 elements 	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98	n ² x x ¹ . x ² . x ² . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 1 = 1 = 1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c)
Windov Windov Floor Walls Roof Total a Party v Interna Interna	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall **	e 1 e 2 e 3 91.9 38.7 elements	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74	n ² x x ¹ . x ² . x ² . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 1 = 1 = 1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna	ws Type ws Type ws Type rea of e vall I wall ** I wall ** I floor I ceiling dows and	e 1 e 2 e 3 91.9 38.7 elements	96 72 , m ² Dws, use e	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n ² x x ¹ . x ² . x ² . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13 0	2K 0.04] = 0.04] = 0.04] = = = = =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03	K)			J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32d)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna * for wind ** includ	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall ** al floor al ceiling dows and e the area	e 1 e 2 e 3 91.9 38.7 elements	n6 '2 , m ² ows, use e sides of in	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n ² x x ¹ . x ² . x ² . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13 0	2K 0.04] = 0.04] = 0.04] = = = = //((1/U-valu	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03	K)	kJ/m²-ŀ		J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32d)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna * for winu ** includ Fabric	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall ** al floor al ceiling dows and the area heat los	 1 2 3 91.9 38.7 91.9 38.7 91.9 91	06 72 , m ² bws, use e sides of in = S (A x	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n ² x x ¹ . x ² . x ² . x ² . x ³ .	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.13 0.13 0.13	$\frac{1}{2} \frac{1}{2} \frac{1}$	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03 0	K)	kJ/m²-ł	< k.	J/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32c) (32e)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						9.22	(36)
if details	of therma	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			51.04	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			-	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.63	39.39	39.16	38.04	37.84	36.87	36.87	36.69	37.24	37.84	38.26	38.7		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m		-	
(39)m=	90.68	90.44	90.2	89.09	88.88	87.91	87.91	87.73	88.28	88.88	89.3	89.74		
									,	Average =	Sum(39)1.	12 /12=	89.09	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		_
			(I) (T						,	Average =	Sum(40)1.	12 /12=	1.15	(40)
Numbe		/s in moi	r Ì	, 									1	
	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	ater hea	ting ene	rgy requ	irement:								kWh/y	ear:	
A		in an av	NI										1	(40)
		upancy, l 9. N = 1		(1 - exp	(-0.0003	849 x (TF)2)] + 0.()013 x (⁻	TFA -13		41		(42)
	A £ 13.				(/_/]	(-,			
								(25 x N)				1.5		(43)
		-		usage by r day (all w		-	-	to achieve	a water us	se target o	f			
		1	<u> </u>			i	·		0			Du	1	
Hot wat	Jan	Feb	Mar	Apr ach month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		· ·	-					· ·					1	
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
Enerav	content of	[•] hot water	used - cal	culated m	onthly $= 4$.	190 x Vd.r	n x nm x D)))))))))))))))))))			m(44) ₁₁₂ = ables 1b, 1		1097.96	(44)
		r			-		90.11						1	
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55	1439.6	(45)
lf instan	taneous v	vater heati	ng at point	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		10181 = 50	m(45) ₁₁₂ =	=	1439.0	(43)
(46)m=	22.39	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68]	(46)
1 (L	storage		20.21	11.02	10.0	11.00	10.02	10.01	10.1	10.20	10.01	21.00		()
Storag	e volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity ł	neating a	and no ta	ank in dw	velling, e	nter 110) litres in	(47)					1	
		•			•			mbi boil	ers) ente	ər '0' in (47)			
Water	storage	loss:												
a) If m	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	y lost fro	om water	⁻ storage	e, kWh/ye	ear			(48) x (49)	=			0		(50)
				cylinder l									1	
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	•	neating s from Ta		UN 4.3									1	(50)
		actor fro		2b								0		(52) (53)
				-							1	~	1	()

Enera	lost fro	m water	storado	k\//b/v	aar			(47) x (51)	x (52) x (53) -		0	l	(54)
		(54) in (5	-	, KVVII/ yt	501			(47) X (01)	/	00) -		0		(54)
	. ,	loss cal		for each	month			((56)m = (55) × (41)	m		-		
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
		-							-	m where (-	l lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Drimor		loss (an	nual) fre	um Toble								0		(58)
	-	loss (all				59)m = ((58) ÷ 36	65 x (41)	m			<u> </u>		()
	•				`	,	· ·	. ,		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) ÷ 30	65 × (41))m						
(61)m=	50.96	44.64	47.56	44.22	43.83	40.61	41.96	43.83	44.22	47.56	47.83	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	200.21	175.18	182.26	161.66	156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		(62)
Solar DH	HW input of	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)					
(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=	200.21	175.18	182.26	161.66	156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		
								Outp	out from wa	ater heater	r (annual)₁	12	1987.77	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	62.37	54.56	56.68	50.1	48.43	42.48	40.45	45.34	45.85	52.43	56.22	60.8		(65)
inclu	ide (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	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=	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62		(66)
Lightin	g gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	20.11	17.86	14.53	. 11	8.22	6.94	7.5	9.75	13.08	16.61	19.39	20.67		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=		216.23	210.63	198.72	183.68	169.55	160.1	157.88	163.48	175.39	190.43	204.56		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(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)								
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
Water	heating	gains (T	able 5)											
(72)m=	83.83	81.2	, 76.18	69.59	65.09	59.01	54.37	60.94	63.67	70.48	78.08	81.72		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	380.13	377.48	363.53	341.49	319.18	297.68	284.16	290.76	302.42	324.67	350.09	369.15		(73)
				-	-	-	-			-			•	

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

•	Access Facto Table 6d		Area m ²	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.72	x	11.28	×	0.63	×	0.7	=	12.83	(75)
Northeast 0.9x	0.77	x	3.72	x	22.97	x	0.63	x	0.7	=	26.11	(75)
Northeast 0.9x	0.77	x	3.72	x	41.38	x	0.63	x	0.7	=	47.04	(75)
Northeast 0.9x	0.77	x	3.72	x	67.96	×	0.63	×	0.7	=	77.26	(75)
Northeast 0.9x	0.77	x	3.72	x	91.35	×	0.63	x	0.7	=	103.85	(75)
Northeast 0.9x	0.77	x	3.72	x	97.38	x	0.63	x	0.7	=	110.71	(75)
Northeast 0.9x	0.77	x	3.72	x	91.1	x	0.63	×	0.7	=	103.57	(75)
Northeast 0.9x	0.77	x	3.72	x	72.63	x	0.63	×	0.7	=	82.57	(75)
Northeast 0.9x	0.77	x	3.72	x	50.42	×	0.63	×	0.7	=	57.32	(75)
Northeast 0.9x	0.77	x	3.72	x	28.07	×	0.63	×	0.7	=	31.91	(75)
Northeast 0.9x	0.77	x	3.72	x	14.2	×	0.63	x	0.7	=	16.14	(75)
Northeast 0.9x	0.77	x	3.72	x	9.21	×	0.63	×	0.7	=	10.48	(75)
Southeast 0.9x	0.77	x	0.66	x	36.79	×	0.63	x	0.7	=	7.42	(77)
Southeast 0.9x	0.77	x	0.66	x	62.67	×	0.63	x	0.7	=	12.64	(77)
Southeast 0.9x	0.77	x	0.66	x	85.75	×	0.63	x	0.7	=	17.3	(77)
Southeast 0.9x	•	x	0.66	x	106.25	×	0.63	x	0.7	=	21.43	(77)
Southeast 0.9x		x	0.66	x	119.01	×	0.63	x	0.7	=	24	(77)
Southeast 0.9x	•	x	0.66	X	118.15	X	0.63	x	0.7	=	23.83	(77)
Southeast 0.9x	-	x	0.66	x	113.91	×	0.63	x	0.7	=	22.98	(77)
Southeast 0.9x	_	x	0.66	x	104.39	x	0.63	×	0.7	=	21.06	(77)
Southeast 0.9x	•	x	0.66	x	92.85	x	0.63	x	0.7	=	18.73	(77)
Southeast 0.9x		x	0.66	x	69.27	x	0.63	×	0.7	=	13.97	(77)
Southeast 0.9x		x	0.66	x	44.07	x	0.63	x	0.7	=	8.89	(77)
Southeast 0.9x		x	0.66	x	31.49	x	0.63	×	0.7	=	6.35	(77)
Southwest _{0.9x}	-	x	7.39	x	36.79		0.63	x	0.7	=	83.1	(79)
Southwest0.9x	•	x	7.39	x	62.67		0.63	×	0.7	=	141.55	(79)
Southwest0.9x		x	7.39	x	85.75		0.63	×	0.7	=	193.67	(79)
Southwest _{0.9x}		x	7.39	x	106.25		0.63	x	0.7	=	239.97	(79)
Southwest _{0.9x}		x	7.39	x	119.01		0.63	×	0.7	=	268.78	(79)
Southwest0.9x		x	7.39	x	118.15		0.63	×	0.7	=	266.84	(79)
Southwest _{0.9x}		x	7.39	x	113.91		0.63	x	0.7	=	257.26	(79)
Southwest0.9x	••••	x	7.39	x	104.39		0.63	×	0.7	=	235.76	(79)
Southwest _{0.9x}	•	x	7.39	x	92.85	ļ	0.63	×	0.7	=	209.7	(79)
Southwest0.9x		x	7.39	x	69.27		0.63	×	0.7	=	156.44	(79)
Southwest0.9x		x	7.39	x	44.07		0.63	×	0.7	=	99.53	(79)
Southwest _{0.9x}	0.77	x	7.39	x	31.49		0.63	x	0.7	=	71.11	(79)

Solar g	gains in	watts, ca	alculated	for eac	n month			(83)m = S	um(74)m .	(82)m				
(83)m=	103.35	180.3	258.01	338.66	396.64	401.39	383.81	339.39	285.76	202.32	124.56	87.94		(83)
Total g	jains – ii	nternal a	and sola	r (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	483.48	557.78	621.54	680.15	715.81	699.07	667.97	630.14	588.18	526.99	474.65	457.09		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)											-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.96	0.89	0.73	0.56	0.61	0.85	0.97	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.75	19.91	20.16	20.49	20.77	20.94	20.99	20.98	20.87	20.5	20.07	19.73		(87)
Temp	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)													
(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.95		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.95	0.84	0.64	0.44	0.49	0.78	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.29	18.52	18.88	19.35	19.73	19.93	19.97	19.97	19.86	, 19.38	18.76	18.25		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.21	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$														
(92)m=	18.59	18.81	19.15	19.59	19.95	20.14	20.18	+ (1 — 1∟ 20.18	20.07	19.62	19.03	18.56		(92)
				n internal							10.00	10.00		(0-)
(93)m=	18.59	18.81	19.15	19.59	19.95	20.14	20.18	20.18	20.07	19.62	19.03	18.56		(93)
	ace hea	tina reau	uirement											
					e obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
				using Ta					,	, (,			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	0.99	0.98	0.94	0.84	0.66	0.47	0.52	0.79	0.95	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	481.18	552.25	607.37	638.89	604.19	460.63	311.08	325.33	462.38	503.22	470.05	455.42		(95)
	nly avera	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			r	al tempe		· · · · · ·	- ,	<u> </u>	<u>, ,</u>	-	r			()
(97)m=		1257.82	1140.85	952.29	733.1	487.18	314.76	331.43	527.12	801.39	1065.36	1288.87		(97)
•		<u> </u>	· · · · · ·	r each n		i		<u> </u>	`	<u>í - </u>	r í			
(98)m=	606.24	474.14	396.9	225.65	95.91	0	0	0	0	221.84	428.62	620.09		-
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =										3069.39	(98)			
Space heating requirement in kWh/m²/year										39.64	(99)			
9a. Energy requirements – Individual heating systems including micro-CHP)														
-	e heatir	-												-
Fraction of space heat from secondary/supplementary system									0	(201)				

														_
Fracti	on of sp	bace hea	at from m	nain syst	em(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)		
Efficiency of secondary/supplementary heating system, %											0	(208)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		g require	r È	r i	d above)		1			-	1	1	1	
	606.24	474.14	396.9	225.65	95.91	0	0	0	0	221.84	428.62	620.09	J	
(211)m		8)m x (20	<u> </u>	· · · ·	<u> </u>								1	(211)
	649.08	507.64	424.95	241.6	102.69	0	0	0 Toto	0	237.52	458.91 211) _{15,1012}	663.9		(211)
•)m x (20	ig fuel (s 01)] } x 1		• ·	month	0	0	0	0	0	0	0	3286.29	
(213)11-	0	0	0	0	0	0	0	-	-	-	215) _{15,1012}		0	(215)
Output	200.21	ater hea 175.18	182.26	ulated al 161.66	bove) 156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		_
	-	ater hea	· · · · · · · · · · · · · · · · · · ·	05.00						05.70	07.45	07.75	80.3	(216)
(217)m=		87.43	86.96	85.89	83.86	80.3	80.3	80.3	80.3	85.73	87.15	87.75	J	(217)
		heating, m x 100												
(219)m=		200.36	209.6	188.21	186.64	171.67	164.47	183.35	185.37	197.71	207.62	222.79]	
								Tota	I = Sum(2	19a) ₁₁₂ =			2346.18	(219)
Annual totals kWh/year										•	kWh/year	7		
Space heating fuel used, main system 1													3286.29	
Water	heating	fuel use	d										2346.18	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
central heating pump:												30		(230c)
boiler with a fan-assisted flue												45]	(230e)
Total electricity for the above, kWh/year								sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											355.2	(232)		
Total d	lelivered	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				6062.67	(338)
12a. (CO2 em	nissions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHP						_
						Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır	
Space heating (main system 1)					(211	(211) x			0.2	16	=	709.84	(261)	
Space heating (secondary)						(21	(215) x			0.5	19	=	0	(263)
Water heating						(219	(219) x			0.216 =			506.78	(264)
Space and water heating						(26	1) + (262) ·	+ (263) + (264) =				1216.61	(265)
Electricity for pumps, fans and electric keep-hot							1) x			0.5	19	=	38.93	(267)

Electricity for lighting	(232) x	0.519 =	184.35	(268)
Total CO2, kg/year		sum of (265)(271) =	1439.89	(272)
TER =			18.59	(273)