## **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 *Printed on 09 June 2021 at 10:01:42* 

Project Informatic	on:				
Assessed By:	Ben Tunningley (	STRO027495)	Building Type:	End-terrace House	
Dwelling Details:					
NEW DWELLING	AS BUILT		Total Floor Area: 7	′4.1m²	
Site Reference :	Albany Farm		Plot Reference:	Plot 030	
Address :	9 Buttercup Roac	, Bishops Waltham, SOUTHA	MPTON , 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	R				
	ing system: Mains g	jas			
Fuel factor: 1.00 (r	0,		18.81 kg/m²		
•	oxide Emission Rate Dioxide Emission Ra	. ,	15.01 kg/m <sup>2</sup>	Oł	к
1b TFEE and DF			roro r kg/m		
Target Fabric Ener	rgy Efficiency (TFE	Ξ)	52.2 kWh/m²		
Dwelling Fabric Er	nergy Efficiency (DF	EE)	45.0 kWh/m <sup>2</sup>		
				Oł	K
2 Fabric U-value	es	•			
Element External v	wall	Average	Highest	0	ĸ
Party wal		0.24 (max. 0.30) 0.00 (max. 0.20)	0.24 (max. 0.70) -	OF OF	
Floor	1	0.11 (max. 0.25)	0.11 (max. 0.70)	Oł	
Roof		0.11 (max. 0.20)	0.11 (max. 0.35)	Oł	
Openings	6	1.40 (max. 2.00)	1.40 (max. 3.30)	OF	
2a Thermal bridg		, , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , ,		
Thermal I	bridging calculated	from linear thermal transmittar	ices for each junction		
3 Air permeabili	ty				
	oility at 50 pascals		4.77		
Maximum			10.0	Oł	ĸ
4 Heating efficie	ncy				
Main Heatir	ng system:	Database: (rev 478, produc	,		
		Boiler systems with radiato 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 Of	к
Secondary	heating system:	None			

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Cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls Hot water controls:	Programmer, room therm No cylinder thermostat No cylinder	nostat and TRVs	ок
Boiler interlock:	Yes		ОК
.ow energy lights			
Percentage of fixed lights wi Minimum	th low-energy fittings	100.0% 75.0%	OK
Mechanical ventilation			
Continuous extract system ( Specific fan power: Maximum	decentralised)	0.16 0.18 0.7	ОК
Summertime temperature			
Overheating risk (South Enged on:	gland):	Slight	OK
Overshading: Windows facing: North Wes Windows facing: South East Windows facing: North East Vindows facing: North East Ventilation rate: Blinds/curtains:	t	Very Little 3.06m <sup>2</sup> 6.51m <sup>2</sup> 2.28m <sup>2</sup> 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 N			n Tunniı oma FS	0,	2			a Num are Ver				027495 on: 1.0.5.41	
					Р	roperty	Address	: Plot 03	0				
Address :			uttercup	Road , I	Bishops	Walthar	n, SOUT	HAMPT	ON , SC	)32 1RF			
1. Overall d	welling dir	mension	s:										
0 14						-	a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	1
Ground floor						3	57.05	(1a) x	2	2.4	(2a) =	88.92	(3a)
First floor						3	7.05	(1b) x	2.	.67	(2b) =	98.92	(3b)
Total floor are	ea TFA =	(1a)+(1l	o)+(1c)+(	(1d)+(1e	)+(1r	n)	74.1	(4)					
Dwelling volu	me							(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	187.84	(5)
2. Ventilation	n rate:												
			main heating		econdar eating	у	other		total			m <sup>3</sup> per hour	
Number of ch	imneys		0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number of op	en flues	Г	0	7 + [	0	] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of int	termittent	fans						- F	0	x 1	10 =	0	(7a)
Number of pa	assive ver	nts						Γ	0	<b>x</b> 1	10 =	0	(7b)
Number of flu	ieless gas	s fires						Γ	0	x 4	40 =	0	(7c)
								_			Air ch	hanges per hou	_ .r
Infiltration due	o to chimi	oove flu	oc and f	nnc - (6)	a)+(6b)+(7	′a)+(7b)+(	7c) -	Г					-
If a pressurisa								continue fr	0 om (9) to (		÷ (5) =	0	(8)
Number of										,		0	(9)
Additional i	nfiltration									[(9)-	-1]x0.1 =	0	(10)
Structural i	nfiltration	: 0.25 fo	r steel or	timber f	frame or	0.35 fo	r masoni	ry constr	uction			0	(11)
	es of wall are areas of ope				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 draug	ht lobby,	enter 0.(	)5, else e	enter 0								0	(13)
Percentage	e 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 permea	•	•	•			•	•	•	etre of e	nvelope	area	4.76999998092651	(17)
If based on a	-	-							in hninn	1		0.24	(18)
Air permeabile Number of sid			ressunsaud	on lest nas	s been dor	le or a deg	jree all pe	meability	is being us	seu		2	(19)
Shelter factor		, ou					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rat	e incorpo	rating sh	nelter fac	tor			(21) = (18	) x (20) =				0.2	(21)
Infiltration rat	e modifie	d for mo	nthly wir	d speed	I								4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly avera	age 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 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 (allow	ing for sł	nelter an	d wind s	speed) =	= (21a) x	(22a)m					
	0.26	0.25	0.25	0.22	0.22	0.19	0.19	0.19	0.2	0.22	0.23	0.24		
			-	rate for t	he appli	cable ca	ise	•			•	ـــــــــــــــــــــــــــــــــــــ		
		al ventila		ondix N (2	2h) - (22c		oquation (	N5)) otho	nuico (22)	(220)		l	0.5	(23a)
				endix N, (2 ciency in %						) = (23a)		l	0.5	(23b)
			-	-	-					04		[ 	0	(23c)
a) II (24a)m=								$\frac{HR}{0}$	$\frac{1}{0} = \frac{1}{2}$	$\frac{20}{10}$ m + (	230) × [	$\begin{bmatrix} 1 - (23c) \\ 0 \end{bmatrix}$	÷ 100]	(24a)
		-	_		-				I		-	0		(24a)
				entilation			covery (	100)(240)	p)m = (2	26)m + ( 0	23D)			(24b)
(24b)m=		Ť	, i	, i	÷	÷	÷		, i	0	0	0		(240)
				ntilation of the	•	-				5 x (23)	n)			
(24c)m=	· ,	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(24c)
				l ole hous						0.0	0.0	0.0		. ,
				m = (221)						0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	1d) in bo	x (25)		•			
(25)m=	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3 Ho	at losso	e and he	at loss	paramete	or.									
ELEN		Gros		Openin		Net A	rea	U-val	ue	AXU		k-value	Δ	Xk
		area		m	-	A ,i		W/m2		(W/		kJ/m²·k		J/K
Doors						2.1	x	1.4	=	2.94				(26)
Window	ws Type	e 1				3.06	x1	/[1/( 1.4 )+	0.04] =	4.06				(27)
Window	ws Type	e 2				6.51	x1	I/[1/( 1.4 )+	0.04] =	8.63				(27)
Window	ws Type	e 3				2.28	x1	I/[1/( 1.4 )+	0.04] =	3.02				(27)
Floor						37.0	5 X	0.11	=	4.0755	5	75	2778.7	75 (28)
Walls		87.3	39	13.9	5	73.44		0.24	=	17.63		60	4406.	
Roof		37.0		0		37.0		0.11		4.08		9	333.4	
	rea of e	elements				161.4		0.11				Ŭ		(31)
Party v			,						<b>-</b>			45	1922.8	``
	l wall **	*				42.7		0	=	0		45		
						59.9						9	539.13	=
	l wall **					90.09						9	810.77	=
Interna						37.0	5					18	666.9	
	l ceiling					37.0						9	333.4	5 (32e)
				effective wi nternal wal			lated using	g formula 1	/ <u>(</u> (1/U-val	ue)+0.04] a	as given ii	n paragraph	3.2	

Fabric heat loss, W/K = S (A x U)

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

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K

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

(26)(30) + (32) =	44.43	(33)
((28)(30) + (32) + (32a)(32e) =	11791.71	(34)
= (34) ÷ (4) =	159.13	(35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						7.41	(36)
		al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			51.84	(37)
Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (	25)m x (5)	-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	31.52	31.21	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99		(38)
Heat t	ransfer (	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	83.36	83.04	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83		
Heat lo	oss para	ameter (H	· HLP). W	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	82.89	(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		
( - )											Sum(40)1		1.12	(40)
Numb	er of day	ys in moi	nth (Tab	le 1a)						0				
	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)
								•					1	
4 W/2	ater hea	ting ene	rav reau	irement <sup>.</sup>								kWh/ye	ear:	
		ang ono	igy ioqu											
		upancy, I		<b>F</b> 4	( 0 0000	40 (T			040 (			.34		(42)
	A > 13. A £ 13.	9, N = 1 9 N = 1	+ 1.76 x	[1 - exp	(-0.0003	649 X (11	-A -13.9	)2)] + 0.0	JU13 X (	IFA -13.	.9)			
		ge hot wa	ater usag	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		89	.81	]	(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed			se target o		-	1	
not mor	e that 125	litres per	person pei	r day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	in litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		-	_	_		
(44)m=	98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42	88.01	91.6	95.2	98.79		
_							-	- (			m(44) <sub>112</sub> =		1077.7	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x L	0Tm / 3600	) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49	102.7	119.69	130.65	141.88		
15 :	<i>(</i>					(	a mta n O in	haven (10		Total = Su	m(45) <sub>112</sub> =	=	1413.04	(45)
		vater heati. 1	- ·							r			1	
(46)m=	21.98 storage	19.22	19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
	-	ne (litres)	includir	na anv si	olar or M	///HRS	storane	within sa	ame ves	ما		0	1	(47)
-		neating a					-			501		0		(47)
	•	o stored			-			. ,	ers) ente	er '0' in (	47)			
	storage		not nat		10144001	liotaintai					,			
	-	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			ear			(48) x (49)	) =			0		(50)
		turer's de				or is not						0	l	()
Hot wa	ater stor	age loss	factor fr	om Tabl								0	]	(51)
		neating s		on 4.3									1	
		from Ta		01-								0		(52)
rempe	erature f	actor fro	m rable	ZD								0		(53)

		om water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54) (55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (	L H11)] ÷ (5	0), else (5	7)m = (56)	n where (	H11) is fro	m Append	l 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)
	•	loss cal	,			59)m = (	(58) ÷ 36	5 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	, (59)m + (61)m	
(62)m=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		(62)
Solar Dł	IW input of	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	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=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		
						-		Outp	out from wa	ater heate	r (annual)₁	12	1575.01	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	52.15	45.71	47.4	41.66	40.22	35.06	32.85	37.18	37.48	43.24	46.77	50.61		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	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	is (Table	5). Wat	ts										
	Jan	Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	140.48	140.48	140.48	140.48	140.48	140.48	140.48	140.48	140.48	140.48	140.48	140.48		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	46.59	41.38	33.65	25.48	19.04	16.08	17.37	22.58	30.31	38.48	44.92	47.88		(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=	308.46	311.67	303.6	286.43	264.75	244.38	230.77	227.57	235.63	252.8	274.48	294.85		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	51.39	51.39	51.39	51.39	51.39	51.39	51.39	51.39	51.39	51.39	51.39	51.39		(69)
Pumps	and fai	ns gains	(Table 5	ī 5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=		-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66		(71)
Water	heatina	gains (T	able 5)			1				1			I	
(72)m=	70.1	68.02	63.71	57.86	54.05	48.7	44.15	49.98	52.05	58.11	64.96	68.03		(72)
	nternal	gains =			Į	. (66)	<b>u</b> m + (67)m	ı + (68)m +	- + (69)m + (	l (70)m + (7	1)m + (72)	m	I	
(73)m=	526.37	522.28	502.18	470.98	439.07	410.37	393.51	401.35	419.21	450.62	485.57	511.98		(73)
		L											1	

#### 6. Solar gains:

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

Orientation:	<ul> <li>calculated using</li> <li>Access Facto</li> <li>Table 6d</li> </ul>		Area m <sup>2</sup>	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	1	x	2.28	x	11.28	x	0.45	×	1.11	=	11.58	(75)
Northeast 0.9x	1	x	2.28	x	22.97	x	0.45	×	1.11	i =	23.56	(75)
Northeast 0.9x	1	x	2.28	x	41.38	x	0.45	×	1.11	=	42.45	(75)
Northeast 0.9x	1	x	2.28	x	67.96	x	0.45	×	1.11	] =	69.72	(75)
Northeast 0.9x	1	x	2.28	x	91.35	x	0.45	×	1.11	] =	93.72	(75)
Northeast 0.9x	1	x	2.28	x	97.38	x	0.45	x	1.11	=	99.92	(75)
Northeast 0.9x	1	x	2.28	x	91.1	x	0.45	×	1.11	] =	93.47	(75)
Northeast 0.9x	1	x	2.28	x	72.63	x	0.45	x	1.11	=	74.52	(75)
Northeast 0.9x	1	x	2.28	x	50.42	x	0.45	×	1.11	] =	51.73	(75)
Northeast 0.9x	1	x	2.28	x	28.07	x	0.45	×	1.11	=	28.8	(75)
Northeast 0.9x	1	x	2.28	×	14.2	x	0.45	x	1.11	=	14.57	(75)
Northeast 0.9x	1	x	2.28	×	9.21	x	0.45	×	1.11	=	9.45	(75)
Southeast 0.9x	1	x	6.51	×	36.79	x	0.45	x	1.11	=	107.79	(77)
Southeast 0.9x	1	x	6.51	x	62.67	x	0.45	x	1.11	=	183.6	(77)
Southeast 0.9x	1	x	6.51	x	85.75	x	0.45	x	1.11	=	251.21	(77)
Southeast 0.9x	1	x	6.51	×	106.25	x	0.45	x	1.11	=	311.26	(77)
Southeast 0.9x	1	x	6.51	x	119.01	x	0.45	x	1.11	=	348.64	(77)
Southeast 0.9x	1	x	6.51	x	118.15	x	0.45	x	1.11	=	346.12	(77)
Southeast 0.9x	1	x	6.51	×	113.91	x	0.45	x	1.11	=	333.7	(77)
Southeast 0.9x	1	x	6.51	x	104.39	x	0.45	x	1.11	=	305.81	(77)
Southeast 0.9x	1	x	6.51	x	92.85	x	0.45	x	1.11	=	272.01	(77)
Southeast 0.9x	1	x	6.51	×	69.27	x	0.45	x	1.11	=	202.92	(77)
Southeast 0.9x	1	x	6.51	x	44.07	x	0.45	x	1.11	=	129.1	(77)
Southeast 0.9x	1	x	6.51	x	31.49	x	0.45	x	1.11	=	92.24	(77)
Northwest 0.9x		x	3.06	x	11.28	x	0.45	×	1.11	=	15.54	(81)
Northwest 0.9x	1	x	3.06	x	22.97	x	0.45	×	1.11	=	31.63	(81)
Northwest 0.9x		x	3.06	x	41.38	x	0.45	×	1.11	] =	56.98	(81)
Northwest 0.9x		x	3.06	x	67.96	x	0.45	×	1.11	=	93.58	(81)
Northwest 0.9x	1	x	3.06	x	91.35	x	0.45	×	1.11	=	125.78	(81)
Northwest 0.9x	1	x	3.06	x	97.38	x	0.45	x	1.11	=	134.1	(81)
Northwest 0.9x	1	x	3.06	x	91.1	x	0.45	×	1.11	=	125.45	(81)
Northwest 0.9x	1	x	3.06	x	72.63	x	0.45	x	1.11	=	100.01	(81)
Northwest 0.9x	1	x	3.06	x	50.42	x	0.45	×	1.11	=	69.43	(81)
Northwest 0.9x		x	3.06	x	28.07	x	0.45	×	1.11	=	38.65	(81)
Northwest 0.9x		x	3.06	x	14.2	x	0.45	×	1.11	=	19.55	(81)
Northwest 0.9x	1	x	3.06	×	9.21	x	0.45	×	1.11	] =	12.69	(81)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	134.9	238.79	350.65	474.56	568.15	580.14	552.61	480.33	393.17	270.36	163.22	114.39		(83)
Total g	jains – ii	nternal a	and solar	r (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	661.27	761.07	852.83	945.54	1007.21	990.51	946.12	881.68	812.38	720.98	648.79	626.37		(84)
7. Me	an inter	nal temp	berature	(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)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.9	0.81	0.67	0.51	0.38	0.42	0.63	0.85	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=	19.65	19.89	20.22	20.57	20.83	20.95	20.99	20.98	20.89	20.55	20.03	19.59		(87)
Temp	erature	during h	heating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.98	19.98	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=	0.96	0.93	0.88	0.77	0.62	0.44	0.29	0.33	0.56	0.81	0.93	0.96		(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=	18.77	19.01	19.32	19.65	19.87	19.96	19.98	19.98	19.93	, 19.64	19.15	18.72		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.2	(91)
Moon	interna	l tompor	aturo (fo	or the wh	olo dwol	lling) – fl	Λ 🗸 Τ1	⊥ (1 _ fl	Δ) <del>V</del> T2					
(92)m=	18.95	19.19	19.51	19.84	20.07	20.16	20.19	20.18	20.12	19.83	19.33	18.9		(92)
				internal										. ,
(93)m=	18.8	19.04	19.36	19.69	19.92	20.01	20.04	20.03	19.97	19.68	19.18	18.75		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(1	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	n:				-						
(94)m=	0.95	0.92	0.86	0.76	0.61	0.44	0.3	0.34	0.56	0.8	0.92	0.95		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	625.31	696.92	734.99	720.15	617.18	434.35	282.22	297.04	453.22	577.17	594.3	597.12		(95)
Month	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)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1208.86	1173.9	1064.83	893.61	680.51	448.47	284.76	301.05	486.58	752.04	1000.83	1205.31		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97]	)m – (95	)m] x (4′	1)m			
(98)m=	434.16	320.53	245.4	124.89	47.12	0	0	0	0	130.1	292.7	452.49		
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2047.4	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								27.63	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					-
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	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	ing syste	em 1								90.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	ח, %						0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		ř	r Ò	alculate	d above)	)							-	
	434.16	320.53	245.4	124.89	47.12	0	0	0	0	130.1	292.7	452.49		
(211)m		1	1	00 ÷ (20					-				1	(211)
	479.73	354.18	271.16	138	52.06	0	0		0	143.76	323.42 211) <sub>15,1012</sub>	499.99	2262.32	(211)
•		ig fuel (s 01)] } x 1 0		y), kWh/ 08) 0	month 0	0	0	0	0	0	0	0	]	], ,
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water	heating	9												1
Output				ulated a			i	i		i			7	
	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		
	-	ater hea	i	00.05	00.40	07.0	07.0	07.0	07.0	00.05	00.40	00.00	87.3	(216)
(217)m=		89.5	89.28	88.85	88.16	87.3	87.3	87.3	87.3	88.85	89.42	89.66		(217)
		heating, m x 100						_				_		
(219)m=		157.05	163.51	144.73	141.07	124.58	117.07	132.01	132.89	150.19	161	173.59		_
								Tota	I = Sum(2	19a) <sub>112</sub> =			1776.51	(219)
	l totals		مأ مممنام	o	4					k	Wh/year	ſ	kWh/year	7
		·		system	I								2262.32	
Water	heating	fuel use	ed										1776.51	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
mech	anical v	rentilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Э			49.6		(230a)
centra	al heatir	ng pump	:									30	]	(230c)
boiler	with a f	fan-assis	sted flue									45	]	(230e)
Total e	lectricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			124.6	(231)
Electric	city for I	ighting											329.1	(232)
Electric	city gen	erated b	y PVs										-324.72	(233)
Total d	elivered	d energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				4167.81	(338)
				eating sy			. ,	. ,						_
						_								
						Fu kW	<b>el</b> /h/year			Fuel P (Table			<b>Fuel Cost</b> £/year	
Space	heating	ı - main s	system 1	l			1) x			3.4	·	x 0.01 =	78.73	(240)
	-	, main :					) x			0	<u> </u>	x 0.01 =	0	](240) ](241)
	-			-			5) X					x 0.01 =		-
Space	neating	l - secon	uary			(21)	<i>.</i> , <i>.</i>			13.	19	x 0.01 =	0	(242)

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	61.82 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	16.43 (249)
(if off-peak tariff, list each of (230a) to (230g)			
Energy for lighting	(232)	13.19 × 0.01 =	43.41 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01 =	-42.83 (252)
Appendix Q items: repeat lines (253) and (25 Total energy cost (245	54) as needed )(247) + (250)(254) =		277.56 (255)
11a. SAP rating - individual heating system	S		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255	5) x (256)] ÷ [(4) + 45.0] =		0.98 (257)
SAP rating (Section 12)			86.35 (258)
12a. CO2 emissions – Individual heating sy	stems including micro-CHP		
	<b>Energy</b> kWh/year	<b>Emission factor</b> kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	488.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	383.73 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	872.39 (265)
Electricity for pumps, fans and electric keep-	hot (231) x	0.519 =	64.67 (267)
Electricity for lighting	(232) x	0.519 =	170.8 (268)
Energy saving/generation technologies Item 1		0.519 =	-168.53 (269)
Total CO2, kg/year		sum of (265)(271) =	939.33 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	12.68 (273)
El rating (section 14)			89 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2760.03 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2167.35 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	4927.37 (265)
Electricity for pumps, fans and electric keep-	hot (231) x	3.07 =	382.52 (267)
Electricity for lighting	(232) x	0 =	1010.34 (268)
Energy saving/generation technologies Item 1		3.07 =	-996.9 (269)

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

(272) ÷ (4) =

5323.33	(272)
71.84	(273)

					User D	Details:						
Assessor Name: Software Name:		n Tunnir oma FS	0.			Softwa	a Num are Vei	rsion:			027495 on: 1.0.5.41	
	• •		<u> </u>			Address						
Address :		uttercup	Road , I	Bishops	Waltha	n, SOUI	HAMPT	ON, SC	032 1RF			
1. Overall dwelling dir	nension	S:			•	- ( 2)		A 11	·			
Ground floor					<b></b>	a(m²)	(10) X		ight(m)	(20) -	Volume(m <sup>3</sup> )	
						37.05	(1a) x		2.4	(2a) =	88.92	(3a)
First floor					3	37.05	(1b) x	2	.67	(2b) =	98.92	(3b)
Total floor area TFA =	(1a)+(1b	o)+(1c)+(	(1d)+(1e	e)+(1n	)	74.1	(4)					
Dwelling volume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	187.84	(5)
2. Ventilation rate:												
		main heating		econdar leating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	ſ	0	<u></u> + ר	0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	Г	0	<u>-</u> + -	0	ī + Ē	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent	∟ fans							0	x 1	10 =	0	(7a)
Number of passive ver	its						Ē	0	x 1	0 =	0	(7b)
Number of flueless gas	fires						Г	0	x 4	40 =	0	(7c)
										A := b		
Infiltration due to object	ava flu			a) . (6b) . (7	a) (7b) (	70) -	Г				hanges per hou	-
Infiltration due to chiminal If a pressurisation test has	•						continue fr	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys ir				,							0	(9)
Additional infiltration									[(9)-	1]x0.1 =	0	(10)
Structural infiltration:	0.25 fo	r steel or	timber f	frame or	0.35 fo	r masoni	ry constr	uction			0	(11)
if both types of wall are deducting areas of ope				ponding to	the grea	ter wall are	ea (after					_
If suspended woode	- /	•		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.0	)5, else e	enter 0								0	(13)
Percentage of windo	ws and	doors dr	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability valu		•				•	•	etre of e	envelope	area	4.7699999809265 <sup>,</sup>	1 (17)
If based on air permea	•										0.24	(18)
Air permeability value app Number of sides shelte		ressurisatio	on test has	s been don	e or a de	gree air pe	rmeability	is being u	sed			
Shelter factor	ieu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorpor	atina sh	nelter fac	tor			(21) = (18	) x (20) =				0.2	](21)
Infiltration rate modified	-			ł							L	J, ,
Jan Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	speed fr	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 sh	nelter an	d wind s	speed)	= (21a) x	(22a)m					
	0.26	0.25	0.25	0.22	0.22	0.19	0.19	0.19	0.2	0.22	0.23	0.24		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	ise		-		-	. — Г		
				endix N (2	3h) - (23a	) x Fmv (e	equation	(N5)) , othe	rwise (23ł	n) – (23a)		L	0.5	(23a)
								om Table 4h		o) = (200)		L	0.5	(23b)
			-	-	-					2h)m + (	23h) x [	L [1 – (23c)	0 	(23c)
(24a)m=	0			0	0	0							. 100]	(24a)
	balance	l d mech	I anical ve	entilation	without	heat red	L	 (MV) (24t	(2))m = (2)	1 2b)m + (	1 23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	u ouse ex	r tract ver	ntilation of	or positiv	e input v	ventilat	tion from (	utside		<b></b>			
					•	-		4c) = (22		.5 × (23b	<b>)</b> )			
(24c)m=	0.51	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	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (2	24d) in bo	x (25)	-	-			
(25)m=	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. He	at losse	s and he	eat loss i	paramete	er:									
ELEN		Gros		Openin		Net Ar	ea	U-val	ue	ΑXU		k-value	АX	(k
		area	(m²)	. m	-	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙K	kJ/	К
Doors						2.1	)	1.4	=	2.94				(26)
Window	ws Type	e 1				3.06	)	(1/[1/( 1.4 )+	0.04] =	4.06				(27)
Window	ws Type	e 2				6.51	)	(1/[1/( 1.4 )+	0.04] =	8.63				(27)
Window	ws Type	e 3				2.28	)	<sub>&lt;</sub> 1/[1/( 1.4 )+	0.04] =	3.02				(27)
Floor						37.05	5 )	0.11	=	4.0755	5	75	2778.75	5 (28)
Walls		87.3	39	13.9	5	73.44	4	0.24	=	17.63		60	4406.4	(29)
Roof		37.0	)5	0		37.05	5 )	0.11	=	4.08		9	333.45	(30)
Total a	rea of e	elements	, m²			161.4	.9							(31)
Party v	vall					42.73	3 >	<b>(</b> 0	=	0		45	1922.85	5 (32)
Interna	I wall **					59.9		-				9	539.136	6 (32c)
Interna	l wall **					90.09						9	810.7722	2 (32c)
Interna	l floor					37.05	5					18	666.9	(32d)
Interna	l ceiling	1				37.05						9	333.45	4
	-		ows, use e	effective wi	ndow U-va			ng formula 1	/[(1/U-vali	ue)+0.04] a	ı as given ir	n paragraph		

\*\* 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/m<sup>2</sup>K

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) =

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

44.43

11791.71

159.13

(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	<						7.41	(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) =			51.84	(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=	31.52	31.21	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	83.36	83.04	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83	82.83		
Heat lo	uss nara	ameter (H	HP)W	m²K	1	1				Average = = (39)m ÷	Sum(39)1.	12 /12=	82.89	(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	1	
(10)	2	2		2	2		2				Sum(40)1		1.12	(40)
Numb	er of dag	ys in mo	nth (Tab	le 1a)						Worugo –			1.12	
	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)
													1	
4. Wa	ater hea	ting ene	rav reau	rement:								kWh/ye	ear:	
												,		
if TF	A > 13.			[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	)013 x ( <sup>-</sup>	TFA -13.		34		(42)
Annua		je hot wa						(25 x N)				.81	]	(43)
		al average i litres per				-	-	to achieve	a water us	se target o	f		1	
notmor					i	i	·				1		1	
L lat wat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		in litres per 1	-		·			i –		i	1	i	1	
(44)m=	98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42	88.01	91.6	95.2	98.79		<b>_</b>
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	0Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1077.7	(44)
(45)m=	146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49	102.7	119.69	130.65	141.88		
										Total = Su	m(45) <sub>112</sub> =	-	1413.04	(45)
lf instan	taneous v	vater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	21.98	19.22	19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
	storage		includin		olor or M		otorogo	within or		aal			1	(47)
		,		0 1			•	within sa	ame ves	sei		0		(47)
		neating a			-			(47) mbi boil	ore) onto	ar 'O' in <i>(</i>	47)			
	storage		not wate	51 (UIIS II	iciuues i	nstantai								
	-	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
		actor fro				,	• /					0		(49)
		om water			ear			(48) x (49)	=			0		(50)
		turer's de				or is not						•	I	()
		age loss			e 2 (kW	h/litre/da	ay)					0		(51)
		neating s		on 4.3									1	(==)
		from Ta actor fro		2h								0		(52) (53)
. Smpt		20101 110										0	1	(33)

_				,									i i	
		m water (54) in (5	-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. ,	. , .		for each	month			((56)m = (	55) 🗸 (11)	m		0		(55)
							i	··· ·		· · · · ·			1	(50)
(56)m=	0 ar contains	0 s dedicate	0 d solar sto	0 orage, (57)i	0 = (56)m	$0 = \frac{0}{100}$	0 H11)1 $\div$ (5)	0	$0_{7}m - (56)$	0 m where (	0 H11) is fro	0 m Annend	liv H	(56)
-				1	· · ·	1	1	· ·						()
(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)
	•			for each	```	,	· ·	• • •						
		i		le H5 if t	i	i	i	<u> </u>			, I		1	
(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	l for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		(62)
Solar Dł	-IW input of	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	S)					
(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=	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		
								Outp	out from wa	ater heate	r (annual)₁	12	1575.01	(64)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	« [(46)m	+ (57)m	+ (59)m	]	
(65)m=	52.15	45.71	47.4	41.66	40.22	35.06	32.85	37.18	37.48	43.24	46.77	50.61		(65)
inclu	ide (57)	m in calo	ulation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	. ,			5 and 5a	-	,		U				,	0	
		s (Table			/-									
Melab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07		(66)
				opendix										
(67)m=	19.22	17.07	13.89	10.51	7.86	6.63	7.17	9.32	12.51	15.88	18.53	19.76	l	(67)
				Append							10.00	10.110		()
Appila (68)m=		208.82	203.41	191.91	177.38	163.73	154.61	5a), aisc 152.47	157.87	169.38	183.9	197.55		(68)
											105.9	197.55		(00)
		,		ppendix	· ·		· · · · · ·	1		r	0474	0474	I	(60)
(69)m=		34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71		(69)
•		ns gains I	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·									1	
(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=	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66		(71)
Water	heating	gains (T	able 5)											
(72)m=	70.1	68.02	63.71	57.86	54.05	48.7	44.15	49.98	52.05	58.11	64.96	68.03		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	357.11	355.03	342.13	321.4	300.42	280.19	267.05	272.89	283.55	304.49	328.52	346.46		(73)

#### 6. Solar gains:

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

Orientation:	<ul> <li>calculated using</li> <li>Access Facto</li> <li>Table 6d</li> </ul>		Area m <sup>2</sup>	a and	Flux Flue 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.28	×	11.28	×	0.45	×	1.11	=	8.91	(75)
Northeast 0.9x	0.77	x	2.28	×	22.97	×	0.45	x	1.11	=	18.14	(75)
Northeast 0.9x	0.77	x	2.28	x	41.38	x	0.45	x	1.11	=	32.69	(75)
Northeast 0.9x	0.77	x	2.28	×	67.96	×	0.45	×	1.11	=	53.69	(75)
Northeast 0.9x	0.77	x	2.28	×	91.35	x	0.45	x	1.11	=	72.17	(75)
Northeast 0.9x	0.77	x	2.28	×	97.38	×	0.45	x	1.11	=	76.94	(75)
Northeast 0.9x	0.77	x	2.28	×	91.1	×	0.45	×	1.11	=	71.97	(75)
Northeast 0.9x	0.77	x	2.28	×	72.63	×	0.45	×	1.11	=	57.38	(75)
Northeast 0.9x	0.77	x	2.28	×	50.42	×	0.45	x	1.11	=	39.83	(75)
Northeast 0.9x	0.77	x	2.28	x	28.07	×	0.45	x	1.11	=	22.17	(75)
Northeast 0.9x	0.77	x	2.28	×	14.2	×	0.45	x	1.11	=	11.22	(75)
Northeast 0.9x	0.77	x	2.28	×	9.21	×	0.45	x	1.11	=	7.28	(75)
Southeast 0.9x	0.77	x	6.51	×	36.79	×	0.45	x	1.11	=	83	(77)
Southeast 0.9x	0.77	x	6.51	x	62.67	x	0.45	x	1.11	=	141.37	(77)
Southeast 0.9x	0.77	x	6.51	×	85.75	×	0.45	x	1.11	=	193.43	(77)
Southeast 0.9x	0.77	x	6.51	x	106.25	×	0.45	x	1.11	=	239.67	(77)
Southeast 0.9x	0.77	x	6.51	x	119.01	x	0.45	x	1.11	=	268.45	(77)
Southeast 0.9x	0.77	x	6.51	×	118.15	×	0.45	x	1.11	=	266.51	(77)
Southeast 0.9x	0.77	x	6.51	×	113.91	x	0.45	x	1.11	=	256.95	(77)
Southeast 0.9x	0.77	x	6.51	×	104.39	×	0.45	x	1.11	=	235.48	(77)
Southeast 0.9x	0.77	x	6.51	×	92.85	×	0.45	x	1.11	=	209.45	(77)
Southeast 0.9x	0.77	x	6.51	×	69.27	×	0.45	x	1.11	=	156.25	(77)
Southeast 0.9x	0.77	x	6.51	x	44.07	x	0.45	x	1.11	=	99.41	(77)
Southeast 0.9x	0.77	x	6.51	×	31.49	×	0.45	x	1.11	=	71.03	(77)
Northwest 0.9x	0.77	x	3.06	×	11.28	×	0.45	x	1.11	=	11.96	(81)
Northwest 0.9x	0.77	x	3.06	×	22.97	×	0.45	x	1.11	=	24.35	(81)
Northwest 0.9x	0.77	x	3.06	x	41.38	×	0.45	x	1.11	=	43.87	(81)
Northwest 0.9x	0.77	x	3.06	×	67.96	x	0.45	x	1.11	=	72.05	(81)
Northwest 0.9x	0.77	x	3.06	×	91.35	×	0.45	x	1.11	=	96.85	(81)
Northwest 0.9x	0.77	x	3.06	×	97.38	×	0.45	x	1.11	=	103.26	(81)
Northwest 0.9x	0.77	x	3.06	x	91.1	x	0.45	x	1.11	=	96.59	(81)
Northwest 0.9x	0.77	x	3.06	x	72.63	x	0.45	x	1.11	=	77.01	(81)
Northwest 0.9x	0.77	x	3.06	×	50.42	×	0.45	×	1.11	=	53.46	(81)
Northwest 0.9x	0.77	x	3.06	×	28.07	×	0.45	×	1.11	=	29.76	(81)
Northwest 0.9x	0.77	x	3.06	×	14.2	×	0.45	×	1.11	=	15.05	(81)
Northwest 0.9x	0.77	x	3.06	×	9.21	×	0.45	×	1.11	=	9.77	(81)

Solar g	gains in	watts, ca	alculated	for eacl	n month			(83)m = S	um(74)m .	(82)m		-		
(83)m=	103.87	183.87	270	365.41	437.47	446.7	425.51	369.86	302.74	208.18	125.68	88.08		(83)
Total g	jains – ii	nternal a	and sola	r (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	460.99	538.9	612.13	686.81	737.89	726.89	692.57	642.75	586.29	512.67	454.2	434.54		(84)
7. Me	an inter	nal temp	berature	(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)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.9	0.8	0.65	0.5	0.55	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 Tabl	e 9c)					
(87)m=	19.32	19.55	19.9	20.32	20.68	20.89	20.97	20.95	20.79	20.31	19.73	19.28		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.98	19.98	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
l Itilis:	ation fac	tor for a	ains for	rest of d	vellina	h2 m (se	e Table	9a)						
(89)m=	0.98	0.97	0.95	0.88	0.76	0.57	0.4	0.45	0.71	0.91	0.97	0.99		(89)
		<u>.</u>	· · · · · ·	the rest		<del>т `</del>					40.07	40.44	I	(00)
(90)m=	18.45	18.68	19.02	19.43	19.75	19.93	19.97	19.97	19.86	19.43	18.87	18.41		(90)
									· · · · ·	LA = Livin	y alea ÷ (4	+) =	0.2	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m=	18.63	18.86	19.2	19.61	19.94	20.13	20.18	20.17	20.05	19.61	19.04	18.59		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.48	18.71	19.05	19.46	19.79	19.98	20.03	20.02	19.9	19.46	18.89	18.44		(93)
8. Sp	ace hea	ting requ	uirement	t										
				mperatur		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut			<u> </u>	using Ta									I	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.98	0.96	ains, hm 0.93	0.87	0.75	0.57	0.4	0.45	0.7	0.9	0.97	0.98	l	(94)
(94)m=				4)m x (84		0.57	0.4	0.43	0.7	0.9	0.97	0.98		(34)
(95)m=	451.56	519.89	, VV = (94 572	+)11 X (04 595.92	+)ITI 549.9	412.9	277.31	289.57	410.5	460.96	438.74	427.19	l	(95)
				perature		_	277.01	200.07	410.0	400.00	400.74	427.15		(00)
(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)
				al tempe										
(97)m=	1182.16		1039.58	874.51	670.42	445.27	283.97	299.87	480.13	734.01	976.84	1179.39		(97)
				r each m			h = 0.02							
(98)m=	543.57	421.13	347.88	200.58	89.67	0	0	0	0	203.15	387.43	559.63		
										(kWh/year		I	2753.03	(98)
Creek	a haatin	~ ~ ~ ~	a na a na t-ina						. por jou.	(	, came	· / ·		4
•		• •		kWh/m <sup>2</sup>	•								37.15	(99)
			nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-	4 fac	I -								I		
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)

Fractio	on of sp	ace hea	at from n	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fractio	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ncy of I	main spa	ace heat	ting syste	əm 1								90.5	(206)
Efficie	ncy of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space		ř .	r ·	calculated	r í							1	1	
L	543.57	421.13	347.88	200.58	89.67	0	0	0	0	203.15	387.43	559.63	]	
(211)m Г			T	100 ÷ (20						004.40	400.4	040.00	1	(211)
L	600.62	465.34	384.4	221.63	99.08	0	0	0 Tota	0 II (kWh/yea	224.48 ar) =Sum(2	428.1	618.38 =	3042.03	(211)
Snaca	heatin	a fual (s	econdar	ry), kWh/	month						/15,1012	2	3042.03	
•		•	00 ÷ (20	• ·	monur									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	<b>;</b> =	0	(215)
Water h		•												
Output Г	<u>from w</u> 160.26	ater hea 140.56	ter (calc 145.98	ulated at 128.59	bove) 124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64	1	
L Efficien		ater hea		120.00									87.3	(216)
(217)m=	89.75	89.68	89.53	89.22	88.61	87.3	87.3	87.3	87.3	89.2	89.61	89.78		(217)
∟ Fuel for	water	heating,	kWh/m	onth	<u> </u> ]			1					1	
· · -	<u>= (64)</u> 178.56	m x 100	) ÷ (217) 163.05	)m 144.12	140.35	124.58	117.07	132.01	132.89	149.6	160.66	173.34	1	
(219)11=	176.50	150.74	103.05	144.12	140.55	124.30	117.07		I = Sum(2)		100.00	175.54	1772.96	(219)
Annual	totals								,		Wh/year	•	kWh/year	
Space I	neating	fuel use	ed, main	system	1								3042.03	7
Water h	eating	fuel use	d										1772.96	Ī
Electric	ity for p	oumps, f	ans and	electric l	keep-ho	t								
mecha	anical v	entilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Э			49.6	1	(230a)
		ig pump		,	·		•					30	]	(230c)
		• • •	sted flue									45	]	(230e)
					-			cum	of (230a).	(220a) -		40	]	_
			above, i	kWh/yea	ľ			Sum	01 (230a).	(2309) =			124.6	(231)
Electric	•												339.51	(232)
Electric	ity gen	erated b	y PVs										-324.72	(233)
Total de	elivered	l energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				4954.37	(338)
12a. C	O2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF	)					
						En	ergy			Emiss	ion fac	tor	Emissions	
							/h/year			kg CO		-	kg CO2/yea	
Space I	neating	(main s	ystem 1	)		(21	1) x			0.2	16	=	657.08	(261)
Space I	neating	(second	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

382.96

(264)

Space and water heating	(261) + (262) + (263) + (264	4) =	1040.04	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	64.67	(267)
Electricity for lighting	(232) x	0.519 =	176.2	(268)
Energy saving/generation technologies Item 1		0.519 =	-168.53	(269)
Total CO2, kg/year		sum of (265)(271) =	1112.38	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	15.01	(273)
EI rating (section 14)			87	(274)

							User D	etails:						
Assess Softwa				n Tunnii oma FS	•••			Strom Softwa	are Ver	sion:			027495 on: 1.0.5.41	
								Address						
Addres				· ·	Road, I	Bishops	Walthar	n, SOUT	HAMPT	ON , SC	032 1RF			
1. Over	all dwell	ling dir	nension	s:										
<b>•</b>								a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	٦
Ground f	floor						3	37.05	(1a) x	2	2.4	(2a) =	88.92	(3a)
First floo	or						3	37.05	(1b) x	2	.67	(2b) =	98.92	(3b)
Total floo	or area T	ΓFA =	(1a)+(1t	o)+(1c)+	(1d)+(1e	e)+(1r	i)	74.1	(4)					
Dwelling	ı volume								(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	187.84	(5)
2. Venti	ilation ra	ate:											-	_
				main neating		econdar leating	У	other		total			m <sup>3</sup> per hour	
Number	of chimr	neys	Γ	0	] + [	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number	of open	flues	Γ	0	_ + _	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number	of intern	nittent	fans						- F	3	<b>x</b> 1	0 =	30	(7a)
Number	of passi	ve ven	its						Γ	0	<b>x</b> 1	0 =	0	(7b)
Number	of fluele	ss gas	fires						Γ	0	x 4	40 =	0	(7c)
												A in ah	ongoo nor hou	
Infiltratio		a la ina n	ava flu			a) . (6b) . (7	a) (7h) (	70) -	Г				hanges per hou	-
Infiltratio								otherwise o	continue fr	30 om (9) to (		÷ (5) =	0.16	(8)
	er of sto												0	(9)
Additic	onal infili	tration									[(9)-	1]x0.1 =	0	(10)
Structu	ural infilt	ration:	0.25 fo	r steel oi	timber t	frame or	0.35 fo	r masoni	ry constr	uction			0	(11)
	th types of Icting area		•			ponding to	the great	er wall are	a (after					_
	-					ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no d	Iraught lo	obby, e	enter 0.0	)5, else e	enter 0								0	(13)
Percer	ntage of	windo	ws and	doors dr	aught st	ripped							0	(14)
Windo	ow infiltra	ation						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltrat	tion rate	•						(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
		•					•		•	etre of e	nvelope	area	5	(17)
If based	•		•								1		0.41	(18)
Number	-			ressurisatio	on test nas	s been aon	e or a deg	gree air pe	rmeability	is being us	sea		2	(19)
Shelter fa		onone	i cu					(20) = 1 -	[0.075 x (1	9)] =			0.85	(10)
Infiltratio	on rate in	corpoi	rating sh	elter fac	tor			(21) = (18)	) x (20) =				0.35	](21)
Infiltratio			-			ł								<b>_</b> ` `
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly	average	wind	speed fr	om Tabl	e 7								-	
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (22	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjuste	ed infiltra	tion rate	e (allowii	ng for sh	nelter an	d wind s	peed) :	= (21a) x	(22a)m					
	0.44	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	]	
	ate effect chanical		-	ate for t	he appli	cable ca	se						0	(23a)
				ndix N, (2	3b) = (23a	a) × Fmv (e	equation	(N5)) , othe	rwise (23t	o) = (23a)			0	(23b)
								m Table 4h		, , ,			0	(23c)
a) If I	balanced	d mecha	anical ve	ntilation	with he	at recove	ery (M∖	/HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	-	( /
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If I	balanced	d mecha	anical ve	ntilation	without	heat rec	overy (	(MV) (24t	)m = (2	2b)m + (	23b)	•		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If v	whole ho	ouse ext	ract ven	tilation o	or positiv	e input v	ventilat	ion from a	outside		-		-	
r	<u> </u>		<u> </u>		, ,	, 	· · · ·	4c) = (22l	ŕ	<u> </u>	ŕ		1	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24c)
								ion from = 0.5 + [(2		0.51				
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	1	(24d)
			rate - en					4d) in box					]	
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(25)
			- ( ]			1		-	1	1	1	1	1	
ELEM	at losses IENT	Gros area	S	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors						2.1	x	1	=	2.1				(26)
Window	vs Type	1				3.06	x	1/[1/( 1.4 )+	0.04] =	4.06				(27)
Window	vs Type	2				6.51	x	1/[1/( 1.4 )+	0.04] =	8.63				(27)
Window	vs Type	3				2.28	x	1/[1/( 1.4 )+	0.04] =	3.02				(27)
Floor						37.05	5 X	0.13	=	4.8165	;			(28)
Walls		87.3	9	13.9	5	73.44	ı x	0.18	=	13.22				(29)
Roof		37.0	5	0		37.05	5 X	0.13	=	4.82				(30)
Total a	rea of ele	ements	, m²			161.4	9							(31)
Party w	all					42.73	3 X	0	=	0				(32)
Interna	I wall **					59.9							$\exists \Box$	(32c)
Interna	l wall **					90.09	)				Ī		$\exists \Box$	(32c)
Intorno											- I		$\exists$	(32d)
mema	l floor					37.05	5							(0_0)
	l floor I ceiling					37.05					[		$\exists$	(32e)
Interna * for wind	l ceiling					37.05 alue calcul	5	ng formula 1	1/[(1/U-val	ue)+0.04] a	as given in	n paragraph		
Interna * for wind ** include	l ceiling dows and r	s on both	sides of in	ternal walı		37.05 alue calcul	5	ng formula 1 (26)(30		ue)+0.04] a	 as given in	n paragraph	3.2 40.66	(32e)
Interna * for wind ** include Fabric	l ceiling dows and r e the areas	s on both s, W/K =	sides of in = S (A x	ternal walı		37.05 alue calcul	5	-	) + (32) =	ue)+0.04] a			r	(32e) (33)

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

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can be ı	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						9.09	(36)
		al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
	abric he								(33) +	(36) =			49.75	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y	r	i		(38)m	= 0.33 × (	25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	37.1	36.87	36.63	35.54	35.34	34.39	34.39	34.21	34.75	35.34	35.75	36.18		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	86.86	86.62	86.39	85.3	85.09	84.14	84.14	83.96	84.51	85.09	85.51	85.94		
Heat lo	oss para	ameter (l	HP)W	/m²K				•		Average = = (39)m ÷	Sum(39)1.	12 /12=	85.3	(39)
(40)m=	1.17	1.17	1.17	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16	1	
()											Sum(40)1		1.15	(40)
Numb	er of day	ys in mo	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	Мау	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	rav reau	irement:								kWh/ye	ear:	
		upancy,		[1 - ovo	(_0 0003		-130	)2)] + 0.0	)013 v ( <sup>-</sup>	TEA _13		.34		(42)
		9, N = 1 9, N = 1	+ 1.70 ×	li - evh	(-0.0002	943 X (11	A-13.9	/2/] + 0.0	013 X (	II A - 13.	.9)			
Annua	l averag	e hot wa						(25 x N)				.81	]	(43)
		al average i litres per				-	-	to achieve	a water us	se target o	f			
notmor			1	lay (all w	i		·				1	1	1	
List wat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		in litres pei	-			i — — —		 I		i	1	1	1	
(44)m=	98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42	88.01	91.6	95.2	98.79		
Energy	content of	<sup>f</sup> hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> = ables 1b, 1		1077.7	(44)
(45)m=	146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49	102.7	119.69	130.65	141.88	1	
										I Total = Su	 m(45) <sub>112</sub> =	 =	1413.04	(45)
lf instan	taneous v	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	21.98	19.22	19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
	storage										·		-	
Storag	e volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ime ves	sel		0		(47)
		neating a			-			. ,						
			hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage	turer's de	aclarad I	oss fact	or is kno	wn (k\//k	n/dav).					0	1	(49)
							vuay).					0	] 1	(48)
		actor fro						(40) (40)				0	]	(49)
		om wateı turer's de				or is not		(48) x (49)	=			0		(50)
		age loss		•								0	]	(51)
		neating s			,						<u> </u>		1	
		from Ta										0	]	(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

		m water	-	, kWh/y€	ear			(47) x (51)	x (52) x (	53) =		0		(54)
	. ,	(54) in (5	•	for ooob	manth			((FG)m - (	EE) ~ (11)	~		0	l I	(55)
		loss cal					-	((56)m = (					I	(50)
(56)m=	0	0 dodicator	0 d color eto	0	0 = (56)m	0	0	0	$0_{7} = (56)$	0 m where (	0 ⊣11) is fro	0 m Appond		(56)
-			1 SUIAI SIU	iage, (37)i			(3) 		/ )III = (30)					
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	om Table	93							0		(58)
	•	loss cal			`	,	· ·	. ,						
•	· · ·	1		1		i	i	<u> </u>	· ·	r thermo	,		ı	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	50.34	43.82	46.68	43.4	43.02	39.86	41.19	43.02	43.4	46.68	46.95	50.34		(61)
Total h	eat req	uired for	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	196.84	171.95	178.9	158.68	153.63	135.31	129.63	144.51	146.11	166.37	177.6	192.22		(62)
Solar DH	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	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=	196.84	171.95	178.9	158.68	153.63	135.31	129.63	144.51	146.11	166.37	177.6	192.22		
				-				Outp	out from w	ater heater	r (annual)₁	12	1951.74	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m=	61.3	53.56	55.63	49.18	47.53	41.7	39.7	44.5	45	51.47	55.18	59.76		(65)
inclu	ide (57)	m in calo	ulation	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	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=	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07	117.07		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				]	
(67)m=	19.22	17.07	13.89	10.51	7.86	6.63	7.17	9.32	12.51	15.88	18.53	19.76		(67)
Applia	nces da	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			]	
(68)m=	<u> </u>	208.82	203.41	191.91	177.38	163.73	154.61	152.47	157.87	169.38	183.9	197.55		(68)
Cookir	na aains	(calcula	ted in A	ppendix	L. equat	ion L15	or L15a)	. also se	e Table	5			1	
(69)m=		34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	1	(69)
		ns gains											ł	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
		aporatio					Ŭ	Ū	<u> </u>		<u> </u>	•	ł	
(71)m=		-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	-93.66	1	(71)
				I	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00		AT 17
(72)m=	82.39	gains (T 79.7	74.78	68.3	63.89	57.92	53.37	59.81	62.5	69.18	76.64	80.32	1	(72)
				00.0	00.09									(•-)
		gains =		004.04	040.05					(70)m + (7			l	(72)
(73)m=	369.41	366.71	353.19	331.84	310.25	289.41	276.27	282.72	294	315.56	340.19	358.76	l	(73)

#### 6. Solar gains:

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

-	<ul> <li>calculated using</li> <li>Access Facto</li> <li>Table 6d</li> </ul>		Area m <sup>2</sup>		Flux Table 6a		g_ Table 6b	FF Table 6c		Gains (W)		
Northeast 0.9x	0.77	×	2.28	×	11.28	×	0.63	x	0.7	=	7.86	(75)
Northeast 0.9x	0.77	×	2.28	×	22.97	×	0.63	x	0.7	=	16	(75)
Northeast 0.9x	0.77	x	2.28	x	41.38	x	0.63	x	0.7	=	28.83	(75)
Northeast 0.9x	0.77	×	2.28	×	67.96	×	0.63	x	0.7	=	47.35	(75)
Northeast 0.9x	0.77	×	2.28	×	91.35	×	0.63	x	0.7	=	63.65	(75)
Northeast 0.9x	0.77	×	2.28	×	97.38	×	0.63	x	0.7	=	67.86	(75)
Northeast 0.9x	0.77	×	2.28	×	91.1	×	0.63	x	0.7	=	63.48	(75)
Northeast 0.9x	0.77	x	2.28	×	72.63	x	0.63	x	0.7	=	50.61	(75)
Northeast 0.9x	0.77	×	2.28	×	50.42	×	0.63	x	0.7	=	35.13	(75)
Northeast 0.9x	0.77	x	2.28	×	28.07	×	0.63	x	0.7	=	19.56	(75)
Northeast 0.9x	0.77	×	2.28	×	14.2	x	0.63	x	0.7	=	9.89	(75)
Northeast 0.9x	0.77	×	2.28	×	9.21	×	0.63	x	0.7	=	6.42	(75)
Southeast 0.9x	0.77	×	6.51	×	36.79	×	0.63	x	0.7	=	73.2	(77)
Southeast 0.9x	0.77	x	6.51	×	62.67	×	0.63	x	0.7	=	124.69	(77)
Southeast 0.9x	0.77	x	6.51	×	85.75	×	0.63	x	0.7	=	170.61	(77)
Southeast 0.9x	0.77	x	6.51	×	106.25	×	0.63	x	0.7	=	211.39	(77)
Southeast 0.9x	0.77	x	6.51	x	119.01	x	0.63	x	0.7	=	236.78	(77)
Southeast 0.9x	0.77	×	6.51	×	118.15	×	0.63	x	0.7	=	235.06	(77)
Southeast 0.9x	0.77	x	6.51	×	113.91	x	0.63	x	0.7	=	226.63	(77)
Southeast 0.9x	0.77	x	6.51	×	104.39	×	0.63	x	0.7	=	207.69	(77)
Southeast 0.9x	0.77	x	6.51	×	92.85	x	0.63	x	0.7	=	184.73	(77)
Southeast 0.9x	0.77	×	6.51	×	69.27	×	0.63	x	0.7	=	137.81	(77)
Southeast 0.9x	0.77	x	6.51	×	44.07	x	0.63	x	0.7	=	87.68	(77)
Southeast 0.9x		×	6.51	×	31.49	×	0.63	x	0.7	=	62.65	(77)
Northwest 0.9x		x	3.06	×	11.28	×	0.63	x	0.7	=	10.55	(81)
Northwest 0.9x		x	3.06	×	22.97	×	0.63	x	0.7	=	21.48	(81)
Northwest 0.9x		x	3.06	x	41.38	x	0.63	x	0.7	=	38.7	(81)
Northwest 0.9x		x	3.06	×	67.96	×	0.63	x	0.7	=	63.55	(81)
Northwest 0.9x	0.77	x	3.06	×	91.35	×	0.63	x	0.7	=	85.42	(81)
Northwest 0.9x		x	3.06	×	97.38	×	0.63	x	0.7	=	91.07	(81)
Northwest 0.9x		x	3.06	×	91.1	×	0.63	x	0.7	=	85.2	(81)
Northwest 0.9x	0.77	x	3.06	×	72.63	×	0.63	x	0.7	=	67.92	(81)
Northwest 0.9x		x	3.06	×	50.42	×	0.63	x	0.7	=	47.15	(81)
Northwest 0.9x		×	3.06	×	28.07	×	0.63	x	0.7	=	26.25	(81)
Northwest 0.9x		×	3.06	×	14.2	×	0.63	x	0.7	=	13.28	(81)
Northwest 0.9x	0.77	×	3.06	×	9.21	×	0.63	x	0.7	=	8.62	(81)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	91.62	162.17	238.14	322.29	385.85	393.99	375.3	326.21	267.02	183.62	110.85	77.68		(83)
Total g	iains – ir	nternal a	and sola	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	461.02	528.88	591.33	654.14	696.1	683.4	651.57	608.94	561.02	499.17	451.04	436.44		(84)
7. Me	an inter	nal temp	perature	(heating	season	)								
Temp	erature	during h	neating p	periods ir	n the livii	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	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	0.88	0.72	0.55	0.61	0.85	0.97	1	1		(86)
Mean	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													
(87)m=	19.75	19.9	20.15	20.49	20.78	20.94	20.99	20.98	20.87	20.49	20.06	19.72		(87)
Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
=m(88)	19.94	19.94	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 g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.95	0.84	0.63	0.43	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=	18.28	18.51	18.87	19.36	19.74	19.93	19.97	19.97	19.86	19.37	18.75	18.25		(90)
			•						f	LA = Livin	g area ÷ (4	ł) =	0.2	(91)
Mean	interna	l temner	ature (fo	or the wh	ole dwe	llina) – fl	Δ 🗸 Τ1	⊥ (1 _ fl	Δ) <del>~</del> T2					
(92)m=	18.58	18.79	19.13	19.59	19.95	20.14	20.18	20.17	20.06	19.6	19.02	18.55		(92)
			I he mear	internal			m Table	4e. whe		opriate				
(93)m=	, 18.58	18.79	19.13	19.59	19.95	20.14	20.18	20.17	20.06	19.6	19.02	18.55		(93)
8. Sp	8. Space heating requirement													
Set T	i to the r	mean int	ternal tei	mperatui	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	able 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac		ains, hm	i i i i i i i i i i i i i i i i i i i									l	
(94)m=	1	0.99	0.98	0.94	0.84	0.65	0.46	0.51	0.79	0.96	0.99	1		(94)
Usefu			i – – – – – i	4)m x (84	·									
(95)m=	458.86	523.82	578.12	613.78	583.19	442.62	297.68	311.27	441.69	477.38	446.78	434.86		(95)
	<u> </u>		r	perature	1			1						(00)
(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	i		- ,		<u>, ,</u>	-	1010.00	4000.4		(07)
(97)m=	1240.4	1203.32		911.62	702.15	466.18	300.91	316.86	504.08	766.13	1019.02	1233.4		(97)
		<u> </u>	1	or each m	ì			i	· · · ·	<u> </u>	·	504.44	1	
(98)m=	581.47	456.62	381.96	214.45	88.51	0	0	0	0	214.83	412.01	594.11		
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =										2943.96	(98)			
Space heating requirement in kWh/m²/year										39.73	(99)			
9a. Energy requirements – Individual heating systems including micro-CHP)														
-	e heatir	-												-
Fraction of space heat from secondary/supplementary system									0	(201)				

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)			
Efficiency of secondary/supplementary heating system, %										0	(208)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g requir	ement (c	alculate	d above)	)	i	i	r	i	i	i	1	
	581.47	456.62	381.96	214.45	88.51	0	0	0	0	214.83	412.01	594.11		
(211)m		i i	1	00 ÷ (20			1	r	r	r	r	r	1	(211)
	622.56	488.89	408.96	229.6	94.76	0	0	0	0 I (kWh/yea	230.01	441.13	636.09		٦
•	)m x (20	g fuel (s 01)] } x 1 0		y), kWh/ 8) 08)	month 0	0	0	0	0	0	0	2	3151.99	(211)
(213)11=	0	0	0	0	0	0	0	-	l (kWh/yea	-	-	-	0	(215)
Water	heating	r							(		/ 15,101	2	0	
		-	ter (calc	ulated a	bove)		_						_	
	196.84	171.95	178.9	158.68	153.63	135.31	129.63	144.51	146.11	166.37	177.6	192.22		_
		ater hea	ter	<b>.</b>									80.3	(216)
(217)m=		87.39	86.91	85.81	83.72	80.3	80.3	80.3	80.3	85.7	87.1	87.7		(217)
		heating, m x 100												
(219)m=		196.75	205.84	184.92	183.5	168.5	161.44	179.96	181.95	194.14	203.9	219.17		
							•	Tota	I = Sum(2	19a) <sub>112</sub> =			2304.75	(219)
Annual totals kWh/year									kWh/year	-				
Space	heating	fuel use	ed, main	system	1								3151.99	
Water	heating	fuel use	ed										2304.75	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler with a fan-assisted flue												45	j	(230e)
Total e	electricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting											339.51	(232)
Total d	lelivered	d energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				5871.25	 _(338)
				lual heati	, , ,	. ,	. ,	. ,						_]
										_ ·	. ,			
							e <b>rgy</b> /h/year			kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	
Space	heating	ı (main s	vstem 1	)			1) x			0.2		=	680.83	(261)
	-	•		,		(21	5) x			0.5		=	0	(263)
Space heating (secondary) Water heating							(219) x					=	497.83	(264)
Space and water heating							1) + (262) ·	+ (263) + (	264) =	0.2	10			(265)
Electricity for pumps, fans and electric keep-hot							1) x	() . (	/			_	1178.66	-
Electri	ony for p	oumps, f	ans and	electric	veeb-110	ι (23	·/ <b>^</b>			0.5	19	=	38.93	(267)

Electricity for lighting	(232) x	0.519 =	176.2 (268)
Total CO2, kg/year		sum of (265)(271) =	1393.79 (272)
TER =			18.81 (273)