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 10:01:40*

Project Information	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 035	
Address :	21 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	
-	rs items included v ete report of regula	vithin the SAP calculations. tions compliance.			
1a TER and DER					
	ing system: Mains g	jas			
Fuel factor: 1.00 (I	mains gas) oxide Emission Rate		18.68 kg/m²		
•	Dioxide Emission Rate		13.74 kg/m²		ок
1b TFEE and DF					
Target Fabric Ene	rgy Efficiency (TFEI	Ξ)	50.6 kWh/m ²		
Dwelling Fabric Er	nergy Efficiency (DF	EE)	43.3 kWh/m ²		
0 Estris II velue					OK
2 Fabric U-value Element		Average	Highest		
External		0.24 (max. 0.30)	0.24 (max. 0.70)		ок
Party wal		0.00 (max. 0.20)	-		OK
Floor		0.11 (max. 0.25)	0.11 (max. 0.70)		ОК
Roof		0.11 (max. 0.20)	0.11 (max. 0.35)		ОК
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)		ОК
2a Thermal brid					
		from linear thermal transmittar	ices for each junction		
3 Air permeabili			4.40		
Maximum	bility at 50 pascals		4.48 10.0		ок
4 Heating efficie	ncv				
Main Heatir		Database: (rev 478, produc	t index 017929):		
		· · ·	rs or underfloor heating - ma	ains gas	ок
Secondary	heating system:	None			

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Cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls	Programmer, room therm	lostat and TRVs	OK
Hot water controls:	No cylinder thermostat		
Boiler interlock:	No cylinder Yes		ОК
Low energy lights	163		OK
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum	0, 0	75.0%	ОК
Mechanical ventilation			
Continuous extract system (decentralised)		
Specific fan power:		0.16 0.18	
Maximum		0.7	OK
Summertime temperature			
Overheating risk (South Eng	land):	Slight	OK
sed on:			
Overshading:		Very Little	
Windows facing: North West		3.06m² 6.51m²	
Windows facing: South East			
Ventilation rate:		4.00 No. 6	
Blinds/curtains:		None	
) Key features			
Roofs U-value		0.11 W/m²K	
Party Walls U-value		0 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

						User D	etails:						
Assessor Software			n Tunniı oma FS	0,	2			a Num are Vei				027495 on: 1.0.5.41	
					Р	roperty	Address	: Plot 03	5				
Address :			Buttercu	p Road ,	, Bishop	s Waltha	am, SOL	ITHAMP	TON, SO	032 1RF	-		
1. Overall d	welling di	mension	S:										
0 14							a(m²)	I	Av. He	ight(m)	1	Volume(m ³)	1
Ground floor						3	37.05	(1a) x	2	2.4	(2a) =	88.92	(3a)
First floor						3	37.05	(1b) x	2	.67	(2b) =	98.92	(3b)
Total floor ar	ea TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r	n)	74.1	(4)					
Dwelling volu	ume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	187.84	(5)
2. Ventilatio	n rate:												
			main heating		econdar leating	У	other		total			m ³ per hour	
Number of cl	nimneys		0	+	0	+	0] = [0	x 4	40 =	0	(6a)
Number of o	pen flues		0	+	0	+	0	_ = _	0	x 2	20 =	0	(6b)
Number of in	termittent	fans							0	x 1	10 =	0	(7a)
Number of p	assive ver	nts						Ē	0	x 1	10 =	0	(7b)
Number of fl	ueless gas	s fires						Γ	0	x 4	40 =	0	(7c)
											Air ch	hanges per hou	_ .r
Infiltration du	e to chim	nevs flu	es and f	ans = (6	a)+(6b)+(7	′a)+(7b)+(7c) =	Г	0		÷ (5) =](8)
If a pressuris								continue fr	-		- (0) -	0	
Number of	storeys ir	n the dw	elling (ns	5)								0	(9)
Additional	infiltration									[(9)-	-1]x0.1 =	0	(10)
Structural	infiltration	: 0.25 fo	r steel or	r timber f	frame or	0.35 fo	r mason	ry constr	uction			0	(11)
	es of wall are areas of ope				ponding to	o the great	ter wall are	a (after					
If suspend	,	0 //	,		ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draug	ht lobby,	enter 0.0)5, else e	enter 0								0	(13)
Percentag	e of windo	ows and	doors dr	aught st	ripped							0	(14)
Window in	filtration						0.25 - [0.2	! x (14) ÷ 1	= [00			0	(15)
Infiltration	rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permea	•	•	-			•	•	•	etre of e	nvelope	area	4.48000001907349	(17)
If based on a	-	-							·	(0.22	(18)
Air permeabi			ressurisatio	on test nas	s been aor	ie or a de	gree air pe	rmeability	is being us	sea		2	(19)
Shelter facto							(20) = 1 -	[0.075 x (1	9)] =			0.85	(13)
Infiltration rat	te incorpo	rating sh	nelter fac	tor			(21) = (18) x (20) =				0.19	(21)
Infiltration rat		-			ł							L	_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly aver	age wind	speed fi	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	te (allow	ing for sl	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m	•		•	
	0.24	0.24	0.23	0.21	0.2	0.18	0.18	0.18	0.19	0.2	0.21	0.22	
		<i>ctive air</i> al ventila	-	rate for	the appli	icable ca	ise		-				0.5 (23a)
				endix N. (2	23b) = (23;	a) x Fmv (e	equation (N5)) , othe	rwise (23ł	(23a) = (23a)		l	· · · ·
								n Table 4h		o) (200)		l	0.5 (23b) 0 (23c)
			-	-	-					2b)m + ((23b) x [l 1 – (23c)	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)
b) If	balance	ed mech	anical ve	entilation	without	heat red	covery (u MV) (24t)m = (2	1 2b)m + (23b)	1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If	whole h	nouse ex	tract ver	ntilation	r positiv	/e input	ventilati	on from a	outside		1		
i	f (22b)r	n < 0.5 >	« (23b),	then (24	c) = (23	o); other	wise (24	c) = (22	b) m + 0	.5 × (23)		
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)
								on from 0.5 + [(2		0.5]			
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)
Effe	ctive air	change	rate - e	nter (24a	a) or (24	b) or (24	c) or (24	ld) in bo	x (25)		-		
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)
3. He	at losse	s and he	eat loss	paramet	er:								
ELEN		Gros		Openir		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł	
Doors						2.1	x	1.4	=	2.94			(26)
Windo	ws Type	e 1				3.06	x1	/[1/(1.4)+	0.04] =	4.06			(27)
Window	ws Type	e 2				6.51	x1	/[1/(1.4)+	0.04] =	8.63			(27)
Floor						37.05	5 X	0.11	=	4.0755	5	75	2778.75 (28)
Walls		87.3	39	11.6	7	75.72	2 X	0.24	=	18.17	= 1	60	4543.2 (29)
Roof		37.0	05	0		37.05	5 X	0.11	=	4.08	= 1	9	333.45 (30)
Total a	rea of e	elements	s, m²			161.4	9						(31)
Party v	vall					42.73	3 X	0	=	0		45	1922.85 (32)
Interna	ıl wall *	ł				59.9						9	539.136 (32c)
Interna	ıl wall *	ł				90.09	9					9	810.7722 (32c)
Interna	l floor					37.05						18	666.9 (32d)
Interna	l ceiling	9				37.05						9	333.45 (32e)
				effective w nternal wa			lated usin	g formula 1	1/[(1/U-vali	ue)+0.04] a	as given ir	n paragraph	

Fabric heat loss, $W/K = S(A \times U)$	(26)(30) + (32) =	41.95	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	11928.51	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	= (34) ÷ (4) =	160.98	(35)

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

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 I	<						6.75	(36)
		al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			48.7	(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=	30.99	30.99	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=	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69		
Heatle		motor (l		/ <u>m</u> 21/		I	I			-	Sum(39)1	12 /12=	79.69	(39)
	<u> </u>	ameter (H	<u>,</u>	1	1.00	1.00	1.00	1.00	· · ·	= (39)m ÷		1.00	1	
(40)m=	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.00	
Numb	er of day	ys in moi	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	1.08	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			•					•			•	•		
4. Wa	ater hea	ting ene	rav reau	irement:								kWh/ye	ear:	
			39.044											
		upancy, I		F 4	(0 0000	40 (T	- 40.0		040 (.34		(42)
		9, $N = 1$ 9, $N = 1$	+ 1.76 x	[1 - exp	(-0.0003	349 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA -13.	.9)			
			ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		89	.81	1	(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o			l	(-)
not mor	e that 125	i 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 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) ₁₁₂ =		1077.7	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	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) ₁₁₂ =	=	1413.04	(45)
lt instan	taneous v	vater heatil	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)				1	
(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		includir				otorogo	within or				_	1	(47)
-		, ,					-	within sa	anie ves	Sei		0		(47)
		neating a			-			(47) mbi boil	ore) ont	ar 'O' in (47)			
	storage		not wate	er (uns n	iciuues i	iistailtai					47)			
	-	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav):					0	1	(48)
		actor fro				(, , ,					0		(49)
		om water			aar			(48) x (49)	_			-		(50)
		turer's de				or is not		(40) X (40)	-			0		(30)
		age loss		-								0		(51)
		neating s									L		ı	
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

•••		m water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54) (55)
Water s	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m	L		I	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
`´´	r contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (L H11)] ÷ (50	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	v circuit	loss (an	nual) fro	om Table								0		(58)
		loss cal	,			59)m = ((58) ÷ 36	5 × (41)	m					
(moc	lified by	factor fr	om Tab	le H5 if t	here is s	solar wat	er heatir	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 eacl	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 DH	IW input o	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 ad	dditiona	l lines if	FGHRS	and/or V	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	from wa	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 heatei	r (annual)₁	12	1575.01	(64)
Heat ga	ains froi	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m) + 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)
		45.71 m in calc											eating	(65)
inclu	de (57)ı		ulation o	of (65)m	only if c								eating	(65)
inclu 5. Inte	de (57)ı ernal ga	m in calc ains (see	culation of Table 5	of (65)m and 5a)	only if c								eating	(65)
inclu 5. Inte	de (57)ı ernal ga	m in calc	culation of Table 5	of (65)m and 5a)	only if c								eating	(65)
inclu 5. Inte	de (57)i ernal ga blic gain	m in calc ains (see s (Table	culation of Table 5	of (65)m and 5a) ts	only if c):	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	(65)
inclu 5. Inte Metabo (66)m=	de (57)i ernal ga blic gain Jan 140.48	m in calc ains (see s (Table Feb	culation of Table 5 5), Wat Mar 140.48	of (65)m and 5a ts Apr 140.48	only if c): May 140.48	ylinder is Jun 140.48	s in the c Jul 140.48	dwelling Aug 140.48	or hot w Sep 140.48	ater is fr Oct	om com Nov	munity h Dec	eating	
inclu 5. Inte Metabo (66)m=	de (57)i ernal ga blic gain Jan 140.48	m in calc ains (see s (Table Feb 140.48	culation of Table 5 5), Wat Mar 140.48	of (65)m and 5a ts Apr 140.48	only if c): May 140.48	ylinder is Jun 140.48	s in the c Jul 140.48	dwelling Aug 140.48	or hot w Sep 140.48	ater is fr Oct	om com Nov	munity h Dec	eating	
inclu 5. Inte Metaboo (66)m= Lighting (67)m=	de (57)i ernal ga blic gain Jan 140.48 g gains 48.32	m in calc ains (see s (Table Feb 140.48 (calculat	Table 5 5), Wat Mar 140.48 ted in Ap 34.91	of (65)m and 5a ts Apr 140.48 opendix 26.43	only if c): May 140.48 L, equati 19.75	Jun 140.48 ion L9 of 16.68	Jul 140.48 r L9a), a 18.02	Aug 140.48 Iso see 23.42	or hot w Sep 140.48 Fable 5 31.44	Oct 140.48 39.92	om com Nov 140.48	Dec	eating	(66)
inclu 5. Inte Metaboo (66)m= Lighting (67)m=	de (57)i ernal ga blic gain Jan 140.48 g gains 48.32	m in calc ains (see s (Table Feb 140.48 (calculat 42.92	Table 5 5), Wat Mar 140.48 ted in Ap 34.91	of (65)m and 5a ts Apr 140.48 opendix 26.43	only if c): May 140.48 L, equati 19.75	Jun 140.48 ion L9 of 16.68	Jul 140.48 r L9a), a 18.02	Aug 140.48 Iso see 23.42	or hot w Sep 140.48 Fable 5 31.44	Oct 140.48 39.92	om com Nov 140.48	Dec	eating	(66)
inclu 5. Internet of the second secon	de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46	m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc	Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6	of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43	only if c): 140.48 L, equati 19.75 dix L, eq 264.75	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38	Jul 140.48 r L9a), a 18.02 13 or L1 230.77	Aug 140.48 Iso see 23.42 3a), also 227.57	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63	ater is fr Oct 140.48 39.92 ble 5 252.8	om com Nov 140.48 46.59	Dec 140.48 49.67	eating	(66) (67)
inclu 5. Internet of the second secon	de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46	m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67	Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6	of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43	only if c): 140.48 L, equati 19.75 dix L, eq 264.75	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38	Jul 140.48 r L9a), a 18.02 13 or L1 230.77	Aug 140.48 Iso see 23.42 3a), also 227.57	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63	ater is fr Oct 140.48 39.92 ble 5 252.8	om com Nov 140.48 46.59	Dec 140.48 49.67	eating	(66) (67)
inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m=	de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39	m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula	culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39	of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 opendix 51.39	only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15	Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a)	Aug 140.48 Iso see 23.42 3a), also 227.57	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table	ater is fr Oct 140.48 39.92 ble 5 252.8 5	om com Nov 140.48 46.59 274.48	munity h Dec 140.48 49.67 294.85	eating	(66) (67) (68)
inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m=	de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39	m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39	culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39	of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 opendix 51.39	only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15	Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a)	Aug 140.48 Iso see 23.42 3a), also 227.57	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table	ater is fr Oct 140.48 39.92 ble 5 252.8 5	om com Nov 140.48 46.59 274.48	munity h Dec 140.48 49.67 294.85	eating	(66) (67) (68)
inclu 5. International Internationa Internatis Internationa Internationa Internatione Inter	de (57) ernal ga Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3	m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains	Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3	of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3	only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat 51.39	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39	Jul 140.48 r L9a), a 18.02 13 or L1: 230.77 or L15a) 51.39	Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39	ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39	om com Nov 140.48 46.59 274.48 51.39	Munity h	eating	(66) (67) (68) (69)
inclu 5. International Internationa Internatis Internationa Internationa Internatione Inter	de (57) ernal ga Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3	m in calo ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3	Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3	of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3	only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat 51.39	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39	Jul 140.48 r L9a), a 18.02 13 or L1: 230.77 or L15a) 51.39	Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39	ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39	om com Nov 140.48 46.59 274.48 51.39	Munity h	eating	(66) (67) (68) (69)
inclu 5. Intr Metaboo (66)m= (66)m= [Lighting (67)m= (68)m= [Cookin (69)m= Pumps (70)m= Losses (71)m=	de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66	m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio	Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66	of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 tive valu	only if c): 140.48 L, equat 19.75 dix L, equat 264.75 L, equat 51.39 3 es) (Tab	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5)	Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3	Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 se Table 51.39 3	ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3	om com Nov 140.48 46.59 274.48 51.39 3	munity h Dec 140.48 49.67 294.85 51.39 3	eating	 (66) (67) (68) (69) (70)
inclu 5. International inclusion Metabox (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Lossess (71)m= Water I	de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66	m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio -93.66	Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66	of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 tive valu	only if c): 140.48 L, equat 19.75 dix L, equat 264.75 L, equat 51.39 3 es) (Tab	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5)	Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3	Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 se Table 51.39 3	ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3	om com Nov 140.48 46.59 274.48 51.39 3	munity h Dec 140.48 49.67 294.85 51.39 3	eating	 (66) (67) (68) (69) (70)
inclu 5. Intr Metabor (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Lossess (71)m= Water I (72)m=	de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66 heating 70.1	m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio -93.66 gains (T	Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66 fable 5) 63.71	of (65)m and 5a ts Apr 140.48 opendix 26.43 opendix 286.43 opendix 51.39 5a) 3 tive valu -93.66	only if c): 140.48 L, equati 19.75 Jix L, equati 264.75 L, equati 51.39 3 es) (Tab -93.66	ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5) -93.66 48.7	Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3 -93.66	Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3 -93.66 49.98	or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39 3 -93.66 52.05	ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3 -93.66 58.11	om com Nov 140.48 46.59 274.48 51.39 3 -93.66 64.96	munity h Dec 140.48 49.67 294.85 51.39 3 -93.66 68.03	eating	 (66) (67) (68) (69) (70) (71)

6. Solar gains:

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

Orientation:	e calculated usin Access Fact Table 6d	0	Area m²	Table 6a	and	Flu		ations	g_			FF Table 6c	ion.		Gains (W)	
Southeast 0.9x	1	x	6.5	1	x	3	6.79	x	0.	.45	×	1.11		=	107.79	(77)
Southeast 0.9x	1	x	6.5	1	x	6	2.67	x	0.	.45	×	1.11		=	183.6	(77)
Southeast 0.9x	1	x	6.5	1	x	8	5.75	x	0.	.45	x	1.11		=	251.21	(77)
Southeast 0.9x	1	x	6.5	1	x	1(06.25	x	0.	.45	×	1.11		=	311.26	(77)
Southeast 0.9x	1	x	6.5	1	x	1	19.01	x	0.	.45	×	1.11		=	348.64	(77)
Southeast 0.9x	1	x	6.5	1	x	11	18.15	x	0.	.45	x	1.11		=	346.12	(77)
Southeast 0.9x	1	x	6.5	1	x	11	13.91	x	0.	.45	x	1.11		=	333.7	(77)
Southeast 0.9x	1	x	6.5	1	x	1()4.39	x	0.	.45	×	1.11		=	305.81	(77)
Southeast 0.9x	1	×	6.5	1	x	9	2.85	x	0.	.45	×	1.11		=	272.01	(77)
Southeast 0.9x	1	x	6.5	1	x	6	9.27	x	0.	.45	×	1.11		=	202.92	(77)
Southeast 0.9x	1	×	6.5	1	x	4	4.07	x	0.	.45	×	1.11		=	129.1	(77)
Southeast 0.9x	1	x	6.5	1	x	3	1.49	x	0.	.45	x	1.11		=	92.24	(77)
Northwest 0.9x	1	×	3.0	6	x	1	1.28	x	0.	.45	×	1.11		=	15.54	(81)
Northwest 0.9x	1	×	3.0	6	x	2	2.97	x	0.	.45	×	1.11		=	31.63	(81)
Northwest 0.9x	1	x	3.0	6	x	4	1.38	x	0.	.45	x	1.11		=	56.98	(81)
Northwest 0.9x	1	x	3.0	6	x	6	7.96	x	0.	.45	×	1.11		=	93.58	(81)
Northwest 0.9x	1	x	3.0	6	x	9	1.35	x	0.	.45	×	1.11		=	125.78	(81)
Northwest 0.9x	1	×	3.0	6	x	9	7.38	x	0.	.45	×	1.11		=	134.1	(81)
Northwest 0.9x	1	x	3.0	6	x	ç	91.1	x	0.	.45	×	1.11		=	125.45	(81)
Northwest 0.9x	1	x	3.0	6	x	7	2.63	x	0.	.45	×	1.11		=	100.01	(81)
Northwest 0.9x	1	×	3.0	6	x	5	0.42	x	0.	.45	×	1.11		=	69.43	(81)
Northwest 0.9x	1	x	3.0	6	x	2	8.07	x	0.	.45	×	1.11		=	38.65	(81)
Northwest 0.9x	1	x	3.0	6	x	1	4.2	x	0.	.45	×	1.11		=	19.55	(81)
Northwest 0.9x	1	x	3.0	6	x	ę	9.21	x	0.	.45	×	1.11		=	12.69	(81)
Solar gains i		ulatad.	for oool	mont				(82)m	n = Sumi	(74)m	(82)m			-		—
(83)m= 123.3		08.19	404.84	474.43	-	80.22	459.14	405	-	41.44	241.57	7 148.65	104	.93		(83)
Total gains -									I							
(84)m= 651.4	3 739.05 81	11.63	876.77	914.2	8	91.19	853.3	808	.01 7	61.78	693.62	2 635.9	618	8.7		(84)
7. Mean inte	ernal tempera	ature (heating	seaso	n)			•								
Temperatur	e during heat	ting pe	eriods ir	the liv	ing	area f	rom Tal	ole 9	, Th1 (°C)				[21	(85)
Utilisation fa	actor for gain	s for li	ving are	a, h1,r	n (s	ее Та	ble 9a)						_			
Jan	Feb	Mar	Apr	Мау		Jun	Jul	A	ug	Sep	Oct	Nov	D	ec		
(86)m= 0.96	0.94	0.9	0.83	0.7	().54	0.4	0.4	14 (0.65	0.85	0.94	0.9)7		(86)
Mean interr	al temperatu	ire in li	ving are	ea T1 (1	follo	w ste	ps 3 to 7	7 in T	able 9)c)			-			
(87)m= 19.74	I	0.24	20.57	20.82	-	0.95	20.99	20.	-	20.9	20.58	20.09	19.	67		(87)
Temperatur	e during heat	tina pe	eriods in	rest o	f dw	ellina	from Ta	able 9	9. Th2	(°C)						
(88)m= 20.02		0.02	20.02	20.02	-	0.02	20.02	20.	· ·	20.02	20.02	20.02	20.	02		(88)
	II												L			

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 0.96 0.93 0.89 0.79 0.65 0.47 0.32 0.35 0.58 0.82 0.93 0.96	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	1
(90)m= 18.89 19.09 19.38 19.68 19.9 19.99 20.02 20.01 19.96 19.69 19.23 18.83	(90)
fLA = Living area ÷ (4) =	0.2 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 19.06 19.27 19.55 19.86 20.09 20.19 20.21 20.21 20.15 19.87 19.41 19	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1
(93)m= 18.91 19.12 19.4 19.71 19.94 20.04 20.06 20.06 20 19.72 19.26 18.85	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-cale the utilisation factor for gains using Table 9a	culate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec]
Utilisation factor for gains, hm:	1
(94)m= 0.95 0.92 0.87 0.78 0.64 0.47 0.32 0.36 0.57 0.81 0.92 0.95	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 617.2 680.1 708.1 686.95 589.53 418.3 273.47 287.79 437.99 560.92 584.36 590.84	(95)
Monthly average external temperature from Table 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 for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	1
(97)m= 1164.55 1133.04 1028.28 861.64 656.3 433.47 276.13 291.83 470.46 727.17 968.95 1167.45	(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	1
(98)m= 407.23 304.38 238.22 125.77 49.68 0 0 0 0 123.69 276.9 429	
Total per year (kWh/year) = Sum(98) _{15,912} =	1954.86 (98)
Space heating requirement in kWh/m²/year	26.38 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
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	90.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/year
Space heating requirement (calculated above)	-
407.23 304.38 238.22 125.77 49.68 0 0 0 0 123.69 276.9 429	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
449.98 336.33 263.22 138.98 54.89 0 0 0 0 136.67 305.97 474.03]
Total (kWh/year) =Sum(211) _{15,1012} =	2160.07 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)] } x 100 ÷ (208)	1
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ļ
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)

Water heating

Output	t from wa	ater heat	ter (calc	ulated al	bove)					-	-			
	160.26	140.56	145.98	128.59	124.36	108.76	102.2	115.25	116.02	133.45	143.96	155.64		_
Efficier	ncy of wa	ater hea	ter				-			-	-		87.3	(216)
(217)m=		89.46	89.26	88.85	88.19	87.3	87.3	87.3	87.3	88.81	89.38	89.63		(217)
	or water l ו = (64)ו	•												
. ,	178.91	157.11	163.55	144.72	141.02	124.58	117.07	132.01	132.89	150.26	161.07	173.65		
								Tota	I = Sum(2	19a) ₁₁₂ =			1776.84	(219)
	al totals									k	Wh/year	•	kWh/year	-
Space	heating	fuel use	ed, main	system	1								2160.07	1
Water	heating	fuel use	d										1776.84	
Electric	city for p	umps, fa	ans and	electric	keep-ho	t								
mech	anical ve	entilatior	n - balan	ced, ext	ract or p	ositive ir	nput fror	n outside	Ð			49.6		(230a)
centra	al heatin	g pump:										30		(230c)
boiler	with a fa	an-assis	ted flue									45		(230e)
Total e	electricity	for the	above, ł	(Wh/yea	r			sum	of (230a).	(230g) =			124.6	(231)
Electric	city for li	ghting											341.37	(232)
Electric	city gene	erated by	y PVs										-481.92	(233)
Total d	lelivered	energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				3920.97	(338)
10a. I	Fuel cos	ts - indiv	vidual he	ating sy	stems:									-
						Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
Space	heating	- main s	system 1			(211	1) x			3.4	8	x 0.01 =	75.17	(240)
Space	heating	- main s	system 2	2		(213	3) x			0		x 0.01 =	0	(241)
Space	heating	- secon	dary			(215	5) x			13.	19	x 0.01 =	0	(242)
Water	heating	cost (otł	ner fuel)			(219	9)			3.4	8	x 0.01 =	61.83	(247)
Pumps	s, fans a	nd electi	ric keep-	hot		(231	1)			13.	19	x 0.01 =	16.43	(249)
•														
		-	ch of (2	30a) to (230g) se		•••	licable a	nd apply	· ·		•	Table 12a	
•••	y for ligh	ting	,	, ,	0,	eparately (232	•••	licable a	nd apply	fuel prie 13.		ding to x 0.01 =	Table 12a 45.03	(250)
•••		ting	,	, ,	0,		•••	licable a	nd apply	· ·		•		(250) (251)
•••	y for ligh	ting	,	, ,	0,	(232	•••		nd apply	· ·	19	•	45.03	-
Additio Appen	y for ligh onal stan dix Q ite	ting ding cha ms: repe	arges (T	able 12)	nd (254)	(232 one as need	2) of (233) to ded	o (235) x)	nd apply	13.	19	x 0.01 =	45.03 120 -63.57](251)](252)
Additio Appen Total	y for ligh onal stan dix Q ite energ	ting ding cha ms: repe y cost	arges (Tr	able 12) (253) ai	nd (254) (245)((232 one	2) of (233) to ded	o (235) x)	nd apply	13.	19	x 0.01 =	45.03 120	(251)
Additio Appen Total 11a. \$	y for ligh onal stan dix Q ite energ SAP rati	ting ding cha ms: repe y cost ng - indiv	arges (Tr eat lines vidual he	able 12) (253) ai eating sy	nd (254) (245)((232 one as need	2) of (233) to ded	o (235) x)	nd apply	13.	19	x 0.01 =	45.03 120 -63.57](251)](252)](255)
Additio Appen Total 11a. (Energy	y for ligh onal stan dix Q ite energ SAP ration y cost de	ting ding cha ms: repe y cost ng - indiv	arges (T eat lines vidual he fable 12)	able 12) (253) ai eating sy	nd (254) (245)(/stems	one as neec 247) + (25	2) of (233) to ded 50)(254)	o (235) x) =	nd apply	13.	19	x 0.01 =	45.03 120 -63.57 254.9 0.42](251)](252)](255)](256)
Additio Appen Total 11a. S Energy Energy	y for ligh onal stan dix Q ite energ SAP rati	ting ding cha ms: repe y cost ng - indiv eflator (T ctor (EC	arges (T eat lines vidual he able 12) F)	able 12) (253) ai eating sy	nd (254) (245)(/stems	(232 one as need	2) of (233) to ded 50)(254)	o (235) x) =	nd apply	13.	19	x 0.01 =	45.03 120 -63.57 254.9](251)](252)](255)

12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	466.58 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	383.8 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	850.37 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	64.67 (267)
Electricity for lighting	(232) x	0.519 =	177.17 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year		sum of (265)(271) =	842.1 (272)
CO2 emissions per m ²		(272) ÷ (4) =	11.36 (273)
EI rating (section 14)			91 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)		•	
Space heating (main system 1) Space heating (secondary)	kWh/year	factor	kWh/year
	kWh/year (211) x	factor =	kWh/year 2635.29 (261)
Space heating (secondary)	kWh/year (211) x (215) x	factor = 1.22 = 3.07 = 1.22 =	kWh/year 2635.29 (261) 0 (263)
Space heating (secondary) Energy for water heating	kWh/year (211) x (215) x (219) x	factor = 1.22 = 3.07 = 1.22 =	kWh/year 2635.29 (261) 0 (263) 2167.75 (264)
Space heating (secondary) Energy for water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26	factor 1.22 = 3.07 = 1.22 = 64) =	kWh/year 2635.29 (261) 0 (263) 2167.75 (264) 4803.04 (265)
Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26 (231) x	factor 1.22 = 3.07 =	kWh/year 2635.29 (261) 0 (263) 2167.75 (264) 4803.04 (265) 382.52 (267)
Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26 (231) x	factor 1.22 = 3.07 = 1.22 = 64) = 3.07 = 0 =	kWh/year 2635.29 (261) 0 (263) 2167.75 (264) 4803.04 (265) 382.52 (267) 1048.01 (268)

					User D	Details:						
Assessor Name: Software Name:		n Tunnir oma FS	•••			Softwa	a Num are Vei	rsion:			0027495 on: 1.0.5.41	
						Address						
Address :		Buttercu	o Road ,	, Bishops	s Waltha	am, SOU	ITHAMP	TON, SO	032 1RF	-		
1. Overall dwelling dir	nension	s:			_							
One word file on						a(m²)			ight(m)	1	Volume(m ³)	٦
Ground floor					3	37.05	(1a) x	2	2.4	(2a) =	88.92	(3a)
First floor					3	37.05	(1b) x	2	.67	(2b) =	98.92	(3b)
Total floor area TFA =	(1a)+(1t	o)+(1c)+((1d)+(1e	e)+(1r)	74.1	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	187.84	(5)	
2. Ventilation rate:												
		main heating		econdar leating	у	other		total			m ³ per hour	
Number of chimneys	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 intermittent	fans						- L	0	x 1	10 =	0	(7a)
Number of passive ver	ts						Ē	0	x 1	10 =	0	(7b)
Number of flueless gas	fires						Г	0	x 4	40 =	0	(7c)
							L					J
										Air ch	hanges per hou	ır
Infiltration due to chimr								0		÷ (5) =	0	(8)
If a pressurisation test ha				ed, procee	d to (17),	otherwise of	continue fr	om (9) to ((16)			
Number of storeys in Additional infiltration	the dw	elling (ns	5)						[(0)	11-0.4	0	(9)
Structural infiltration:	0 25 fo	r staal ar	timbort	frame or	0 35 fo	r masoni	w constr	uction	[(9)-	-1]x0.1 =	0	(10)
if both types of wall are							•	uction			0](11)
deducting areas of ope	• /				4 (1)							1
If suspended woode				ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e				wine o ol							0	(13)
Percentage of windo Window infiltration	ws and		augni si	npped		0.25 - [0.2	$(14) \div 1$	001 -			0	(14)
Infiltration rate						(8) + (10)			+ (15) =		0	(15)
Air permeability valu	e a50 e	expresse	d in cub	oic metre	s per ho					area	4.48000001907349	
If based on air permea						•	•		in olopo	area	0.22	(18)
Air permeability value app	•							is being u	sed		0.22	
Number of sides shelte	red										2	(19)
Shelter factor						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor			(21) = (18) x (20) =				0.19	(21)			
Infiltration rate modified	ار ۱					1	r	1				
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind		· · · · ·	e 7								1	
(22)m= 5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	

Wind 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		
Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m					
	0.24	0.24	0.23	0.21	0.2	0.18	0.18	0.18	0.19	0.2	0.21	0.22		
			-	rate for a	he appli	cable ca	ise			•				
		al ventila		ondiv NL /	(22) = (22)		acuation (muion (22k	(220)			0.5 (23)	
								N5)) , othe) = (23a)			0.5 (23)	
			-	-	-			m Table 4h		0 h)	(00h) [1 (00 c)	0 (230	c)
,			anical Ve	entilation		at recove	<u> </u>	1	a)m = (2 0	1	1	1 – (23c)	÷ 100] (24;	2)
(24a)m=	_			-	-	-	0	0		0	0	0	(240	(ב
,		r	1	1	r	1		MV) (24t	ŕ	1	<u> </u>		(24)	b)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0	(24)	J)
					-	-		on from (lc) = (22l		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	0.5	(24)	c)
								on from		0.0	0.0	0.0	, ,	ĺ
								0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24	d)
Effe	ctive air	change	rate - ei	nter (24a	u) or (24l	b) or (24	c) or (24	4d) 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. He	at losse	s and he	eat loss	paramet	er:									
ELEN		Gros		Openir		Net Ar	ea	U-val	ue	AXU		k-value	e AXk	
		area	(m²)	•	1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙ł	K kJ/K	
Doors						2.1	x	1.4	=	2.94			(26))
Windo	ws Type	e 1				3.06	x1	I/[1/(1.4)+	- 0.04] =	4.06			(27))
Windo	ws Type	e 2				6.51	x1	/[1/(1.4)+	- 0.04] =	8.63			(27))
Floor						37.05	5 X	0.11	=	4.0755	5	75	2778.75 (28))
Walls		87.3	39	11.6	7	75.72	2 X	0.24		18.17	i F	60	4543.2 (29))
Roof		37.0)5	0		37.05	5 X	0.11	=	4.08	= i	9	333.45 (30))
Total a	rea of e	elements	s, m²			161.4	9				เ		(31))
Party v	vall					42.73	x	0		0		45	1922.85 (32)	
•	al wall **					59.9					I	9	539.136 (32)	
	al wall **					90.09					l I	9	810.7722 (32)	
Internal floor						37.05					l I	18	666.9 (32)	
	al ceiling	1									l T			
	-			offective	indow I I v	37.05		a formula 1	1/[/1/11.00]	ua)+0 0 <i>4</i> 1 /	as aivon ir	9 n paragraph		=)
		as on both						g ionnuid i	(1/0-vall	uoj+0.0 4] (as given in	i palayiapii	0.2	

Fabric heat loss, $W/K = S (A \times U)$ (26)...(30) + (32) =41.95(33)Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =11928.51(34)Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²K= (34) ÷ (4) =160.98(35)

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

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	<						6.75	(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) =			48.7	(37)
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 79.69														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	30.99	30.99	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=	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69	79.69		
Heat lo	oss para	ameter (H	HLP), W/	/m²K						-		₁₂ /12=	79.69	(39)
(40)m=	<u> </u>	· · · · ·	<u> </u>	i	1.08	1.08	1.08	1.08				1.08		
. ,										Average =	Sum(40)1	₁₂ /12=	1.08	(40)
Numb	er of day	ys in mo	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 ene	rgy requi	irement:								kWh/ye	ear:	
													1	
if TF	A > 13.	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0)013 x (⁻	TFA -13.		34		(42)
Annua	l averag	je hot wa										.81		(43)
		-				-	-	to achieve	a water us	se target o	f			
notmor			1		i	i	·		-			_	1	
Hot wat					,				Sep	Oct	Nov	Dec		
		·		r	i — — —			· ·					l	
(44)m=	98.79	95.2	91.6	88.01	84.42	80.83	80.83	84.42						
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600			· · ·		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) ₁₁₂ =	-	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)				L	
(46)m=			19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
	-		includir		alar ar M		storago	within or		col				(47)
		,		0 ,			•			501		0		(47)
		-			-			• •	ers) ente	er '0' in <i>(</i>	47)			
			not wate			notantai								
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	om water	⁻ storage	, kWh/ye	ear			(48) x (49)	=			0		(50)
b) If n	nanufac	turer's de	eclared o	cylinder l	oss fact									
		-	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
		-	ee secti	on 4.3									l	(50)
		from Ta	bie ∠a m Table	2b								0		(52) (53)
· ompt		20101 110										0		(00)

	le et fre							(47) (54)		50)			I	
		m water (54) in (5	-	, KVVN/Y6	ear			(47) x (51)) X (52) X (53) =		<u>כ</u> כ		(54) (55)
	. ,	loss cal		for each	month			((56)m = (55) x (41)	m		5		(00)
							r			-	0	0	I	(56)
(56)m= If cylinde	0 er contains	0 s dedicate	0 d solar sto	0 rage (57)	0 = (56)m	$0 \times [(50) - ($	0 H11)1 ∸ (5	0 0) else (5	0 = (56)	0 m where (0 H11) is fro	0 m Append	ix H	(30)
-				- · ·	 I	1								
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	-	loss (an										0		(58)
	•	loss cal			`	,	· ·	• • •						
•		i		1	1	i	i	<u> </u>		r thermo	,	-	l	(50)
(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	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contributi	on 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 heater	(annual)	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 x	((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	
	. ,	ains (see		. ,	-			U				•		
		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)
		(calcula												
(67)m=	20.12	17.87	14.53	11	8.22	6.94	7.5	9.75	13.09	16.62	19.4	20.68	l	(67)
											10.4	20.00		(0.)
••		ins (calc 208.82	203.41	191.91	177.38	163.73	13 OF L1	3a), aisc 152.47	157.87	169.38	183.9	197.55	l	(68)
(68)m=											163.9	197.55		(00)
		(calcula		-	· · ·		, 						l	(00)
(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	· · · · · · · · · · · · · · · · · · ·	· ·	r	r	r			· · · · · ·			I	
(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	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	358.01	355.83	342.78	321.89	300.78	280.5	267.39	273.32	284.14	305.23	329.38	347.38		(73)
						-							•	

6. Solar gains:

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

Orientation:	e calculated usin Access Fac Table 6d	•	Area m ²	I able 6a	FI		ations	g_ Table 6b		FF Fable 6c	tion.	Gains (W)	
Southeast 0.9x	0.77	x	6.5	51	x	36.79	x	0.45	x	1.11	=	83	(77)
Southeast 0.9x	0.77	x	6.5	51	x	62.67	x	0.45	x	1.11	=	141.37	(77)
Southeast 0.9x	0.77	x	6.5	51	x	85.75	x	0.45	x	1.11	=	193.43	(77)
Southeast 0.9x	0.77	x	6.5	51	x	106.25	x	0.45	x	1.11	=	239.67	(77)
Southeast 0.9x	0.77	x	6.5	51	x	119.01	x	0.45	x	1.11	=	268.45	(77)
Southeast 0.9x	0.77	x	6.5	51	x	118.15	x	0.45	x	1.11	=	266.51	(77)
Southeast 0.9x	0.77	x	6.5	51	x	113.91	x	0.45	x	1.11	=	256.95	(77)
Southeast 0.9x	0.77	x	6.5	51	x	104.39	x	0.45	x	1.11	=	235.48	(77)
Southeast 0.9x	0.77	x	6.5	51	x	92.85	x	0.45	x	1.11	=	209.45	(77)
Southeast 0.9x	0.77	x	6.5	51	x	69.27	x	0.45	x	1.11	=	156.25	(77)
Southeast 0.9x	0.77	x	6.5	51	x	44.07	x	0.45	x	1.11	=	99.41	(77)
Southeast 0.9x	0.77	x	6.5	51	x	31.49	x	0.45	x	1.11	=	71.03	(77)
Northwest 0.9x	0.77	x	3.0	6	x	11.28	x	0.45	x	1.11	=	11.96	(81)
Northwest 0.9x	0.77	x	3.0	6	x	22.97	x	0.45	x	1.11	=	24.35	(81)
Northwest 0.9x	0.77	x	3.0	6	x	41.38	x	0.45	x	1.11	=	43.87	(81)
Northwest 0.9x	0.77	x	3.0	6	x	67.96	x	0.45	x	1.11	=	72.05	(81)
Northwest 0.9x	0.77	x	3.0	6	x	91.35	x	0.45	x	1.11	=	96.85	(81)
Northwest 0.9x	0.77	x	3.0	6	x	97.38	x	0.45	x	1.11	=	103.26	(81)
Northwest 0.9x	0.77	x	3.0	6	x	91.1	x	0.45	x	1.11	=	96.59	(81)
Northwest 0.9x	0.77	x	3.0	6	x	72.63	x	0.45	x	1.11	=	77.01	(81)
Northwest 0.9x	0.77	x	3.0	6	x	50.42	x	0.45	x	1.11	=	53.46	(81)
Northwest 0.9x	0.77	x	3.0	6	x	28.07	x	0.45	x	1.11	=	29.76	(81)
Northwest 0.9x	0.77	x	3.0	6	x	14.2	x	0.45	x	1.11	=	15.05	(81)
Northwest 0.9x	0.77	x	3.0	6	x	9.21	x	0.45	x	1.11	=	9.77	(81)
Solar gains i	n watte cale	ulated	for oad	o month			(83)m	= Sum(74)m	(82)m				
(83)m= 94.96	1 1	37.31	311.73	365.31	369.77	353.54	312		186.01	114.46	80.8]	(83)
Total gains -						, watts			1			1	
(84)m= 452.9	7 521.55 5	80.09	633.61	666.09	650.27	620.93	585	5.8 547.04	491.24	443.84	428.18]	(84)
7. Mean inte	ernal temper	ature (heating	season)	•	,		1	•		2	
	e during hea		Ŭ		,	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fa	actor for gair	ns for li	ving are	ea, h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec]	
(86)m= 0.99	0.98	0.96	0.92	0.83	0.69	0.53	0.5	8 0.79	0.94	0.98	0.99		(86)
Mean intern	al temperatu	ure in li	iving are	ea T1 (fo	Sllow ste	eps 3 to 7	7 in T	able 9c)	•	•		-	
(87)m= 19.41		19.93	20.31	20.66	20.88	20.97	20.9		20.34	19.79	19.36]	(87)
Temperatur	e during hea	ating pe	eriods ir	n rest of	dwellin	· g from Ta	able 9	, Th2 (°C)				4	
(88)m= 20.02		20.02	20.02	20.02	20.02	20.02	20.0	,	20.02	20.02	20.02]	(88)
L	_ I I					1		I		<u> </u>		1	

Utilisatio	on fact	or for g	ains for I	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.95	0.9	0.79	0.61	0.43	0.47	0.73	0.92	0.98	0.99		(89)
Mean in	nternal	temper	ature in	the rest	of dwelli	ing T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	le 9c)				
	18.57	18.77	19.08	19.45	19.77	19.96	20.01	20	19.89	, 19.48	18.95	18.52		(90)
	ł					1			f	fLA = Livin	g area ÷ (4	4) =	0.2	(91)
Mean in	nternal	temper	ature (fo	r the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fL	Δ) x T2			L		
	18.74	18.94	19.25	19.63	19.96	20.15	20.2	20.2	20.07	19.66	19.12	18.69		(92)
	djustm	ent to t	ne mear	internal	temper	i ature fro	n Table	4e, whe	ere appro	priate				
(93)m=	18.59	18.79	19.1	19.48	19.81	20	20.05	20.05	19.92	19.51	18.97	18.54		(93)
8. Spac	e heat	ing requ	uirement			•								
				•		ned at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	- 1		-	using Ta		<u> </u>								
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	- î	or for g			0.70	0.61	0.42	0.49	0.70	0.01	0.07	0.08		(04)
	0.98		0.94	0.89	0.78	0.61	0.43	0.48	0.72	0.91	0.97	0.98		(94)
	44.44	504.96	vv = (9 ² 546.74	4)m x (84 561.56	+)III 518.29	394.47	268	279.82	394.49	445.64	429.9	421.51		(95)
				perature			200	210.02	004.40	440.04	420.0	421.01		(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)
								x [(93)m						
		1107.05		843	645.91	430.02	275.28	290.61	464.09	709.92	946.01	1142.57		(97)
Space h	heating	require	ement fo	r each m	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95	j)m] x (4′	1)m			
(98)m= 5	516.82	404.61	340.35	202.64	94.95	0	0	0	0	196.63	371.6	536.46		
	-							Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2664.05	(98)
Space h	heating	require	ement in	kWh/m²	/year							Ī	35.95	(99)
9a. Ener	av rea	uiremer	ıts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	(HP)			L		
Space I)			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
•		•	t from s	econdar	y/supple	mentary	system					[0	(201)
Fraction	n of spa	ace hea	t from m	nain syst	em(s)			(202) = 1 -	- (201) =			ĺ	1	(202)
Fractior	n of tot	al heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =		Ĺ	1	(204)
Efficien	cy of n	nain spa	ace heat	ing syste	em 1							Ĺ	90.5	(206)
	•	•		0,		g systen	า %					l	0	(208)
	·					- ·		A.1.0	Sen	Oct	Nov		-	
	Jan	Feb	Mar	Apr alculate	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
· –	516.82	404.61	340.35	202.64	94.95	0	0	0	0	196.63	371.6	536.46		
(211)m =								-	-					(211)
	571.07	447.08	376.08	223.91	104.92	0	0	0	0	217.27	410.6	592.78		(211)
Ľ			010100			Ů	ů		-	ar) =Sum(2			2943.7	(211)
Snace h	heating	ı fuel (e	econdar	y), kWh/	month				· · · · · ·		- 1	l		``'
Opacer		, 1001 (0	soonual	<i>y</i> /,//										
= {[(98)m	-	1)] } x 1	00 ÷ (20	8)										
= {[(98)m (215)m=	-	1)] } x 1 0	00 ÷ (20 0	8) 0	0	0	0	0	0	0	0	0		
	n x (20				0	0	0		-	0 ar) =Sum(2	-		0	(215)

Water heating

Output from water heater (calculated above)													
160.26 140.56 145.98 128.59 124.36 108.76 102.2 115.25 116.02 133.45 143.96 155.64													_
Efficiency	of water he	ater										87.3	(216)
<mark>(217)m=</mark> 89	9.72 89.65	89.52	89.23	88.66	87.3	87.3	87.3	87.3	89.18	89.58	89.76		(217)
	ater heating												
· · ·	<u>(64)m x 10</u>						(00.04					I	
(219)m= 17	8.62 156.78	163.08	144.11	140.27	124.58	117.07	132.01	132.89	149.64	160.71	173.39		-
							Tota	I = Sum(2)	19a) ₁₁₂ =			1773.14	(219)
Annual totals kWh/year												kWh/year	-
Space heating fuel used, main system 1												2943.7	
Water heating fuel used												1773.14]
Electricity for pumps, fans and electric keep-hot													
mechani	cal ventilation	on - balar	nced, ext	ract or p	ositive ir	nput fron	n outside	Э			49.6		(230a)
central h	eating pum	D:									30		(230c)
boiler wit	th a fan-ass	sted flue									45		(230e)
Total elec	tricity for the	e above, l	kWh/yea	r			sum	of (230a).	(230g) =			124.6	(231)
Electricity	for lighting											355.33	(232)
Electricity generated by PVs													(233)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =												4714.86	(338)
12a. CO2	2 emissions	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHP)					

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	635.84 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	383 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1018.84 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	64.67 (267)
Electricity for lighting	(232) x	0.519 =	184.42 (268)
Energy saving/generation technologies Item 1		0.519 =	-250.12 (269)
Total CO2, kg/year	sum	n of (265)(271) =	1017.81 (272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	13.74 (273)
EI rating (section 14)			89 (274)

						User D	etails:						
Assessor N Software Na			n Tunniı oma FS	•••			Strom Softwa	are Ver	sion:			027495 on: 1.0.5.41	
							Address						
Address :			Buttercu	p Road ,	, Bishops	s Waltha	am, SOU	THAMP	TON, SO	032 1RF	-		
1. Overall dwe	elling dir	mension	s:										
						Area	a(m²)	1	Av. Hei	ight(m)	•	Volume(m ³)	-
Ground floor						3	7.05	(1a) x	2	2.4	(2a) =	88.92	(3a)
First floor						3	7.05	(1b) x	2	.67	(2b) =	98.92	(3b)
Total floor area	a TFA =	(1a)+(1l	o)+(1c)+((1d)+(1e	e)+(1r)	74.1	(4)			-		_
Dwelling volum	ne							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	187.84	(5)
2. Ventilation rate: main secondary other total													
main secondary other total heating heating													
Number of chir	nneys	Ľ	0		0	+	0] = [0	x 4	40 =	0	(6a)
Number of ope	en flues		0	+	0	+	0] = [0	x 2	20 =	0	(6b)
Number of inte	rmittent	fans							3	x 1	10 =	30	(7a)
Number of pas	sive ver	x 1	10 =	0	(7b)								
Number of passive vents 0 $x 10 =$ Number of flueless gas fires 0 $x 40 =$													(7c)
											Air ch	nanges per hou	ur -
Infiltration due	to chimi	nevs. flu	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	30	<u> </u>	÷ (5) =	0.16](8)
lf a pressurisati								continue fr			. (0)	0.10	
Number of s	toreys ir	n the dw	elling (ne	5)								0	(9)
Additional in	filtration									[(9)-	-1]x0.1 =	0	(10)
Structural inf									uction			0	(11)
if both types deducting ar					ponding to	the great	er wall are	a (after					
If suspended	, d woode	n floor, e	, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught	t lobby,	enter 0.0)5, else e	enter 0								0	(13)
Percentage	of windo	ws and	doors dr	aught st	ripped							0	(14)
Window infilt	tration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration ra							(8) + (10)					0	(16)
Air permeab	•	•	-			•	•	•	etre of e	nvelope	area	5	(17)
If based on air Air permeability	-	-							ia haina w	aad		0.41	(18)
Number of side			i essui isalio	511 1851 1185	s been don	e or a ueț	jiee ali pe	inieability	is being us	seu		2	(19)
Shelter factor							(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate	incorpo	rating sh	nelter fac	tor			(21) = (18) x (20) =				0.35	(21)
Infiltration rate	modifie	d for mo	nthly wir	nd speed	ł								-
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average	ge wind	speed fi	rom Tabl	e 7									
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Factor (22a)m = (22)m \div 4														
(22a)m= 1.27 1.25 1.23 1.1 1.08	0.95 0.95 0.92	1 1.08 1.12	1.18											
Adjusted infiltration rate (allowing for shelter and	d wind speed) = (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											
Calculate effective air change rate for the applic If mechanical ventilation:	able case			0 (23a)										
If exhaust air heat pump using Appendix N, (23b) = (23a)	× Fmv (equation (N5)), other	wise (23b) = (23a)		0 (23a) 0 (23b)										
If balanced with heat recovery: efficiency in % allowing fc	or in-use factor (from Table 4h)	=		0 (23c)										
a) If balanced mechanical ventilation with hea	t recovery (MVHR) (24a)m = (22b)m + (23b) >	< [1 – (23c)											
(24a)m= 0 0 0 0 0	0 0 0		0	(24a)										
b) If balanced mechanical ventilation without I	heat recovery (MV) (24b)m = (22b)m + (23b)		1										
(24b)m= 0 0 0 0 0	0 0 0	0 0 0	0	(24b)										
c) If whole house extract ventilation or positive	e input ventilation from o	utside												
if (22b)m < 0.5 × (23b), then (24c) = (23b)); otherwise (24c) = (22b) m + 0.5 × (23b)												
(24c)m= 0 0 0 0 0	0 0 0	0 0 0	0	(24c)										
d) If natural ventilation or whole house positiv	•													
$if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m^2 \times 0.5]$ $(24d)m = 0.6 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.58 0.5$														
		<u> </u>	0.50	(2.13)										
(25)m= 0.6 0.59 0.59 0.57 0.57	Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.6 0.59 0.57 0.55 0.55 0.56 0.57 0.58 0.58 (25)													
3. Heat losses and heat loss parameter:		• • · · ·												
ELEMENT Gross Openings area (m²) m²	Net Area U-valu A ,m ² W/m2		k-value kJ/m²·I											
Doors	2.1 × 1	= 2.1		(26)										
Windows Type 1	3.06 x1/[1/(1.4)+	0.04] = 4.06		(27)										
Windows Type 2	6.51 x1/[1/(1.4)+	0.04] = 8.63		(27)										
Floor	37.05 × 0.13	= 4.8165		(28)										
Walls 87.39 11.67	75.72 × 0.18	= 13.63		(29)										
Roof 37.05 0	37.05 × 0.13	= 4.82		(30)										
Total area of elements, m ²	161.49			(31)										
Party wall	42.73 × 0	= 0		(32)										
Internal wall **	59.9			(32c)										
Internal wall **	90.09			(32c)										
Internal floor	37.05			(32d)										
Internal ceiling	37.05			(32e)										
* for windows and roof windows, use effective window U-va ** include the areas on both sides of internal walls and parti	-	[(1/U-value)+0.04] as giver	n in paragraph	1 3.2										

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	38.05	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	11928.51	(34)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K	Indicative Value: Medium	250	(35)
			-

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

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	<						8.65	(36)
			are not kr	nown (36) =	= 0.05 x (3	1)								
(39)m = (37) + (38)m Average = Sum(39)2 /12= (40)m = (39)m ÷ (4) Average = Sum(39)													46.7	(37)
Ventila	Thermal bridges : S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38) m = 0.33 × (25) m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 37.1 36.87 36.63 35.54 35.34 34.39 34.39 34.21 34.75 35.34 35.75 36.18 Heat transfer coefficient, W/K (39) m = (37) + (38) m 39) m 83.8 83.56 83.33 82.24 82.04 81.08 81.08 80.91 81.45 82.04 82.45 82.88 Average = Sum(39), / 12= Heat loss parameter (HLP), W/m ² K (40) m = (39) m ÷ (4) 40) m 1.13 1.13 1.12 1.11 1.11 1.09 1.09 1.09 1.1 1.11 1.11													
	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=	83.8	83.56	83.33	82.24	82.04	81.08	81.08	80.91	81.45	82.04	82.45	82.88		
Heat lo	oss para	ameter (F	HLP). W	/m²K						-		12 /12=	82.24	(39)
	<u> </u>	· · · ·	<u>, </u>	1	1.11	1.09	1.09	1.09				1.12]	
(- /													1.11	(40)
Numb	er of day	ys in mo	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	1	(41)
		•		•	•					•	•	•		
4 W/2	ater hea	tina ene	rav reau	irement [.]								kWh/ve	ear:	
1			igy ioqu	ironnonn.										
				14	(0 0000	ио (тг	- 40.0		040/			.34		(42)
			+ 1.76 x	ti - exp	(-0.0003	549 X (1F	-A -13.9)2)] + 0.0	JU13 X (IFA -13.	.9)			
			ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		89	0.81]	(43)
		-				-	-	to achieve	a water us	se target o	f		1	
not mor	e that 125	litres per	person pe	r day (all w	ater use, l	not and co	ld)			1	1	1	,	
					,				Sep	Oct	Nov	Dec		
Hot wat	er usage i	n 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		
-						100					× /		1077.7	(44)
Energy	content of	not water	usea - cai	culated me	ontniy = 4.	190 x va,r	n x nm x L	JTM / 3600	v KVVN/MOR	nth (see Ta		<i>c,</i> 1 <i>a)</i>	1	
(45)m=	146.5	128.13	132.22	115.27	110.61	95.45	88.44	101.49						
lf instan	taneous v	vətor hoəti	na at noin	t of use (no	hot water	r storana)	ontor () in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1413.04	(45)
	r	. <u> </u>	- ·	·		·				17.05	10.0	04.00	1	(40)
			19.83	17.29	16.59	14.32	13.27	15.22	15.41	17.95	19.6	21.28		(46)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0	1	(47)
-							-					0	J	()
		-			-			. ,	ers) ente	ər '0' in (47)			
	storage			,					,	,	,			
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	j	(49)
Energ	y lost fro	om watei	⁻ storage	, kWh/ye	ear			(48) x (49)	=			0	j	(50)
b) If n	nanufact	turer's de	eclared	cylinder	loss fact	or is not	known:							
		age loss			le 2 (kW	h/litre/da	ay)					0	J	(51)
		neating s		on 4.3									1	(==)
		from Ta		2h								0		(52)
rempe	aurel	actor fro		20								0		(53)

-								(47) (54)	(50) (50)			I	(= .)
		m water (54) in (5	-	, KVVN/Ye	ear			(47) x (51)) x (52) x (53) =		0 0		(54) (55)
	. ,	loss cal		for each	month			((56)m = (55) x (41)	m		0	i	(33)
	-	0					r			0	0	0	I	(56)
(56)m= If cylinde	0 er contains	-	0 d solar sto	0 rage, (57)r	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0). else (5	0 7)m = (56)	m where (0 H11) is fro	0 m Append	j lix H	(30)
-				- · ·	 I	1							l	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
		loss (an										0		(58)
	•	loss cal			`		· ·	. ,						
•	· ·	1		1	i	r	i	<u> </u>	· ·	r thermo	,	0	I	(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	l I	(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 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=	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 of	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 (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 wa	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 >	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	de (57)	m in calc	culation	of (65)m	only if c	ylinder i:	s in the a	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
		s (Table												
metab	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)
	n dains	(calculat		nendix	L equat	ion I 9 o	riga)a	lso see	L Table 5				ł	
(67)m=	20.12	17.87	14.53	11	8.22	6.94	7.5	9.75	13.09	16.62	19.4	20.68	1	(67)
		ins (calc									-		i	. ,
(68)m=		208.82	203.41	191.91	177.38	163.73	154.61	152.47	157.87	169.38	183.9	197.55	1	(68)
											100.0	107.00	ł	()
		(calcula		-	L, equal 34.71		, 				24 71	24 71	I	(69)
(69)m=	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	34.71	l	(03)
-		ns gains	· · · · · · · · · · · · · · · · · · ·	· ·				-			-	_	I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
	-	aporatio	· •	· · · · · ·	· · · ·	· · ·	·						I	
(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)	i	i	i	i			i			1	
(72)m=	82.39	79.7	74.78	68.3	63.89	57.92	53.37	59.81	62.5	69.18	76.64	80.32		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	370.3	367.51	353.84	332.33	310.62	289.72	276.61	283.16	294.58	316.3	341.06	359.68		(73)

6. Solar gains:

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

Orientation:					Flux Table 6a			ations	g_ Table 6b			FF Table 6c			Gains (W)	
Southeast 0.9>	0.77	x	6.5	1	x [3	6.79	x		0.63	x	0.7] = [73.2	(77)
Southeast 0.9	0.77	x	6.5	1	x [6	2.67	x		0.63	×	0.7		=	124.69	(77)
Southeast 0.9	0.77	x	6.5	1	× [8	5.75	x		0.63	×	0.7		=	170.61	(77)
Southeast 0.9>	0.77	x	6.5	1	× [1(06.25	x		0.63	×	0.7		=	211.39	(77)
Southeast 0.9	0.77	x	6.5	1	×	1	19.01	×		0.63	×	0.7		=	236.78	(77)
Southeast 0.9	0.77	x	6.5	1	×	1	18.15	x		0.63	×	0.7		=	235.06	(77)
Southeast 0.9	0.77	x	6.5	1	× [1	13.91	x		0.63	×	0.7		=	226.63	(77)
Southeast 0.9	0.77	x	6.5	1	×	1(04.39	×		0.63	×	0.7		=	207.69	(77)
Southeast 0.9	0.77	x	6.5	1	×	9	2.85	x		0.63	x	0.7		=	184.73	(77)
Southeast 0.9	0.77	x	6.5	1	×	6	9.27	x		0.63	×	0.7		=	137.81	(77)
Southeast 0.9	0.77	x	6.5	1	× [4	4.07	x		0.63	×	0.7		=	87.68	(77)
Southeast 0.9	0.77	x	6.5	1	x [3	1.49	x		0.63	×	0.7		=	62.65	(77)
Northwest 0.9	0.77	x	3.0	6	x [1	1.28	x		0.63	×	0.7		=	10.55	(81)
Northwest 0.9	0.77	x	3.0	6	× [2	2.97	x		0.63	×	0.7		=	21.48	(81)
Northwest 0.9>	0.77	x	3.0	6	x	4	1.38	x		0.63	x	0.7		=	38.7	(81)
Northwest 0.9>	0.77	x	3.0	6	x	6	7.96	x		0.63	×	0.7		=	63.55	(81)
Northwest 0.9>	0.77	x	3.0	6	x	9	1.35	x		0.63	x	0.7		=	85.42	(81)
Northwest 0.9>	0.77	x	3.0	6	x [9	7.38	x		0.63	x	0.7		=	91.07	(81)
Northwest 0.9>	0.77	x	3.0	6	x [ę	91.1	x		0.63	×	0.7		=	85.2	(81)
Northwest 0.9>	0.77	x	3.0	6	x	7	2.63	x		0.63	x	0.7		=	67.92	(81)
Northwest 0.9>	0.77	x	3.0	6	× [5	0.42	x		0.63	×	0.7		=	47.15	(81)
Northwest 0.9	0.77	x	3.0	6	× [2	8.07	x		0.63	×	0.7		=	26.25	(81)
Northwest 0.9	0.77	x	3.0	6	× [14.2	x		0.63	×	0.7		=	13.28	(81)
Northwest 0.9>	0.77	x	3.0	6	x [ę	9.21	x		0.63	×	0.7		=	8.62	(81)
Solar gains i	n watte cale	sulated	for each	n month				(83)m	n – Su	ım(74)m .	(82)m					
(83)m= 83.75		209.3	274.94	322.2	1	26.14	311.82	275	- 1	231.88	164.0	-	71	.26		(83)
Total gains -	- internal and	d solar	(84)m =	: (73)m	+ (8	33)m	, watts								1	
(84)m= 454.0	6 513.68 5	563.15	607.28	632.82	61	15.85	588.43	558	.76	526.47	480.3	6 442.02	43	0.94		(84)
7. Mean inte	ernal tempe	rature (heating	seasor	י ו)							•	•			
Temperatur	e during he	ating pe	eriods ir	the livi	ing a	area f	from Tal	ble 9	, Th1	l (°C)					21	(85)
Utilisation fa	actor for gai	ns for li	ving are	a, h1,m	n (se	ee Ta	ble 9a)							I		
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov		Dec		
(86)m= 1	1	0.99	0.97	0.91	0).76	0.59	0.6	64	0.87	0.98	1		1		(86)
Mean interr	al temperat	ure in li	ving are	ea T1 (f	ollov	w ste	ps 3 to 7	7 in T	able	9c)		•				
(87)m= 19.8	<u> </u>	20.17	20.48	20.76	-	0.93	20.99	20.	-	20.86	20.51	20.1	19	9.77		(87)
Temperatur	e durina he	ating pe	eriods in	rest of	dw	ellina	from Ta	able 9	9, Th			•	-			
(88)m= 19.98	<u> </u>	19.98	19.99	20	-	0.01	20.01	20.	· ·	20	20	19.99	19	9.99		(88)
	· ·				•			•				•	•			

Ounse	ation fac	tor for g	ains for r	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.96	0.87	0.67	0.46	0.51	0.8	0.97	0.99	1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)														
(90)m=	18.37	18.58	18.92	19.37	19.75	19.96	20	20	19.89	, 19.42	18.82	18.35		(90)
	LI		¶						f	LA = Livin	g area ÷ (4	l) =	0.2	(91)
Mean internal temperature (for the whole dwelling) = fLA \times T1 + (1 – fLA) \times T2														
(92)m=	18.66	18.86	19.18	19.6	19.95	20.16	20.2	20.2	20.09	19.64	19.09	18.64		(92)
		nent to th	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	L				
(93)m=	18.66	18.86	19.18	19.6	19.95	20.16	20.2	20.2	20.09	19.64	19.09	18.64		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	ï to the r	nean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains u											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.07	0.00	0.40	0.54	0.04	0.00	0.00			(04)
(94)m=		0.99	0.98	0.95	0.87	0.69	0.49	0.54	0.81	0.96	0.99	1		(94)
(95)m=	452.08	509.28	, W = (94 552.4	+)m x (84 576.5	+)m 547.54	423.22	288.24	301.21	423.98	461.25	438.15	429.49		(95)
			ernal tem			_	200.24	501.21	423.30	401.25	430.13	429.49		(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)
			an intern											
(97)m=		1166.48	· · · · · ·	879.86	677.19	, 450.78	292.06	307.39	487.73	741.9	988.2	1196.62		(97)
Space	e heating	g require	ement fo	r each m	nonth, k	Wh/mont	h = 0.02	24 x [(97))m – (95)m] x (4′	1)m			
(98)m=	559.19	441.64	374.93	218.42	96.46	0	0	0	0	208.8	396.04	570.75		
								Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	2866.22	(98)
Space	e heating	g require	ement in	kWh/m²	/year							ĺ	38.68	(99)
9a. En	erav rea	uiremer	nts – Indi	vidual h	eating sv	/stems i	ncludina	micro-C				l		
	e heatin								(HP)					
•									HP)					
		ace hea	at from se	econdar	y/supple	mentary	system		HP)				0	(201)
Fract	ion of sp		at from se at from m			mentary		(202) = 1 -				[0	(201) (202)
		ace hea		ain syst	em(s)	mentary			- (201) =	(203)] =			-	4
Fract	ion of to	ace hea tal heatii	at from m	ain syst main sys	em(s) stem 1	mentary		(202) = 1 -	- (201) =	(203)] =			1	(202)
Fracti Efficie	ion of tot ency of r	ace hea tal heatii nain spa	at from m ng from i ace heati	nain syst main sys ing syste	em(s) stem 1 em 1		·	(202) = 1 -	- (201) =	(203)] =			1	(202)
Fracti Efficie	ion of tot ency of r ency of s	ace hea tal heatii nain spa seconda	at from m ng from r ace heati ry/supple	nain syst main syst ing syste	em(s) stem 1 em 1 y heating	g system	1, %	(202) = 1 - (204) = (20	- (201) = 02) × [1 - 1		Nov	Dec	1 1 93.4 0	(202) (204) (206) (208)
Fracti Efficie Efficie	ion of tot ency of r ency of s Jan	ace hea tal heatii main spa seconda Feb	nt from m ng from r ace heati ry/supple Mar	nain syst main syst ing syste ementar Apr	em(s) stem 1 em 1 y heating May	g system	·	(202) = 1 -	- (201) =	(203)] = Oct	Nov	Dec	1 1 93.4	(202) (204) (206) (208)
Fracti Efficie Efficie	ion of tot ency of r ency of s Jan	ace hea tal heatii main spa seconda Feb	at from m ng from r ace heati ry/supple	nain syst main syst ing syste ementar Apr	em(s) stem 1 em 1 y heating May	g system Jun	1, %	(202) = 1 - (204) = (20	- (201) = 02) × [1 - 1		Nov 396.04	Dec 570.75	1 1 93.4 0	(202) (204) (206) (208)
Fracti Efficie Efficie Space	ion of to ency of r ency of s Jan e heating 559.19	ace hea tal heatin main spa seconda Feb g require 441.64	at from m ng from r ace heati ry/supple Mar ement (c 374.93	nain syst main syst ing syste ementar Apr alculatee 218.42	em(s) stem 1 em 1 y heating May d above) 96.46	g system Jun	n, %	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 – 1 Sep	Oct			1 1 93.4 0	(202) (204) (206) (208) ar
Fracti Efficie Efficie Space	ion of to ency of r ency of s Jan e heating 559.19	ace hea tal heatin main spa seconda Feb g require 441.64	at from m ng from r ace heati ry/supple Mar ement (c	nain syst main syst ing syste ementar Apr alculatee 218.42	em(s) stem 1 em 1 y heating May d above) 96.46	g system Jun	n, %	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - 1 Sep	Oct			1 1 93.4 0	(202) (204) (206) (208)
Fracti Efficie Efficie Space	ion of tot ency of r ency of s Jan e heating 559.19 n = {[(98)	ace hea tal heatii main spa seconda Feb g require 441.64)m x (20	at from m ng from r ace heati ry/supple Mar ement (c 374.93 4)] } x 1	ain syst main syst ing syste ementar Apr alculated 218.42 00 ÷ (20	em(s) stem 1 em 1 y heating May d above) 96.46	g system Jun 0	n, % Jul 0	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - 1 Sep 0	Oct 208.8 223.56	396.04	570.75 611.08	1 1 93.4 0	(202) (204) (206) (208) ar
Fracti Efficie Space (211)m	ion of tot ency of r ency of s Jan e heating 559.19 n = {[(98) 598.7	ace hea tal heatin main spa seconda Feb g require 441.64)m x (20 472.84	at from m ng from n ace heati ry/supple Mar ement (c 374.93 (4)] } x 1 401.42	nain syst main syst ang syste amentar Apr alculated 218.42 00 ÷ (20 233.85	em(s) stem 1 em 1 y heating May d above) 96.46 06) 103.27	g system Jun 0	n, % Jul 0	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - 1 Sep 0	Oct 208.8 223.56	396.04 424.02	570.75 611.08	1 1 93.4 0 kWh/ye	(202) (204) (206) (208) ar (211)
Fracti Efficie Space (211)m	ion of tot ency of r ency of s Jan e heating 559.19 n = {[(98) 598.7 e heating	ace hea tal heatin main spa seconda Feb g require 441.64)m x (20 472.84 g fuel (se	at from m ng from r ace heati ry/supple Mar ement (c 374.93 4)] } x 1	nain syst main syst ing syste ementar Apr alculated 218.42 00 ÷ (20 233.85 y), kWh/	em(s) stem 1 em 1 y heating May d above) 96.46 06) 103.27	g system Jun 0	n, % Jul 0	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - 1 Sep 0	Oct 208.8 223.56	396.04 424.02	570.75 611.08	1 1 93.4 0 kWh/ye	(202) (204) (206) (208) ar (211)
Fracti Efficie Space (211)m	ion of tot ency of r ency of s Jan e heating 559.19 n = {[(98) 598.7 e heating	ace hea tal heatin main spa seconda Feb g require 441.64)m x (20 472.84 g fuel (se	at from m ng from n ace heati ry/supple Mar ement (c 374.93 (4)] } x 1 401.42 econdary	nain syst main syst ing syste ementar Apr alculated 218.42 00 ÷ (20 233.85 y), kWh/	em(s) stem 1 em 1 y heating May d above) 96.46 06) 103.27	g system Jun 0	n, % Jul 0	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - 1 Sep 0	Oct 208.8 223.56	396.04 424.02	570.75 611.08	1 1 93.4 0 kWh/ye	(202) (204) (206) (208) ar (211)
Fracti Efficie Space (211)m Space = {[(98	ion of tot ency of r ency of s Jan e heating 559.19 n = {[(98) 598.7 e heating	ace hea tal heatin main spa seconda Feb g require 441.64)m x (20 472.84 g fuel (se 11)] } x 1	at from m ng from r ace heati ry/supple Mar ament (c 374.93 (4)] } x 1 401.42 econdary 00 ÷ (20	nain syst main syst ementar Apr alculated 218.42 00 ÷ (20 233.85 y), kWh/ 8)	em(s) stem 1 em 1 y heating May d above) 96.46 06) 103.27 month	g system Jun 0	n, % Jul 0	(202) = 1 - (204) = (20 Aug 0 Tota 0	- (201) = 02) × [1 - 1 0 0 I (kWh/yea 0	Oct 208.8 223.56 ar) =Sum(2 0	396.04 424.02 211) _{15,1012}	570.75 611.08 -	1 1 93.4 0 kWh/ye	(202) (204) (206) (208) ar (211)

Water heating

Water neuting									
Output from water heater (calculated above)				I	I	I		I	
196.84 171.95 178.9 158.68 153.63	3 135.31	129.63	144.51	146.11	166.37	177.6	192.22		-
Efficiency of water heater		-	-			-	-	80.3	(216)
(217)m= 87.53 87.32 86.87 85.86 83.92	80.3	80.3	80.3	80.3	85.62	87.01	87.62		(217)
Fuel for water heating, kWh/month									
$(219)m = (64)m \times 100 \div (217)m$	1005	104.44	470.00	404.05	404.0	00444	040.07	I	
(219)m= 224.88 196.91 205.94 184.82 183.07	7 168.5	161.44	179.96	181.95	194.3	204.11	219.37		٦
			1018	II = Sum(2				2305.25	(219)
Annual totals		k	Wh/yea	kWh/year	7				
Space heating fuel used, main system 1								3068.76	
Water heating fuel used		2305.25							
Electricity for pumps, fans and electric keep-h	ot								
central heating pump:	30		(230c)						
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	75	(231)				
Electricity for lighting							355.33	(232)	
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =									(338)
12a. CO2 emissions – Individual heating sys	tems incl	uding mi	cro-CHF)					_
	Emissions								
		lergy Vh/year			kg CO	ion fac 2/kWh		kg CO2/yea	ır
Space heating (main system 1)	(21	1) x			0.2	16	=	662.85	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(21	9) x			0.2	16	=	497.93	(264)
Space and water heating	(26	1) + (262)	+ (263) + ((264) =				1160.79	(265)
Electricity for pumps, fans and electric keep-h	ot (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(23	2) x			0.5	19	=	184.42	(268)
Total CO2, kg/year				sum o	of (265)(271) =		1384.13	(272)

TER =

(273)

18.68