# **Regulations Compliance Report**

	on:			
ssessed By:	Ben Tunningley (	STRO027495)	Building Type:	End-terrace House
Owelling Details:				
EW DWELLING	AS BUILT		Total Floor Area: 77.	44m²
te Reference :	Albany Farm		Plot Reference:	Plot 021
ddress :	36 Buttercup Roa	ad, Bishops Waltham, SOUTH	AMPTON , SO32 1RJ	
Client Details:				
ame:	Bargate Homes			
dress :	The New Barn, V	′icarage Farm Business Par, Wi	inchester Road, Fair Oak, SC	950 7HD
•		within the SAP calculations.		
a TER and DER		ations compliance.		
	ing system: Mains g	Jas		
uel factor: 1.00 (r	• •	<b>J</b>		
arget Carbon Dio	oxide Emission Rate	) (TER)	19.06 kg/m <sup>2</sup>	
-	Dioxide Emission Ra	ate (DER)	14.29 kg/m²	OK
b TFEE and DF				
•	rgy Efficiency (TFE		54.3 kWh/m <sup>2</sup>	
weiling Fabric Er	nergy Efficiency (DF	·EE)	46.7 kWh/m²	ОК
2 Fabric U-value	S			
Element		Average	Highest	
External v		0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wal	I	0.00 (max. 0.20)	-	OK
Floor		0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof Openings		0.11 (max. 0.20) 1.40 (max. 2.00)	0.11 (max. 0.35) 1.40 (max. 3.30)	OK OK
		1.40 (Max. 2.00)	1.40 (max. 5.50)	UK CK
a Thermal bride		from linear thermal transmittand	ces for each junction	
	bridging calculated			
Thermal b Air permeabilit	ty			
Thermal b Air permeabilit Air permeab			4.75	OK
Thermal I Air permeabilit Air permeat Maximum	ty bility at 50 pascals		4.75 10.0	ок
Thermal t Air permeabilit Air permeat Maximum Heating efficie	ty bility at 50 pascals ency	Database: (rev 482, product	10.0	ОК
Thermal b Air permeabilit Air permeab Maximum	ty bility at 50 pascals ency	Database: (rev 482, product Boiler systems with radiator	10.0 t index 017929):	
Thermal t Air permeabilit Air permeat Maximum Heating efficie	ty bility at 50 pascals ency	· ·	10.0	
Thermal t Air permeabilit Air permeat Maximum Heating efficie	ty bility at 50 pascals ency	Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI	10.0 t index 017929):	
Thermal t Air permeabilit Air permeat Maximum Heating efficie	ty bility at 50 pascals ency	Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35	10.0 t index 017929):	
Thermal t Air permeabilit Air permeat Maximum Heating efficie	ty bility at 50 pascals ency	Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi)	10.0 t index 017929): s or underfloor heating - mair	
Thermal b Air permeabilit Air permeab Maximum Heating efficie	ty bility at 50 pascals ency	Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi) Efficiency 89.6 % SEDBUK2	10.0 t index 017929): s or underfloor heating - mair	is gas
3 Air permeabilit Air permeat Maximum 4 Heating efficie	ty bility at 50 pascals ency	Boiler systems with radiator Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi)	10.0 t index 017929): s or underfloor heating - mair	

# **Regulations Compliance Report**

cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls Hot water controls:	Programmer, room therm No cylinder thermostat No cylinder	nostat and TRVs	ОК
Boiler interlock:	Yes		ОК
ow energy lights			
Percentage of fixed lights w 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:	land):	Slight	OK
Overshading: Windows facing: South Wes Windows facing: North East Windows facing: South East Ventilation rate: Blinds/curtains:		Very Little 3.72m <sup>2</sup> 7.39m <sup>2</sup> 0.66m <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:						
	or Name re Name:		en Tunnii roma FS	• •			Softwa	a Num are Vei	rsion:			027495 n: 1.0.5.41	
			_				Address						
Address			Buttercu	p Road ,	, Bishops	s Waltha	am, SOL	ITHAMP	TON , S	032 1R	J		
1. Overa	all dwelling	dimensior	IS:			<b>A</b>	n (ma 2)			aub ( / ma )		\/ e	
Ground flo	oor					-	a(m²)	(1a) x	Av. He		(2a) =	Volume(m <sup>3</sup> )	(3a)
							38.72			.46	1	95.25	
First floor						3	88.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor	r area TFA	= (1a)+(1	b)+(1c)+	(1d)+(1e	e)+(1r	I) 7	7.44	(4)					
Dwelling	volume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	202.51	(5)
2. Ventila	ation rate:												
			main heating		econdar leating	у	other		total			m <sup>3</sup> per hour	
Number o	of chimneys		0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number o	of open flue	s [	0	- - + -	0	_ + _	0	 ] = [	0	x 2	20 =	0	(6b)
Number o	of intermitte	nt fans						- L	0	x 1	10 =	0	_ ](7a)
Number o	of passive v	ents							0	x 1	10 =	0	_ ](7b)
	, of flueless g								0	x 4	40 =	0	](7c)
								L	0			0	(70)
											Air ch	anges per ho	ur
Infiltration	n due to chi	mneys, flu	ues and fa	ans = (6	a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	0	<u> </u>	÷ (5) =	0	(8)
	surisation test	•						continue fr					
	r of storeys		velling (ne	s)								0	(9)
	nal infiltratio									[(9)-	-1]x0.1 =	0	(10)
	ral infiltratio								uction			0	(11)
	types of wall ting areas of o	•			ponaing to	the great	er wall are	a (atter					
lf suspe	ended wood	den floor,	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no dra	aught lobby	v, enter 0.	05, else e	enter 0								0	(13)
Percent	tage of win	dows and	doors dr	aught st	ripped							0	(14)
	v infiltration						_	2 x (14) ÷ 1				0	(15)
Infiltrati								+ (11) + (1				0	(16)
	neability va						•	•	etre of e	nvelope	area	4.75	(17)
	on air perme eability value	•							is being u	ed		0.24	(18)
	of sides she		163301138110		s been don		yree all pe	ппеаышу	is being us	500		2	(19)
Shelter fa							(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration	rate incorp	porating s	helter fac	tor			(21) = (18	) x (20) =				0.2	(21)
Infiltration	rate modif	ied for mo	onthly wir	nd speed	1								_
	Jan Fel	o Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly a	werage wir	d speed f	rom Tabl	e 7									
(22)m=	5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	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	ation rat	e (allow	ing for sl	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			-		 Г		
	echanica			ondix N (2	(25) - (22)	) x Emy (	oquation (	N5)) , othe	nuico (23)	(220)		l	0.5	(23a)
			• • • •		, ,	, ,		n Table 4h		0) – (20a)		l	0.5	(23b)
			-	-	-					() ()	22h) I	[ 1 (22a)	0	(23c)
(24a)m=									a = (2	0	230) × [	$\frac{1-(23c)}{0}$	÷ 100]	(24a)
	-			-	-	-	-		-		-	0		(240)
,			anical ve			· · · · ·	1	0	p)m = (2	2b)m + (	, 1			(24b)
(24b)m=		0			-	0	0			0	0	0		(240)
,					•	•		on from $(22)$		).5 × (23t	)			
(24c)m=	r í í	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5		(24c)
		ventilatio	n or wh				l ventilati	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 - er	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)
2 40	at losso	and he		paramet	or:		•		•					
ELEN		Gros		Openin		Net A	rea	U-val	ue	AXU		k-value	Δ	Xk
		area		n	-	A ,i		W/m2		(W/		kJ/m²·k		J/K
Doors						2.1	x	1.4	=	2.94				(26)
Window	ws Type	1				3.72	x1	/[1/( 1.4 )+	0.04] =	4.93				(27)
Windo	ws Type	2				7.39	x1	/[1/( 1.4 )+	0.04] =	9.8				(27)
Window	ws Type	3				0.66	x1	/[1/( 1.4 )+	0.04] =	0.88				(27)
Floor						38.7	· x	0.11	=	4.257		75	2902	
Walls		91.9	96	13.8	7	78.09		0.24		18.74		60	4685	=
Roof		38.7		0		38.7		0.11		4.26		9	348.4	
	rea of el	L				169.3		0.11		4.20		5		(31)
Party v			,									45		`
						45.6		0	=	0		45	2055.	
	I wall **					69.98	8					9	629.8	
	l wall **					73.74	4					9	663.63	
Interna						38.72	2					18	696.9	96 (32d)
Interna	l ceiling					38.7	2					9	348.4	48 <mark>(32e</mark> )
				effective wi nternal wal			lated using	g formula 1	l/[(1/U-val	ue)+0.04] a	as given ir	n paragraph	3.2	

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

(33)

(34)

(35)

can be ι	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						7.45	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			53.25	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.91	33.57	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41		(38)
Heat ti	ransfer o	coefficie	nt, W/K				-	-	(39)m	= (37) + (3	38)m	-		
(39)m=	87.16	86.82	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66		
						I	1			Average =	Sum(39)1.	12 /12=	86.72	(39)
Heat lo	oss para	ameter (H	HLP), W/	/m²K		-			(40)m	= (39)m ÷	(4)			
(40)m=	1.13	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
Numb	or of day	ys in moi	oth (Tab	10 10)					,	Average =	Sum(40)1	12 /12=	1.12	(40)
NUITID	Jan	Feb	Mar	,	May	Jun	Jul	Δυσ	Sep	Oct	Nov	Dec		
(11)m-	31	28	31	Apr 30	31	30	31	Aug 31	30	31	30	31		(41)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ned occu	upancy, I	N								2	41		(42)
		9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	)013 x (	TFA -13.				(/
	A £ 13.													
		ge hot wa al average								se target o		1.5		(43)
		i litres per				-	-			jo larger e				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat		in litres per			,				000	000		200		
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
()	100.00	00.00	00.00	00.07	00.01	02.00	02.00	00.01			m(44) <sub>112</sub> =		1097.96	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	0Tm / 3600			× /		1001.00	
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55		
		I	I					I		L Total = Su	L m(45) <sub>112</sub> =		1439.6	(45)
lf instan	taneous v	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	22.39	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
Water	storage	loss:												
Storag	e volum	ne (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
		neating a			•			• •						
		o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	ər '0' in (	47)			
	storage					. /1 \ \ //	(1-)						I	
		turer's de			or is kno	wn (kvvr	n/day):					0		(48)
		actor fro										0		(49)
		om water	-			or 10		(48) x (49)	=			0		(50)
		turer's de age loss		•								0	l	(51)
		neating s				., nu 6/ U6	•y)					0		(51)
		from Ta										0		(52)
		actor fro		2b								0		(53)

		m water	-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
	. ,	(54) in (5	,	far aaab				((EC)) ~ (	EE) (44)	~		0	I	(55)
vvater	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m •			1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	()m = (56)	m where (	H11) is fro	m Append	IX H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
Total h	heat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		(62)
Solar Dł	-IW input of	calculated	using App	endix G or	· Appendix	H (negati <sup>,</sup>	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	t from w	ater hea	ter											
(64)m=		142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
								Outp	out from wa	ater heate	r (annual)₁	12	1601.57	(64)
Heat q	ains fro	m water	heating.	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	۲ [(46)m	+ (57)m	+ (59)m	1	-
(65)m=	53.07	46.51	48.23	42.38	40.91	35.66	33.4	37.82	38.12	43.98	47.59	51.5	-	(65)
inclu	L Ide (57)	n in calc	ulation	u of (65)m	only if c	ı vlinder i	s in the a	u dwellina	or hot w	ater is fr	om com	munitv h	eating	
	. ,	ains (see		. ,	-	<b>,</b>						,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,	g	
ivietad	Jan	s (Table Feb	5), vvat Mar	ts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75	144.75		(66)
Ì,										144.75	144.70	1.75		(00)
(67)m=	<u> </u>	(calcula 43.15	35.09	26.57	L, equat 19.86	16.77	18.12	23.55	31.61	40.13	46.84	49.94		(67)
											40.04	49.94		(07)
•••		ins (calc		· · ·	· ·	i	i	, ·			004.00	005.00		(69)
(68)m=		322.73	314.38	296.59	274.15	253.05	238.96	235.64	244	261.78	284.22	305.32	I	(68)
	<u> </u>	(calcula			· · ·	r	, 	1					1	
(69)m=		51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	51.89	I	(69)
Pumps	s and fai	ns gains	(Table &	5a)	r								l .	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	I	(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)	-	-	_	-				
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
Water	heating	gains (T	able 5)											
(72)m=	71.33	69.21	64.82	58.86	54.98	49.53	44.89	50.83	52.94	59.12	66.09	69.22		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	542.46	538.23	517.43	485.16	452.13	422.49	405.11	413.16	431.69	464.17	500.3	527.61		(73)

#### 6. Solar gains:

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

0	e calculated using Access Facto Table 6d		Area m <sup>2</sup>	a anu	Flux Table 6a	luons	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	1	x	7.39	x	11.28	×	0.45	×	1.11	=	37.52	(75)
Northeast 0.9x	1	x	7.39	x	22.97	×	0.45	×	1.11	=	76.38	(75)
Northeast 0.9x	1	x	7.39	x	41.38	×	0.45	x	1.11	=	137.61	(75)
Northeast 0.9x	1	x	7.39	x	67.96	x	0.45	x	1.11	=	225.99	(75)
Northeast 0.9x	1	x	7.39	x	91.35	x	0.45	x	1.11	=	303.77	(75)
Northeast 0.9x	1	x	7.39	x	97.38	×	0.45	×	1.11	=	323.85	(75)
Northeast 0.9x	1	x	7.39	x	91.1	×	0.45	×	1.11	=	302.96	(75)
Northeast 0.9x	1	x	7.39	x	72.63	×	0.45	x	1.11	=	241.52	(75)
Northeast 0.9x	1	x	7.39	x	50.42	×	0.45	×	1.11	=	167.67	(75)
Northeast 0.9x	1	x	7.39	x	28.07	×	0.45	x	1.11	=	93.34	(75)
Northeast 0.9x	1	x	7.39	x	14.2	x	0.45	x	1.11	=	47.21	(75)
Northeast 0.9x	1	x	7.39	x	9.21	×	0.45	x	1.11	=	30.64	(75)
Southeast 0.9x	1	x	0.66	x	36.79	x	0.45	×	1.11	=	10.93	(77)
Southeast 0.9x	1	x	0.66	x	62.67	x	0.45	×	1.11	=	18.61	(77)
Southeast 0.9x	1	x	0.66	x	85.75	x	0.45	x	1.11	=	25.47	(77)
Southeast 0.9x	1	x	0.66	x	106.25	×	0.45	×	1.11	=	31.56	(77)
Southeast 0.9x		x	0.66	x	119.01	×	0.45	x	1.11	=	35.35	(77)
Southeast 0.9x	1	x	0.66	x	118.15	×	0.45	×	1.11	=	35.09	(77)
Southeast 0.9x	1	x	0.66	x	113.91	x	0.45	x	1.11	=	33.83	(77)
Southeast 0.9x	1	x	0.66	x	104.39	×	0.45	x	1.11	=	31	(77)
Southeast 0.9x	1	x	0.66	x	92.85	×	0.45	×	1.11	=	27.58	(77)
Southeast 0.9x		x	0.66	x	69.27	×	0.45	x	1.11	=	20.57	(77)
Southeast 0.9x		x	0.66	x	44.07	×	0.45	x	1.11	=	13.09	(77)
Southeast 0.9x		x	0.66	x	31.49	×	0.45	x	1.11	=	9.35	(77)
Southwest <sub>0.9x</sub>		x	3.72	x	36.79		0.45	x	1.11	=	61.59	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	62.67		0.45	x	1.11	=	104.92	(79)
Southwest0.9x		x	3.72	x	85.75		0.45	x	1.11	=	143.55	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	106.25		0.45	x	1.11	=	177.87	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	119.01		0.45	x	1.11	=	199.22	(79)
Southwest0.9x		x	3.72	x	118.15		0.45	x	1.11	=	197.78	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	113.91		0.45	x	1.11	=	190.68	(79)
Southwest <sub>0.9x</sub>	1	x	3.72	x	104.39		0.45	x	1.11	=	174.75	(79)
Southwest <sub>0.9x</sub>		x	3.72	×	92.85		0.45	×	1.11	=	155.43	(79)
Southwest <sub>0.9x</sub>		x	3.72	×	69.27		0.45	×	1.11	=	115.95	(79)
Southwest <sub>0.9x</sub>		x	3.72	×	44.07		0.45	×	1.11	=	73.77	(79)
Southwest <sub>0.9x</sub>	1	x	3.72	x	31.49		0.45	×	1.11	=	52.71	(79)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	110.04	199.91	306.62	435.41	538.34	556.73	527.47	447.27	350.69	229.86	134.07	92.7		(83)
Total g	jains – ii	nternal a	and solar	r (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	652.5	738.14	824.05	920.57	990.47	979.21	932.58	860.44	782.37	694.03	634.37	620.32		(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=	0.97	0.95	0.91	0.83	0.7	0.53	0.4	0.45	0.67	0.87	0.95	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.59	19.81	20.14	20.52	20.8	20.94	20.98	20.98	20.87	20.49	19.97	19.54		(87)
Temp	erature	during h	heating p	eriods ir	n rest of	dwelling	from Ta	able 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	0.94	0.9	0.8	0.65	0.46	0.31	0.36	0.6	0.84	0.94	0.97		(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=	18.72	18.93	19.25	19.6	19.85	19.96	19.98	19.98	19.91	19.59	19.09	18.67		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.21	(91)
Maan	interne		atura (fa			lline ar) fl	Δ	. (4 4	A) <b>T</b> O					
(92)m=	18.9	19.11	19.43	or the wh 19.79	20.05	20.16	20.19	+ (1 – 1L 20.19	A) X 12	19.78	19.28	18.85		(92)
				n internal							19.20	10.05		(02)
(93)m=	18.75	18.96	19.28	19.64	19.9	20.01	20.04	20.04	19.96	19.63	19.13	18.7		(93)
. ,			uirement		1010				10100	10100	10110			()
				mperatu	re obtain	ed at ste	on 11 of	Table Q	h so tha	t Ti m-('	76)m an	d re-calc	ulate	
				using Ta					o, oo ma	( i,iii=(i	r o)m an			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.95	0.93	0.88	0.79	0.64	0.46	0.32	0.36	0.59	0.83	0.93	0.96		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	621.94	686.11	727.59	726	634.09	451.65	294.9	309.86	465.13	575.13	588.98	595.24		(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=	1259.33	1221.01	1107.91	931.01	710.52	469.06	298.12	315.09	507.99	782.63	1042.26	1256.74		(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=	474.22	359.45	282.95	147.61	56.87	0	0	0	0	154.38	326.36	492.16		_
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2294	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								29.62	(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 m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								90.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	· · ·	alculate	d above)		i				1	-	-	
	474.22	359.45	282.95	147.61	56.87	0	0	0	0	154.38	326.36	492.16		
(211)m	n = {[(98	i	r	100 ÷ (20	)6)								7	(211)
	524	397.18	312.65	163.1	62.84	0	0	0	0	170.59	360.62	543.82		-
•	)m x (20	g fuel (s 01)] } x 1 0		ry), kWh/ 08) 0	month	0	0	0	0	0	211) <sub>15,1012</sub>	0	2534.8	(211)
(215)11=	0	0	0	0	0	0	0	-	-	-	215) <sub>15,1012</sub>	-	0	(215)
	heating	-	ter (calc	ulated a	bove)			, ota			- 10715,1012	2	0	](213)
-	163.01	142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		_
Efficier	ncy of w	ater hea	iter	i									87.3	(216)
(217)m=	89.66	89.57	89.37	88.97	88.27	87.3	87.3	87.3	87.3	88.97	89.48	89.7	J	(217)
		heating,												
(219)m=		m x 100 159.62	166.12	146.97	143.25	126.63	118.97	134.2	135.1	152.51	163.63	176.48	1	
		1	1	1			1	Tota	I = Sum(2	19a) <sub>112</sub> =	1	1	1805.29	(219)
Annua	I totals									k	Wh/year	r	kWh/year	-
Space	heating	fuel use	ed, main	system	1								2534.8	
Water	heating	fuel use	d										1805.29	]
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								-
mech	anical v	entilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Э			52.27	]	(230a)
centra	al heatir	ng pump	:									30	]	(230c)
		ian-assis										45	]	(230e)
				kWh/yea	r			sum	of (230a).	(230a) =			127.27	(231)
	city for l		ubovc, 1	KWIII/you	.1					(				(232)
													343.21	1
		erated b	•		) (004)	(004)	(000)	(0071)					-494.01	(233)
				ses (211		+ (231)	+ (232).	(237D)	=				4316.58	(338)
10a. F	-uel cos	sts - indiv	vidual he	eating sy	stems:									
						Fu kW	<b>el</b> /h/year			<b>Fuel P</b> (Table			<b>Fuel Cost</b> £/year	
Space	heating	- main s	system 1	1		(217	1) x			3.4	8	x 0.01 =	88.21	(240)
Space	heating	ı - main s	system 2	2		(21:	3) x			0		x 0.01 =	0	(241)
Space	heating	- secon	dary			(21	5) x			13.	19	x 0.01 =	0	(242)

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	62.82 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	16.79 (249)
(if off-peak tariff, list each of (230a) to (230g)			
Energy for lighting	(232)	13.19 × 0.01 =	45.27 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01 =	-65.16 (252)
Appendix Q items: repeat lines (253) and (257) <b>Total energy cost</b> (245)	54) as needed 5)(247) + (250)(254) =		267.93 (255)
11a. SAP rating - individual heating system	IS		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(25	5) x (256)] ÷ [(4) + 45.0] =		0.92 (257)
SAP rating (Section 12)			87.18 (258)
12a. CO2 emissions – Individual heating sy	stems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	547.52 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	389.94 (264)
Space and water heating	(261) + (262) + (263) + (264)	4) =	937.46 (265)
Electricity for pumps, fans and electric keep-	-hot (231) x	0.519 =	66.06 (267)
Electricity for lighting	(232) x	0.519 =	178.13 (268)
Energy saving/generation technologies Item 1		0.519 =	-256.39 (269)
Total CO2, kg/year		sum of (265)(271) =	925.25 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	11.95 (273)
El rating (section 14)			90 (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 =	3092.46 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2202.46 (264)
Space and water heating	(261) + (262) + (263) + (264)	4) =	5294.92 (265)
Electricity for pumps, fans and electric keep-	-hot (231) x	3.07 =	390.73 (267)
Electricity for lighting	(232) x	0 =	1053.67 (268)
Energy saving/generation technologies Item 1		3.07 =	-1516.61 (269)

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

(272) ÷ (4) =

5222.71	(272)
67.44	(273)

					User D	Details:						
Assessor Name: Software Name:		n Tunnir oma FS	•••			Softwa	a Num are Vei	rsion:			027495 on: 1.0.5.41	
		<b>-</b>	<u> </u>			Address			000 15			
Address :		Buttercu	p Road ,	, Bishops	s Waltha	am, SOU	ЛТНАМР	TON, S	5032 1R.	J		
1. Overall dwelling dir	nension	S:			•	- ( 2)		A 11	·			
Ground floor						a(m²)	(10) X		ight(m)		Volume(m <sup>3</sup> )	
						38.72	(1a) x	2	.46	(2a) =	95.25	(3a)
First floor					3	38.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor area TFA =	(1a)+(1b	o)+(1c)+(	(1d)+(1e	e)+(1r	i) 7	7.44	(4)					
Dwelling volume							(3a)+(3b)	)+(3c)+(3d	d)+(3e)+	.(3n) =	202.51	(5)
2. Ventilation rate:												
		main heating		econdar leating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	ſ	0	<u>ה ר ר</u>	0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	Г	0	- 	0	ī + Ē	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent	fans							0	x 1	0 =	0	(7a)
Number of passive ver	nts						Г	0	x 1	0 =	0	(7b)
Number of flueless gas	s fires						Γ	0	x 4	40 =	0	(7c)
										Air ob	ongoo nor hou	_ 
lafiltzation due to obim	an an flui			a) . (6b) . (7	a) (7b) (	70) -	Г				anges per hou	-
Infiltration due to chimi If a pressurisation test ha	•						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 great	ter wall are	ea (after					_
If suspended woode	• /	•		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby,	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	4.75	(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 us	sed			
Shelter factor	leu					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorpo			(21) = (18	) x (20) =				0.2	](21)			
Infiltration rate modifie	-			ł							0.2	J, .,
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 (2	22a)m =	(22)m ÷	4										_		
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	5	0.92	1	1.08	1.12	1.18	]		
Adjuste	ed infiltr	ation rat	e (allowi	ing for sł	nelter an	d wind s	speed	) = (	(21a) x	(22a)m	1					
	0.26	0.25	0.25	0.22	0.22	0.19	0.19	9	0.19	0.2	0.22	0.23	0.24			
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	ise									(23a)
				endix N. (2	23b) = (23a	i) x Fmv (e	equatio	n (N	5)) . other	wise (23	3b) = (23a)				0.5	(23b)
					allowing f						()				0.5	(23c)
			-	-	-						22b)m +	(23b) x	[1 – (23c)	L ) ÷ 100	-	_(200)
(24a)m=	0	0	0	0	0	0			0	0	0	0	0	]	1	(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat red	coverv	/ (M	IV) (24b	)m = (2	 22b)m +	(23b)		1		
, (24b)m=	0	0	0	0	0	0	0		0	0	0	0	0	1		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	e input	ventila	atior	n from c	utside	1	-		1		
i	f (22b)r	n < 0.5 ×	< (23b), t	then (24	c) = (23b	); other	wise (	24c	;) = (22b	) m +	0.5 × (23	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)
					se positiv b)m othe						x 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 (	(24c	d) in box	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	paramet	er:											
ELEN		Gros		Openin		Net Ar	ea		U-valu	le	ΑXΙ	J	k-value	Э	АX	k
		area	(m²)	. n	-	A ,r	m²	_	W/m2	K	(W	/K)	kJ/m²-l	K	kJ/K	ζ.
Doors						2.1		x	1.4	=	2.94					(26)
Window	ws Type	e 1				3.72		x1/[	1/( 1.4 )+	0.04] =	4.93					(27)
Window	ws Type	e 2				7.39		x1/[	1/( 1.4 )+	0.04] =	9.8					(27)
Window	ws Type	e 3				0.66		x1/[	1/( 1.4 )+	0.04] =	0.88					(27)
Floor						38.7		<b>x</b> [	0.11	=	4.25	7	75		2902.5	(28)
Walls		91.9	96	13.8	7	78.09	Э	x [	0.24	=	18.7	4	60		4685.4	(29)
Roof		38.7	72	0		38.72	2	x [	0.11	=	4.26		9		348.48	(30)
Total a	rea of e	elements	, m²			169.3	8	_								(31)
Party v	vall					45.67	7	x	0	_ =	0		45		2055.15	(32)
Interna	l wall **					69.98	3	-					9	Ē	629.856	(32c)
Interna	l wall **					73.74	4						9	Ē	663.6366	(32c)
Interna	l floor					38.72	2						18	$\exists$	696.96	(32d)
Interna	l ceiling	J				38.72	2						9	Ē	348.48	(32e)
* for wine	dows and	l roof wind	ows, use e	effective wi	indow U-va	alue calcui	lated us	sing	formula 1,	/[(1/U-va	lue)+0.04]	as given i	n paragraph	1 3.2		-

\*\* 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) =

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

45.8

12330.46

159.23

(33)

(34)

(35)

can be l	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						7.45	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			53.25	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			-	(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.91	33.57	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41	33.41		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	87.16	86.82	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66		
Heat lo	oss para	ameter (H	HLP), W	/m²K				•		Average = = (39)m ÷	Sum(39)1. · (4)	<sub>12</sub> /12=	86.72	(39)
(40)m=	1.13	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12		
				I		I	I	I	,	Average =	Sum(40)1.	<sub>12</sub> /12=	1.12	(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 requ	irement:								kWh/ye	ear:	
A			N 1										1	
if TF				[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		41		(42)
Annua	l averag	je hot wa						(25 x N) to achieve		se target o		1.5	]	(43)
		i litres per				-	-			Ū				
	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	Table 1c x	(43)			•		1	
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
			1					1			m(44) <sub>112</sub> =		1097.96	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55		
lf instan	taneous v	vator hoati	na at noint	of use (no	hot water	r storage)	ontor () in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1439.6	(45)
	r	. <u> </u>		· · ·						40.00	40.07	04.00	1	(AC)
(46)m= Water	22.39 storage	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
	•		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
-		neating a					-						1	
		-			-			mbi boil	ers) ente	er '0' in (	47)			
Water	storage	loss:												
a) If m	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
		om water	-	-				(48) x (49)	=			0		(50)
,		turer's de		•								•	1	(54)
		age loss neating s			5 Z (KVV)	n/nue/08	iy)					0	ļ	(51)
		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)
	. ,	loss cal		for each	month			((56)m = (	55) × (41)	m		<u> </u>		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	l	(56)
		-							-	m where (		-	 ix H	()
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
						Ů	Ŭ	0		Ů				
		loss (an loss cal				50)m - (	(EQ) · 26	5 ~ (11)	~			0		(58)
	•				`	,	· ·	. ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
		l culated	for oach	month (	(61)m –	(60) · 20	$\frac{1}{25 \times (41)}$	m						
(61)m=	13.76	12.43	13.76	13.31	13.76	13.31	13.76	13.76	13.31	13.76	13.31	13.76		(61)
													(50) m + (61) m	(01)
(62)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	(62)m = 117.16	0.65 × (	(45)/11 +	(40)III + 146.42	(57)11 +	(59)m + (61)m	(62)
		_								r contributi				(02)
		l lines if								r contribut	UN IO WAIE	i neating)		
(63)m=		0			0				0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
	from w	ater hea												
(64)m=	163.01	142.97	148.46	130.75	126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
(0.)										ater heater			1601.57	(64)
Heat a	ains fro	m water	heating	kWh/m	onth 0.24	5 ´ [0 85	<b>x</b> (45)m			k [(46)m				], ,
(65)m=	53.07	46.51	48.23	42.38	40.91	35.66	33.4	37.82	38.12	43.98	47.59	51.5	1	(65)
										ater is fr			leating	
	. ,	ains (see		. ,	-	Synnach is	5 11 110 0	wennig				interney i	leating	
					).									
Metabo		<u>s (Table</u> Feb	5), Wat Mar	ts Apr	May	lup	lul	Δυσ	Son	Oct	Nov	Dec		
(66)m=	Jan 120.62	120.62	120.62	120.62	120.62	Jun 120.62	Jul 120.62	Aug 120.62	Sep 120.62	Oct 120.62	Nov 120.62	Dec 120.62		(66)
		(calcula								120.02	120.02	120.02		(00)
(67)m=	20.11	(Calcula 17.86	14.53	11	8.22	6.94	7.5	9.75	13.08	16.61	19.39	20.67	l	(67)
											10.00	20.07		(07)
••		ins (calc 216.23	210.63	198.72	183.68	169.55	160.1	3a), aisc 157.88	163.48	175.39	190.43	204.56	l	(68)
(68)m=											190.43	204.30		(00)
	<u> </u>	(calcula			· ·	r	, I		·	r	25.00	25.00	l	(60)
(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06		(69)
-		ns gains	· · · · · · · · · · · · · · · · · · ·	· ·									I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
	-	aporatio	· •	· · · · · ·	· · · ·	· · ·							I	
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
		gains (T	,	i									l	
(72)m=	71.33	69.21	64.82	58.86	54.98	49.53	44.89	50.83	52.94	59.12	66.09	69.22		(72)
Total i		gains =				(66)	m + (67)m		+ (69)m + (	(70)m + (7	1)m + (72)	m	I	
(73)m=	367.63	365.49	352.17	330.76	309.07	288.2	274.68	280.65	291.69	313.31	338.1	356.65		(73)

#### 6. Solar gains:

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

Orientation:	<ul> <li>calculated using</li> <li>Access Facto</li> <li>Table 6d</li> </ul>		Area m²	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	7.39	×	11.28	x	0.45	×	1.11	=	28.89	(75)
Northeast 0.9x	0.77	x	7.39	x	22.97	x	0.45	x	1.11	=	58.81	(75)
Northeast 0.9x	0.77	x	7.39	x	41.38	x	0.45	x	1.11	=	105.96	(75)
Northeast 0.9x	0.77	x	7.39	x	67.96	x	0.45	x	1.11	=	174.01	(75)
Northeast 0.9x	0.77	x	7.39	x	91.35	x	0.45	x	1.11	=	233.9	(75)
Northeast 0.9x	0.77	x	7.39	×	97.38	x	0.45	x	1.11	=	249.37	(75)
Northeast 0.9x	0.77	x	7.39	×	91.1	x	0.45	x	1.11	=	233.28	(75)
Northeast 0.9x	0.77	x	7.39	×	72.63	x	0.45	x	1.11	=	185.97	(75)
Northeast 0.9x	0.77	x	7.39	×	50.42	x	0.45	×	1.11	=	129.11	(75)
Northeast 0.9x	0.77	x	7.39	×	28.07	x	0.45	x	1.11	=	71.87	(75)
Northeast 0.9x	0.77	x	7.39	x	14.2	x	0.45	x	1.11	=	36.35	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	x	0.45	x	1.11	=	23.59	(75)
Southeast 0.9x	0.77	x	0.66	x	36.79	x	0.45	x	1.11	=	8.41	(77)
Southeast 0.9x	0.77	x	0.66	x	62.67	x	0.45	x	1.11	=	14.33	(77)
Southeast 0.9x	0.77	x	0.66	x	85.75	x	0.45	x	1.11	=	19.61	(77)
Southeast 0.9x	0.77	x	0.66	x	106.25	x	0.45	x	1.11	=	24.3	(77)
Southeast 0.9x	0.77	x	0.66	x	119.01	x	0.45	x	1.11	=	27.22	(77)
Southeast 0.9x	0.77	x	0.66	x	118.15	x	0.45	x	1.11	=	27.02	(77)
Southeast 0.9x	0.77	x	0.66	x	113.91	x	0.45	x	1.11	=	26.05	(77)
Southeast 0.9x	0.77	x	0.66	x	104.39	x	0.45	x	1.11	=	23.87	(77)
Southeast 0.9x	0.77	x	0.66	x	92.85	x	0.45	x	1.11	=	21.23	(77)
Southeast 0.9x	0.77	x	0.66	x	69.27	x	0.45	x	1.11	=	15.84	(77)
Southeast 0.9x	0.77	x	0.66	x	44.07	x	0.45	×	1.11	=	10.08	(77)
Southeast 0.9x	0.77	x	0.66	x	31.49	x	0.45	x	1.11	=	7.2	(77)
Southwest0.9x	0.77	x	3.72	x	36.79		0.45	×	1.11	=	47.43	(79)
Southwest0.9x	0.77	x	3.72	x	62.67		0.45	×	1.11	=	80.78	(79)
Southwest0.9x	0.77	x	3.72	×	85.75		0.45	×	1.11	=	110.53	(79)
Southwest0.9x		x	3.72	x	106.25		0.45	x	1.11	=	136.96	(79)
Southwest0.9x	0.77	x	3.72	×	119.01		0.45	x	1.11	=	153.4	(79)
Southwest0.9x		x	3.72	×	118.15		0.45	x	1.11	=	152.29	(79)
Southwest0.9x	0.77	x	3.72	x	113.91		0.45	x	1.11	=	146.83	(79)
Southwest0.9x	0.77	x	3.72	×	104.39		0.45	x	1.11	=	134.56	(79)
Southwest0.9x		x	3.72	×	92.85		0.45	×	1.11	=	119.68	(79)
Southwest0.9x		x	3.72	x	69.27		0.45	×	1.11	=	89.28	(79)
Southwest <sub>0.9x</sub>		x	3.72	×	44.07		0.45	×	1.11	=	56.81	(79)
Southwest0.9x	0.77	x	3.72	×	31.49		0.45	×	1.11	=	40.59	(79)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	84.73	153.93	236.1	335.26	414.52	428.68	406.15	344.4	270.03	177	103.24	71.38		(83)
Total g	ains – ir	nternal a	and solar	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	452.37	519.42	588.27	666.03	723.59	716.88	680.84	625.05	561.72	490.31	441.34	428.03		(84)
7. Me	an inter	nal temp	oerature	(heating	season	)								
Temp	erature	during h	neating p	eriods ir	n the livii	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.97	0.92	0.82	0.67	0.53	0.59	0.81	0.95	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.28	19.48	19.82	20.25	20.64	20.88	20.96	20.94	20.75	20.25	19.68	19.23		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Ti	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 g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.96	0.9	0.78	0.6	0.42	0.48	0.74	0.93	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.41	18.61	18.95	19.37	19.72	19.92	19.97	19.96	19.83	, 19.37	18.81	18.37		(90)
			1						f	iLA = Livin	g area ÷ (4	4) =	0.21	(91)
Moon	interna	ltomnor	aturo (fo	r tho wh	olo dwo	lling) = fl	Λ 🗸 Τ1	⊥ (1 _ fl	∧) <b>√</b> T2					
(92)m=	18.59	18.79	19.13	19.55	19.92	20.12	20.18	20.17	20.02	19.56	18.99	18.55		(92)
						ature fro					10.00	10.00		
(93)m=	18.44	18.64	18.98	19.4	19.77	19.97	20.03	20.02	19.87	19.41	18.84	18.4		(93)
8. Sp	ace hea	ting requ	uirement	1										
					re obtain	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	ble 9a		-							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.98	0.97	0.95	0.89	0.77	0.59	0.42	0.48	0.74	0.92	0.97	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	444.68	504.78	557.08	590.95	557.49	426.01	288.73	300.3	413.77	450.02	429.09	421.97		(95)
	<u> </u>	-	r	perature		1			-					
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			î	· · · ·		Lm , W =		r	<u> </u>	r				
(97)m=		1193.09	1081.5	910.14	698.95	465.22	297.14	313.58	500.17	763.18	1017.66	1230.37		(97)
•		<u> </u>	1	i		Nh/mont		i		<u>í - (</u>	·			
(98)m=	585.89	462.55	390.17	229.82	105.24	0	0	0	0	232.99	423.78	601.45		-
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	3031.87	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								39.15	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems ii	ncluding	micro-C	CHP)					
-	e heatir	-										I		-
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)

Fracti	ion of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ting syste	em 1								90.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	า, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	_ ar
Space	e heatin	ř ·	r`	calculate	d above)		1				1	l .	L	
	585.89	462.55	390.17	229.82	105.24	0	0	0	0	232.99	423.78	601.45		
(211)m		i	1	100 ÷ (20	-					· ·			1	(211)
	647.4	511.1	431.12	253.94	116.29	0	0	0 Tota	0 L (kWh/ve	257.44	468.26 211) <sub>15,1012</sub>	664.58	2250.44	(211)
Snac	o hoatin	a fuel (s	econdar	ry), kWh/	month			1010				2	3350.14	
•		01)] } x 1		• •	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
		-	-					Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	=	0	(215)
	heating													
Output	from w	ater hea	ter (calc 148.46	ulated a	bove) 126.44	110.55	103.86	117.16	117.95	135.7	146.42	158.3		
Efficie		ater hea			120.11	110.00	100.00		111.00	100.1	110.12	100.0	87.3	(216)
(217)m=		89.72	89.59	89.31	88.73	87.3	87.3	87.3	87.3	89.3	89.66	89.81		(217)
Fuel fo	r water	heating,	kWh/m	onth										
• •		m x 100		)m 146.4	142.51	126.63	118.97	134.2	135.1	151.00	163.31	176.26		
(219)m=	181.56	159.34	165.7	140.4	142.31	120.03	116.97		I = Sum(2	151.96	163.31	170.20	1801.96	(219)
Annua	al totals										Wh/year	-	kWh/year	
			ed, main	system	1						,		3350.14	7
Water	heating	fuel use	ed										1801.96	Ī
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
mech	anical v	entilatio	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	Э			52.27		(230a)
		ng pump		,	·		•					30		(230c)
		fan-assis										45		(230e)
					_			0.100	of (220o)	(220a) -		40		_
			above,	kWh/yea	ſ			Sum	of (230a).	(230 <u>y</u> ) =			127.27	(231)
	city for I	0 0											355.2	(232)
Electri	city gen	erated b	y PVs										-494.01	(233)
Total c	lelivered	d energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				5140.56	(338)
12a. (	CO2 en	nissions ·	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
						En	ergy			Emiss	ion fac	tor	Emissions	•
							/h/year			kg CO			kg CO2/yea	
Space	heating	) (main s	system 1	)		(21	1) x			0.2	16	=	723.63	(261)
Space	heating	(second	dary)			(21	5) x			0.5	19	=	0	(263)

(219) x

0.216

Water heating

389.22

(264)

Space and water heating	(261) + (262) + (263) + (264)	4) =	1112.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	66.06	(267)
Electricity for lighting	(232) x	0.519 =	184.35	(268)
Energy saving/generation technologies Item 1		0.519 =	-256.39	(269)
Total CO2, kg/year		sum of (265)(271) =	1106.87	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	14.29	(273)
EI rating (section 14)			88	(274)

						User D	etails:						
Assesso Software	or Name: e Name:		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 , S	032 1R	J		
1. Overal	l dwelling di	mension	S:				( )						
Ground flo							a(m²)		Av. He			Volume(m <sup>3</sup> )	-
	or					3	8.72	(1a) x	2	.46	(2a) =	95.25	(3a)
First floor						3	8.72	(1b) x	2	.77	(2b) =	107.25	(3b)
Total floor	area TFA =	(1a)+(1l	o)+(1c)+(	(1d)+(1e	e)+(1r	) 7	7.44	(4)					
Dwelling v	olume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	202.51	(5)
2. Ventila	tion rate:												
			main heating		econdar leating	у	other		total			m <sup>3</sup> per hour	
Number of	<sup>:</sup> chimneys	ſ	0	] + [	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of	open flues	Г	0	- 	0	ī + Ē	0	] = [	0	x 2	20 =	0	(6b)
Number of	intermittent	⊥ fans							3	x 1	0 =	30	] (7a)
Number of	passive vei	nts							0	x 1	0 =	0	](7b)
	· flueless ga								0	x 4	40 =	0	](7c)
	g.								•			0	
											Air ch	anges per ho	ur
Infiltration	due to chim	neys, flu	es and fa	ans = <mark>(6</mark>	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.15	(8)
lf a pressu	irisation test ha	is been ca	rried out oi	r is intende	ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			
	of storeys in		elling (ne	s)								0	(9)
	al infiltration									[(9)-	1]x0.1 =	0	(10)
	al infiltration								uction			0	(11)
	types of wall an ing areas of op	•			ponding to	the great	er wall are	a (atter					
	nded woode				ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no dra	ught lobby,	enter 0.0	)5, else e	enter 0								0	(13)
Percenta	age of windo	ows and	doors dr	aught st	ripped							0	(14)
Window	infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltratio	on rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
-	neability valu	•				•		•	etre of e	nvelope	area	5	(17)
	n air permea									1		0.4	(18)
	ability value ap <sup>:</sup> sides shelte		ressurisatio	on test nas	s been aon	e or a deg	gree air pe	rmeability	is being us	sea		2	(19)
Shelter fac		5100					(20) = 1 -	[0.075 x (1	9)] =			0.85	(10)
Infiltration	rate incorpo	rating sh	nelter fac	tor			(21) = (18	) x (20) =				0.34	(21)
Infiltration	rate modifie	d for mo	nthly wir	nd speed	ł							L	-
J	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly av	verage 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	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
Coloul	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
		<i>ctive air c</i> al ventila	-	ale ior l	ne appli	capie ca	Se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
lf bala	anced with	n heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				0	(23c)
a) If	balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [′	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	anical ve	entilation	without	heat rec	overy (N	MV) (24b	)m = (22	2b)m + (	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•			on from c c) = (22t		.5 × (23k	<b>D</b> )			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from l 0.5 + [(2		0.5]				
(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in bo	k (25)	-	-	-		
(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros	SS	Openin	as	Net Ar	~~	LL					. ^	Xk
		area	(m²)	. m	-	A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²∙ł		J/K
Doors		area	(m²)	•	-									
	ws Type		(m²)	•	-	A ,r	n²	W/m2	2K	(W/				J/K
Window		e 1	(m²)	•	-	A ,r	m <sup>2</sup> x	W/m2	2K =   0.04] =	(W/ 2.1				J/K (26)
Windov Windov	ws Type	e 1 e 2	(m²)	•	-	A ,r 2.1 3.72	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.1 4.93				J/K (26) (27)
Windov Windov	ws Type ws Type	e 1 e 2	(m²)	•	-	A ,r 2.1 3.72 7.39	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = = = = = = = = = = = = = = = = = =	(W/ 2.1 4.93 9.8				J/K (26) (27) (27)
Windov Windov Windov	ws Type ws Type	e 1 e 2		•		A ,r 2.1 3.72 7.39 0.66	n <sup>2</sup> x x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K 0.04] = 0.04] = 0.04] =	(W/ 2.1 4.93 9.8 0.88				J/K (26) (27) (27) (27)
Windov Windov Windov Floor	ws Type ws Type	≥ 1 ≥ 2 ≥ 3	16	. m		A ,r 2.1 3.72 7.39 0.66 38.7	n <sup>2</sup> x x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> . x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13	2K 0.04] =   0.04] =   0.04] =   0.04] =	(W/ 2.1 4.93 9.8 0.88 5.031				J/K (26) (27) (27) (27) (28)
Windov Windov Windov Floor Walls Roof	ws Type ws Type ws Type	≥ 1 ≥ 2 ≥ 3 91.9	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	2K 0.04] = 0.04] = 0.04] = = = = =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06				J/K (26) (27) (27) (27) (28) (29)
Windov Windov Windov Floor Walls Roof	ws Type ws Type ws Type ws of e	e 1 e 2 e 3 91.9 38.7	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	2K 0.04] = 0.04] = 0.04] = = = = =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06				J/K (26) (27) (27) (27) (28) (28) (29) (30)
Windov Windov Floor Walls Roof Total a Party v	ws Type ws Type ws Type ws of e	e 1 e 2 e 3 91.9 38.7 elements	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	2K 0.04] =   0.04] =   0.04] =   1 =   1 =   1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (27) (28) (28) (29) (30) (31)
Windov Windov Floor Walls Roof Total a Party w Interna	ws Type ws Type ws Type rea of e vall	<ul> <li>1</li> <li>2</li> <li>3</li> <li>91.9</li> <li>38.7</li> <li>elements</li> </ul>	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67	n <sup>2</sup> x x1. x1. x1. x1. x1. x1. x2. x2. x3. x3. x3. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	2K 0.04] =   0.04] =   0.04] =   1 =   1 =   1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (27) (28) (29) (30) (31) (32)
Windov Windov Floor Walls Roof Total a Party w Interna	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall **	<ul> <li>1</li> <li>2</li> <li>3</li> <li>91.9</li> <li>38.7</li> <li>elements</li> </ul>	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	2K 0.04] =   0.04] =   0.04] =   1 =   1 =   1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c)
Windov Windov Floor Walls Roof Total a Party v Interna Interna	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall **	e 1 e 2 e 3 91.9 38.7 elements	96 '2	13.8		A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	2K 0.04] =   0.04] =   0.04] =   1 =   1 =   1 =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03				J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna	ws Type ws Type ws Type rea of e vall I wall ** I wall ** I floor I ceiling dows and	e 1 e 2 e 3 91.9 38.7 elements	96 72 , m <sup>2</sup> Dws, use e	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.13 0.13 0	2K 0.04] =   0.04] =   0.04] =   =   =   =   =	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03	K)			J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32d)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna * for wind ** includ	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall ** al floor al ceiling dows and e the area	e 1 e 2 e 3 91.9 38.7 elements	n6 '2 , m <sup>2</sup> ows, use e sides of in	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.13 0.13 0	2K 0.04] =   0.04] =   0.04] =   =   =   =   //((1/U-valu	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03	K)	kJ/m²-ŀ		J/K (26) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32d)
Windov Windov Floor Walls Roof Total a Party v Interna Interna Interna * for winu ** includ Fabric	ws Type ws Type ws Type ws Type area of e vall al wall ** al wall ** al floor al ceiling dows and the area heat los	<ul> <li>1</li> <li>2</li> <li>3</li> <li>91.9</li> <li>38.7</li> <li>elements</li> <li>elements</li> <li>as on both</li> </ul>	06 72 , m <sup>2</sup> bws, use e sides of in = S (A x	13.8 0	7	A ,r 2.1 3.72 7.39 0.66 38.7 78.09 38.72 169.3 45.67 69.98 73.74 38.72 38.72 38.72 38.72	n <sup>2</sup> x x <sup>1</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>2</sup> . x <sup>3</sup> .	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.13 0.13 0.13	$\frac{1}{2} \frac{1}{2} \frac{1}$	(W/ 2.1 4.93 9.8 0.88 5.031 14.06 5.03 0	K)	kJ/m²-ł	< k.	J/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32c) (32c) (32c) (32c) (32e)

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

can be ι	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						9.22	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			51.04	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			-	(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.63	39.39	39.16	38.04	37.84	36.87	36.87	36.69	37.24	37.84	38.26	38.7		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m		-	
(39)m=	90.68	90.44	90.2	89.09	88.88	87.91	87.91	87.73	88.28	88.88	89.3	89.74		
									,	Average =	Sum(39)1.	12 /12=	89.09	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		_
			(I) ( <b>T</b>						,	Average =	Sum(40)1.	12 /12=	1.15	(40)
Numbe		/s in moi	r Ì	, 									1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/y	ear:	
A		in a nov	NI										1	(40)
		upancy, l 9. N = 1		(1 - exp	(-0.0003	849 x (TF		)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13		41		(42)
	A £ 13.				(			/_/]	(		-,			
								(25 x N)				1.5		(43)
		-		usage by r day (all w		-	-	to achieve	a water us	se target o	f			
		1	<u> </u>			i	·		0			Du	1	
Hot wat	Jan	Feb	Mar	Apr ach month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		· ·	-					· ·					1	
(44)m=	100.65	96.99	93.33	89.67	86.01	82.35	82.35	86.01	89.67	93.33	96.99	100.65		
Enerav	content of	<sup>•</sup> hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd.r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> = ables 1b, 1		1097.96	(44)
		r			-		90.11						1	
(45)m=	149.26	130.54	134.71	117.44	112.69	97.24	90.11	103.4	104.63	121.94	133.11	144.55	1439.6	(45)
lf instan	taneous v	vater heati	ng at point	t of use (no	o hot water	<sup>r</sup> storage),	enter 0 in	boxes (46		10181 = 50	m(45) <sub>112</sub> =	=	1439.0	(43)
(46)m=	22.39	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68	]	(46)
1 ( L	storage		20.21	11.02	10.0	11.00	10.02	10.01	10.1	10.20	10.01	21.00		()
Storag	e volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity ł	neating a	and no ta	ank in dw	velling, e	nter 110	) litres in	(47)					1	
		•			•			mbi boil	ers) ente	ər '0' in (	47)			
Water	storage	loss:												
a) If m	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	y lost fro	om water	<sup>-</sup> storage	e, kWh/ye	ear			(48) x (49)	=			0		(50)
				cylinder l									1	
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	•	neating s from Ta		UN 4.3									1	(50)
		actor fro		2b								0		(52) (53)
				-							1	~	1	()

Enera	lost fro	m water	storado	k\//b/v	aar			(47) x (51)	x (52) x (	53) -		0	l	(54)
		(54) in (5	-	, KVVII/ yt	501			(47) X (01)	/	00) -		0		(54)
	. ,	loss cal		for each	month			((56)m = (	55) × (41)	m		-		
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
		-							-	m where (		-	l lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Drimor		loss (an	nual) fre	um Toble								0		(58)
	-	loss (all				59)m = (	(58) ÷ 36	65 x (41)	m			<u> </u>		()
	•				`	,	· ·	. ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	50.96	44.64	47.56	44.22	43.83	40.61	41.96	43.83	44.22	47.56	47.83	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	200.21	175.18	182.26	161.66	156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		(62)
Solar DH	HW input of	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	200.21	175.18	182.26	161.66	156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		
								Outp	out from wa	ater heater	r (annual)₁	12	1987.77	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m=	62.37	54.56	56.68	50.1	48.43	42.48	40.45	45.34	45.85	52.43	56.22	60.8		(65)
inclu	ide (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a	):									
Metab	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62	120.62		(66)
Lightin	g gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	20.11	17.86	14.53	11	8.22	6.94	7.5	9.75	13.08	16.61	19.39	20.67		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=		216.23	210.63	198.72	183.68	169.55	160.1	157.88	163.48	175.39	190.43	204.56		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5	-96.5		(71)
Water	heating	gains (T	able 5)											
(72)m=	83.83	81.2	, 76.18	69.59	65.09	59.01	54.37	60.94	63.67	70.48	78.08	81.72		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	380.13	377.48	363.53	341.49	319.18	297.68	284.16	290.76	302.42	324.67	350.09	369.15		(73)
				-	-	-	-			-			•	

#### 6. Solar gains:

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

•	e calculated using Access Facto Table 6d		Area m <sup>2</sup>	a anu	Flux Table 6a	luons	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	7.39	x	11.28	×	0.63	×	0.7	=	25.48	(75)
Northeast 0.9x	0.77	x	7.39	x	22.97	×	0.63	×	0.7	=	51.87	(75)
Northeast 0.9x	0.77	x	7.39	x	41.38	x	0.63	x	0.7	=	93.45	(75)
Northeast 0.9x	0.77	x	7.39	x	67.96	x	0.63	x	0.7	=	153.48	(75)
Northeast 0.9x	0.77	x	7.39	x	91.35	x	0.63	x	0.7	=	206.3	(75)
Northeast 0.9x	0.77	x	7.39	x	97.38	×	0.63	×	0.7	=	219.94	(75)
Northeast 0.9x	0.77	x	7.39	x	91.1	×	0.63	x	0.7	=	205.75	(75)
Northeast 0.9x	0.77	x	7.39	x	72.63	×	0.63	x	0.7	=	164.03	(75)
Northeast 0.9x	0.77	x	7.39	x	50.42	x	0.63	x	0.7	=	113.87	(75)
Northeast 0.9x	0.77	x	7.39	x	28.07	×	0.63	×	0.7	=	63.39	(75)
Northeast 0.9x	0.77	x	7.39	x	14.2	x	0.63	×	0.7	=	32.06	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	x	0.63	x	0.7	=	20.81	(75)
Southeast 0.9x	0.77	x	0.66	x	36.79	×	0.63	×	0.7	=	7.42	(77)
Southeast 0.9x	0.77	x	0.66	x	62.67	x	0.63	×	0.7	=	12.64	(77)
Southeast 0.9x	0.77	x	0.66	x	85.75	×	0.63	×	0.7	=	17.3	(77)
Southeast 0.9x	0.77	x	0.66	x	106.25	×	0.63	x	0.7	=	21.43	(77)
Southeast 0.9x		x	0.66	x	119.01	×	0.63	x	0.7	=	24	(77)
Southeast 0.9x	•	x	0.66	x	118.15	X	0.63	x	0.7	=	23.83	(77)
Southeast 0.9x		x	0.66	x	113.91	×	0.63	x	0.7	=	22.98	(77)
Southeast 0.9x	_	x	0.66	x	104.39	x	0.63	×	0.7	=	21.06	(77)
Southeast 0.9x	•	x	0.66	x	92.85	x	0.63	x	0.7	=	18.73	(77)
Southeast 0.9x		x	0.66	x	69.27	x	0.63	×	0.7	=	13.97	(77)
Southeast 0.9x		x	0.66	x	44.07	x	0.63	x	0.7	=	8.89	(77)
Southeast 0.9x		x	0.66	x	31.49	×	0.63	×	0.7	=	6.35	(77)
Southwest <sub>0.9x</sub>		x	3.72	x	36.79		0.63	x	0.7	=	41.83	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	62.67		0.63	×	0.7	=	71.25	(79)
Southwest0.9x	••••	x	3.72	x	85.75		0.63	×	0.7	=	97.49	(79)
Southwest <sub>0.9x</sub>	•	x	3.72	×	106.25	ļ	0.63	×	0.7	=	120.8	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	119.01		0.63	×	0.7	=	135.3	(79)
Southwest0.9x	•	x	3.72	x	118.15		0.63	×	0.7	=	134.32	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	113.91		0.63	x	0.7	=	129.5	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	104.39		0.63	×	0.7	=	118.68	(79)
Southwest0.9x	•	x	3.72	x	92.85		0.63	×	0.7	=	105.56	(79)
Southwest <sub>0.9x</sub>		x	3.72	x	69.27	ļ	0.63	×	0.7	=	78.75	(79)
Southwest <sub>0.9x</sub>	••••	x	3.72	×	44.07		0.63	×	0.7	=	50.1	(79)
Southwest0.9x	0.77	x	3.72	x	31.49		0.63	x	0.7	=	35.8	(79)

Bighm         74.73         133.76         298.74         91.06         62.96         (83)           Total gains - internal and solar (84)m         (73)m + (83)m, watts         (84)m         57.77         642.39         544.52         540.59         400.78         441.14         432.11         (84)           Atoma 54.86         57.2         647.78         57.77         642.39         544.52         540.59         400.78         441.14         432.11         (84)           Atoma 54.86         57.2         647.78         57.77         642.39         544.52         540.59         400.78         441.14         432.11         (84)           Atoma 54.86         Apr         May         Jul         Jul         Aug         Sep         Oct         Nov         Dec           (80)m         Internal temperature (integrates the fill on the key sep 3 to 7 in Table 9C)         (97)m         19.71         19.87 <td< th=""><th colspan="9">Solar gains in watts, calculated for each month <math>(83)m = Sum(74)m \dots (82)m</math></th><th></th><th></th></td<>	Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$															
(84)m-       454.87       513.24       571.77       637.2       684.78       675.77       642.39       564.52       540.52       640.78       441.14       422.11       (64)         7. Mean internal temperature (heating seeson)         Temperature during heating periods in the living area from Table 9. Th1 (°C)       21       (65)         Using area, h1, m (see Table 9a)         Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (66)         (67)       1       0.99       0.97       0.9       0.75       0.58       0.65       0.88       0.98       1       1       (66)         Mean internal temperature in living area, h1, m (see Table 9a)       (67)       10.34       20.45       20.03       19.7       (67)       (67)         (14)       0.94       1.96       1.987       19.97       19.97       19.96       19.95       (98)         (67)       (67)       (63)       (67)       (62)       (62)       0.62       0.62       0.62       0.62       0.62       0.62       0.62       0.62       0.62       0.62       0.62       0.62	(83)m=	74.73	135.76	208.24	295.7	365.61	378.09	358.23	303.76	238.16	156.11	91.06	62.96		(83)	
Theory         Lease         Lease <thlease< th=""> <th< td=""><td colspan="10">Total gains – internal and solar (84)m = (73)m + (83)m , watts</td><td></td></th<></thlease<>	Total gains – internal and solar (84)m = (73)m + (83)m , watts															
Temperature during heating periods in the living area from Table 9, Th1 (*C)       21       [45]         Utilisation factor for gains for living area, h1,m (see Table 9a)       (66)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (76)       (77)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (78)       (77)       (78)       (78)       (78)<	(84)m=	454.87	513.24	571.77	637.2	684.78	675.77	642.39	594.52	540.59	480.78	441.14	432.11		(84)	
Utilisation factor for gains for living area, h1,m (see Table 9a)         (B6)m=         1       1       0.99       0.97       0.98       0.98       0.98       1       1         Main Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m=       1       1       0.99       0.99       0.98       20.89       20.89       20.84       20.45       20.03       19.7       (67)         Temperature during heating periods in rest of dwelling from Table 9.       Table 9.       Table 9.       (69)m=       1       1       0.99       0.86       0.66       0.46       0.52       0.82       0.97       0.99       1       (69)m=         (1       1       0.99       0.96       0.86       0.66       0.46       0.52       0.82       0.97       0.99       1       (69)m         (1       1       0.99       0.96       0.86       0.66       0.46       0.52       0.87       0.99       1       (69)         (90)       man internal temperature in the rest of dwelling 12 (follow steps 3 to 7 in Table 9c)       (90)	7. Me	an inter	nal temp	berature	(heating	season	)									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Temp	erature	during h	neating p	eriods ir	n the livii	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)	
(86)m=       1       1       0.99       0.97       0.9       0.75       0.58       0.85       0.88       0.98       1       1       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)       (97)m=       19.72       19.86       20.1       20.44       20.75       20.99       20.98       20.84       20.45       20.03       19.7       (67)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)       (88)m       19.95       19.97       19.97       19.97       19.96       19.96       19.97       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.97)       (9.99)       (9.99)       (9.99)       (9.99)       (9.99)       (9.99)       (9.99)       (9.99)       (9.99)       (9.90)       (9.90)       (9.90)       (9.90)       (9.90)       (9.91)       (9.91)       (9.91)       (9.92)       (9.91)       (9.91)       (9.92)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91)       (9.91	Utilisation factor for gains for living area, h1,m (see Table 9a)											_				
Near internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)       (67)         (87)       (87)         (89)       (89)       (89)       (89)       (89)       (89)       (89)         Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a)       (89)       <		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(87)m=       19.72       19.86       20.1       20.44       20.75       20.83       20.98       20.84       20.45       20.30       19.7         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)       (80)m=       19.94       19.95       19.95       19.96       19.97       19.97       19.97       19.96       19.95       19.95       (89)         (80)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.97       0.99       1       (89)         (80)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.97       0.99       1       (89)         (90)m=       18.24       18.44       18.8       19.29       19.71       19.93       19.97       19.96       19.83       19.31       18.21       (90)         (90)m=       18.24       18.44       18.8       19.22       10.14       20.18       20.14       20.41       18.55       18.98       18.52       (93)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) xT2       (92)       (92)       19.55       18.98       18.52       (93)       8.52       (93)       8.52       (93) <td< td=""><td>(86)m=</td><td>1</td><td>1</td><td>0.99</td><td>0.97</td><td>0.9</td><td>0.75</td><td>0.58</td><td>0.65</td><td>0.88</td><td>0.98</td><td>1</td><td>1</td><td></td><td>(86)</td></td<>	(86)m=	1	1	0.99	0.97	0.9	0.75	0.58	0.65	0.88	0.98	1	1		(86)	
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (80)m=       19.94       19.95       19.95       19.95       19.95       19.95       19.95       19.95       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.82       0.97       0.99       1       (89)         (80)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.82       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       18.24       18.44       18.8       19.29       19.17       19.93       19.97       19.96       19.85       18.74       19.07       19.53       19.92       20.14       20.18       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature form Table 4e, where appropriate       (93)me       18.55       18.74       19.07       19.93       19.92       20.14       20.18       20.14       20.18       20.41       19.55       18.98       18.52       (9	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)						
(88)m=       19.94       19.95       19.95       19.96       19.97       19.97       19.97       19.96       19.96       19.95       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (90)m=       1       1       0.99       0.96       0.86       0.66       0.46       0.52       0.82       0.97       0.99       1       (99)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)       (1.4       18.24       18.44       18.8       19.29       19.71       19.93       19.96       19.83       19.31       18.7       18.21       (90)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)m=       18.55       18.74       19.07       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8.9m=       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8.9m=       18.51       18.71       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8.9m= <td>(87)m=</td> <td>19.72</td> <td>19.86</td> <td>20.1</td> <td>20.44</td> <td>20.75</td> <td>20.93</td> <td>20.99</td> <td>20.98</td> <td>20.84</td> <td>20.45</td> <td>20.03</td> <td>19.7</td> <td></td> <td>(87)</td>	(87)m=	19.72	19.86	20.1	20.44	20.75	20.93	20.99	20.98	20.84	20.45	20.03	19.7		(87)	
Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a)       (89)         (89)       1       1       0.99       0.96       0.86       0.66       0.46       0.52       0.82       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)       (90)       18.24       18.4       18.8       19.21       19.71       19.93       19.97       19.96       19.83       19.31       18.7       18.21       (90)         (90)       18.24       18.4       18.8       19.29       19.71       19.93       19.97       19.96       19.83       19.31       18.7       18.21       (90)         (90)       18.52       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.88       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       8.52       (93)       8.52       (93)       8.52       (93)       8.52       (93)       8.52       (93)       8.52       (93)       8.55       18.74       19.07       19.53       19.92       20.14       20.18       20.44       19.55       18.98       18.	Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)						
(89)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.82       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=       18.24       18.44       18.8       19.29       19.71       19.93       19.97       19.96       19.83       19.31       18.7       18.21       (90)         (14.4 Living area + (4) =       0.21       (91)       (14.4 Living area + (4) =       0.21       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)       (92)       Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       8. Space heating requirement       (93)       8. Space heating requirement       (93)       8. Space heating requirement       (94)       Useful gains, hm:       (94)       (94)       (94)         Useful gains, hmGm, W = (94)m (84)m       (93)m = 453.19       50.86       58.90.64       56.93       310.32       323.49       444.49       464.95       437.96       430.86       (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 </td <td>(88)m=</td> <td>19.94</td> <td>19.95</td> <td>19.95</td> <td>19.96</td> <td>19.96</td> <td>19.97</td> <td>19.97</td> <td>19.97</td> <td>19.97</td> <td>19.96</td> <td>19.96</td> <td>19.95</td> <td></td> <td>(88)</td>	(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.95		(88)	
(89)m=       1       1       0.99       0.96       0.86       0.46       0.52       0.82       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=       18.24       18.44       18.8       19.29       19.71       19.93       19.97       19.96       19.83       19.31       18.7       18.21       (90)         (14.4 Living area + (4) =       0.21       (91)       (14.4 Living area + (4) =       0.21       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)       (92)       Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       8. Space heating requirement       (93)       8. Space heating requirement       (93)       8. Space heating requirement       (94)       Useful gains, hm:       (94)       (94)       (94)         Useful gains, hmGm, W = (94)m (84)m       (93)m = 453.19       50.86       58.90.64       56.93       310.32       323.49       444.49       464.95       437.96       430.86       (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 </td <td>Utilisa</td> <td>ation fac</td> <td>tor for g</td> <td>ains for</td> <td>rest of d</td> <td>welling,</td> <td>h2.m (se</td> <td>e Table</td> <td>9a)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2.m (se	e Table	9a)							
(90)m=       18.24       18.44       18.8       19.29       19.71       19.93       19.97       19.96       18.83       19.31       18.7       18.21       (90)         IfLA = Living area ÷ (4) =       0.21       (91)       (92)       (92)       (14 = Living area ÷ (4) =       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2       (92)       (92)       (93)m=       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       8.       Space heating requirement       (93)       8.       Space heating requirement       (94)       (94)         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, shm:       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (95)       (95)       (95)       (96)       (95)       (96)       (95)       (96)       (96)       (95)       (96)       (96)       (96)       (96)       (96)       (97)       (96)       (96)       <				i	ì	· · ·	ì		<u> </u>	0.82	0.97	0.99	1		(89)	
(90)m=       18.24       18.44       18.8       19.29       19.71       19.93       19.97       19.96       18.83       19.31       18.7       18.21       (90)         IfLA = Living area ÷ (4) =       0.21       (91)       (92)       (92)       (14 = Living area ÷ (4) =       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2       (92)       (92)       (93)m=       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       8.       Space heating requirement       (93)       8.       Space heating requirement       (94)       (94)         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, shm:       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (94)       (95)       (95)       (95)       (96)       (95)       (96)       (95)       (96)       (96)       (95)       (96)       (96)       (96)       (96)       (96)       (97)       (96)       (96)       <	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)					
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)m       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8. Space heating requirement       Itemperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a       (94)       (94)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m       (94)m       (94)       (94)       (94)       (94)       (94)       (94)       (95)       (95)       (95)       (95)       (95)       (95)       (95)       (96)       (95)       (96)       (95)       (96)       (95)       (96)       (96)       (96)       (96)       (96)       (96)       (96)       (96)       (96)       (96)       (96)       (97)       (96)       (96)				i	i i i i i i i i i i i i i i i i i i i	i	<u>, ,</u>		r <u>i</u>		<u>,</u>	18.7	18.21		(90)	
(92)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8. Space heating requirement       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8. Space heating requirement       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.41       19.55       18.98       18.52       (93)         8. Space heating requirement       (94)me       1       0.90       19.55       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)me       453.19       509.6       562.21       605.88       589.06       456.93       310.32       323.49       444.49       464.95       437.96       430.86       (95										f	LA = Livin	g area ÷ (4	1) =	0.21	(91)	
(92)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8. Space heating requirement       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (93)         8. Space heating requirement       (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.41       19.55       18.98       18.52       (93)         8. Space heating requirement       (94)me       1       0.90       19.55       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)       (94)       (94)       (94)me       (94)me       (94)me       (95)       (95)       (96)me       (95)       (95)       (96)me       (95)       (96)me       (95)       (96)me       (96)me       (93.1.6       1																
Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (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-calculate the utilisation factor for gains using Table 9a       Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)       99       0.98       0.95       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)me       456.31       310.32       323.49       444.49       464.95       437.96       430.86       (95)         Monthly average external temperature from Table 8       (96)me       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 x [(93)m - (96)m]       (97)m       (92)m1.25.2       (97)       Space heating require		· · · · · ·	· · ·	r È		r			r Ì	, 	19 55	18.98	18 52		(92)	
(93)me       18.55       18.74       19.07       19.53       19.92       20.14       20.18       20.04       19.55       18.98       18.52       (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-calculate the utilisation factor for gains using Table 9a       Image: Content of Con												10.00	10.02		()	
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-calculate         the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.98       0.95       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       453.19       509.6       562.21       605.88       589.06       456.93       310.32       323.49       444.49       464.95       437.96       430.86       (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)         (97)m=       1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m -		<u> </u>		i	i	· · ·					· · · · · · · · · · · · · · · · · · ·	18.98	18.52		(93)	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m =       1       0.99       0.98       0.95       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m =       453.19       509.6       562.21       605.88       589.06       456.93       310.32       323.49       444.49       464.95       437.96       430.86       (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]       (97)m =       1291.79       1251.36       1133.97       947.29       730.88       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)       Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m </td <td>8. Sp</td> <td>ace hea</td> <td>tina reau</td> <td>uirement</td> <td></td> <td>1</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	8. Sp	ace hea	tina reau	uirement		1	1									
the utilisation factor for gains using Table 9a $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						re obtain	ned at ste	ep 11 of	Table 9	o, so tha	t Ti.m=(	76)m an	d re-calc	ulate		
Utilisation factor for gains, hm:       (94)m=       1       0.99       0.98       0.95       0.86       0.68       0.48       0.54       0.82       0.97       0.99       1       (94)         Useful gains, hmGm , W = (94)m x (84)m       (95)m=       453.19       509.6       562.21       605.88       589.06       456.93       310.32       323.49       444.49       464.95       437.96       430.86       (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]       (97)m =       1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)m =       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98)ss.12       3229.03       (98) <td colsp<="" td=""><td></td><td></td><td></td><td></td><td>•</td><td></td><td></td><td></td><td></td><td>,</td><td></td><td>-,</td><td></td><td></td><td></td></td>	<td></td> <td></td> <td></td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> <td>,</td> <td></td> <td>-,</td> <td></td> <td></td> <td></td>					•					,		-,			
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains, hmGm , W = (94)m x (84)m (95)m = $453.19$ 509.6 562.21 605.88 589.06 456.93 310.32 323.49 444.49 464.95 437.96 430.86 (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] (97)m = $1291.79$ 1251.36 1133.97 947.29 730.89 486.69 314.66 331.19 524.61 795.62 1060.55 1285.2 (97) Space heating requirement for each month, kWh/month = $0.024 x [(97)m - (95)m] x (41)m$ (98)m = $623.92$ 498.47 425.39 245.82 105.52 0 0 0 0 0 246.01 448.27 635.63 Total per year (kWh/year) = Sum(98) <sub>1-58-12</sub> = 3229.03 (98) Space heating requirement in kWh/m <sup>2</sup> /year 41.7 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating:	Utilisa	ation fac	tor for g	ains, hm	1:	-	-									
	(94)m=	1	0.99	0.98	0.95	0.86	0.68	0.48	0.54	0.82	0.97	0.99	1		(94)	
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]       (97)m=       1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = $0.024 x [(97)m - (95)m] x (41)m$ (98)m=       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>1.58.12</sub> =       3229.03       (98)         Space heating requirement in kWh/m²/year       41.7       (99)         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	Usefu	ıl gains,	hmGm	, W = (94	4)m x (8-	4)m										
(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]       (97)m=       1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m       (98)m=       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>1-59-12</sub> 3229.03       (98)         Space heating requirement in kWh/m²/year       41.7       (99)         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	(95)m=	453.19	509.6	562.21	605.88	589.06	456.93	310.32	323.49	444.49	464.95	437.96	430.86		(95)	
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] $(97)m =$ 1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m = $623.92$ 498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>15912</sub> =       3229.03       (98)         Space heating requirement in kWh/m²/year         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8				-					
(97)m=       1291.79       1251.36       1133.97       947.29       730.89       486.69       314.66       331.19       524.61       795.62       1060.55       1285.2       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m       (98)m=       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>15912</sub> 3229.03       (98)         Space heating requirement in kWh/m²/year       41.7       (99)         9a. Energy requirements – Individual heating systems including micro-CHP)       Space heating:       41.7       (99)	(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)	
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m         (98)m=       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>15912</sub> Space heating requirement in kWh/m²/year         99)         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]					
(98)m=       623.92       498.47       425.39       245.82       105.52       0       0       0       246.01       448.27       635.63         Total per year (kWh/year) = Sum(98) <sub>15912</sub> =         3229.03       (98)         Space heating requirement in kWh/m²/year       41.7       (99)         9a. Energy requirements – Individual heating systems including micro-CHP)       Space heating:       5	(97)m=	1291.79	1251.36	1133.97	947.29	730.89	486.69	314.66	331.19	524.61	795.62	1060.55	1285.2		(97)	
Total per year (kWh/year) = Sum(98)15.912 = 3229.03 (98)         Space heating requirement in kWh/m²/year         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m				
Space heating requirement in kWh/m²/year       41.7         9a. Energy requirements – Individual heating systems including micro-CHP)         Space heating:	(98)m=	623.92	498.47	425.39	245.82	105.52	0	0	0	0	246.01	448.27	635.63			
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating:	Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =											3229.03	(98)			
Space heating:	Space	e heatin	g require	ement in	kWh/m²	²/year								41.7	(99)	
Space heating:	9a. <u>En</u>	ergy <u>re</u> c	uiremer	nts – Indi	ividual h	eating s	ystem <u>s i</u>	ncluding	micro-C	CHP)					_	
Fraction of space heat from secondary/supplementary system    0    (201)																
	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	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require		alculate	d above)		i	i				r	1	
	623.92	498.47	425.39	245.82	105.52	0	0	0	0	246.01	448.27	635.63	J	
(211)m			<u> </u>	$100 \div (20)$	<u> </u>				-	000.4	170.04	000 54	1	(211)
	668.01	533.69	455.45	263.19	112.98	0	0	0 Tota	0	263.4	479.94 211) <sub>15,1012</sub>	680.54	0.457.04	(211)
= {[(98	)m x (20	01)] } x 1	00 ÷ (20	r í									3457.21	
(215)m=	0	0	0	0	0	0	0	0 Tota		0	0 215) <sub>15.1012</sub>	0		(215)
Wator	heating							TOTA	i (Kvvi#yee	ar) =0um(2	- 10) <sub>15,10</sub> 12	<b>-</b>	0	(215)
	-		ter (calc	ulated a	bove)								_	
•	200.21	175.18	182.26	161.66	156.51	137.85	132.07	147.23	148.85	169.5	180.94	195.51		_
Efficier	ncy of w	ater hea	iter										80.3	(216)
(217)m=		87.54	87.11	86.1	84.08	80.3	80.3	80.3	80.3	85.99	87.24	87.8	]	(217)
		heating, m x 100												
· ,	228.24	200.12	209.23	187.75	186.14	171.67	164.47	183.35	185.37	197.12	207.39	222.67	]	
								Tota	I = Sum(2'	19a) <sub>112</sub> =		-	2343.51	(219)
	al totals	fuelue	d main	a vata m	4					k	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1													3457.21	
	Ũ	fuel use											2343.51	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t							_	
central heating pump:												30		(230c)
boiler with a fan-assisted flue												45	]	(230e)
Total electricity for the above, kWh/year								sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											355.2	(232)		
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =											6230.92	(338)		
12a. (	CO2 em	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHP						
						Fn	ergy			Fmiss	ion fac	tor	Emissions	
						kWh/year				2/kWh		kg CO2/yea	ar	
Space heating (main system 1)					(21	1) x			0.2	16	=	746.76	(261)	
Space heating (secondary)						(21	5) x			0.5	19	=	0	(263)
Water heating						(219	9) x			0.2		=	506.2	(264)
Space and water heating							1) + (262) ·	+ (263) + (	264) =		]		1252.96	](265)
Electricity for pumps, fans and electric keep-hot						t (23 <sup>,</sup>	1) x			0.5	19	=	38.93	(267)
							* 			0.5	1.0		30.33	

Electricity for lighting	(232) x	0.519 =	184.35	(268)
Total CO2, kg/year		sum of (265)(271) =	1476.23	(272)
TER =			19.06	(273)
				_