

# **Regulations Compliance Report**

	ent L1A, 2013 Editio uary 2023 at 14:47::		FSAP 2012 program, Version: 1.0.5.59	)
Project Informati	on:			
Assessed By:	Leighton Howe (S	TRO004042)	Building Type: Flat	
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 61m <sup>2</sup>	
Site Reference :	AL-10		Plot Reference: Flat 1	
Address :	Flat 1, Manor Cou	ırt, 152 Abbey Road, LONDON,	NW6 4ST	
Client Details:				
Name:				
Address :				
This report cove	rs items included w	vithin the SAP calculations.		
-	ete report of regula			
1a TER and DER	र			
	ting system: Mains g	as		
Fuel factor: 1.00 (	- /			
-	oxide Emission Rate	. ,	20.72 kg/m <sup>2</sup>	OK
1b TFEE and DF	Dioxide Emission Ra	te (DER)	15.84 kg/m²	ОК
		=)	58.1 kWh/m²	
-	ergy Efficiency (TFEE nergy Efficiency (DF		53.3 kWh/m²	
	neigy Enclency (Di		33.3 KWI/III-	ок
2 Fabric U-value	es			
Element		Average	Highest	
External	wall	0.18 (max. 0.30)	0.18 (max. 0.70)	ОК
Party wa	II	0.00 (max. 0.20)	-	OK
Floor		(no floor)		
Roof		0.16 (max. 0.20)	0.16 (max. 0.35)	ОК
Opening	S	1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal brid				
		rom linear thermal transmittanc	es for each junction	
3 Air permeabili				
	bility at 50 pascals		5.00 (design value)	
Maximum			10.0	OK
4 Heating efficie	ency			
Main Heati	ng system:	Boiler systems with radiators Data from manufacturer	or underfloor heating - mains gas	
		Combi boiler		
		Efficiency 88.0 % SEDBUK2	009	
		Minimum 88.0 %		ОК
Secondary	heating system:	None		
5 Cylinder insul				
Hot water S	Storage:	No cylinder		
				N/A



Therm Energy Ltd 01903 884357

### **Regulations Compliance Report**

Controls			
Space heating controls Hot water controls:	Programmer and at least No cylinder thermostat No cylinder	two room thermostats	OK
Boiler interlock:	Yes		ОК
Low energy lights			
Percentage of fixed lights w Minimum	vith low-energy fittings	100.0% 75.0%	ОК
Mechanical ventilation			
Not applicable			
Summertime temperature			
Overheating risk (South Ea	st England):	Slight	OK
Overshading: Windows facing: South Windows facing: North Windows facing: West		Average or unknown 12.18m <sup>2</sup> 8.4m <sup>2</sup> 4.2m <sup>2</sup>	
Ventilation rate: Blinds/curtains:		6.00 Dark-coloured curtain or roller Closed 100% of daylight hours	
0 Key features			
Party Walls U-value		0 W/m²K	

Party Walls U-value Photovoltaic array

0 W/m<sup>2</sup>K

			User D	etails:						
Assessor Name: Software Name:	Leighton Howe Stroma FSAP 2	012		Strom Softwa					004042 n: 1.0.5.59	
	Flat 1 Manar Ca			Address:						
Address : 1. Overall dwelling dimer	Flat 1, Manor Cou	un, 152 Ad	оеу коа	IU, LONL	JON, NV	VO 431				
			Area	a(m²)		Av. Hei	iaht(m)		Volume(m <sup>3</sup>	)
Ground floor			-	· ·	(1a) x	<b></b>	.4	(2a) =	146.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(	1e)+(1r	ı)	61	(4)			J 1		
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	146.4	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m <sup>3</sup> per hou	r
Number of chimneys			] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	<u> </u> + [	0	-   =	0	x 2	20 =	0	(6b)
Number of intermittent far	າຣ					3	x 1	10 =	30	(7a)
Number of passive vents					Г	0	x 1	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
					L					
								Air ch	anges per ho	our
Infiltration due to chimney					ontinuo fr	30		÷ (5) =	0.2	(8)
If a pressurisation test has be Number of storeys in th		naea, proceed	<i>u io (17),</i> c	ornerwise c	onunue no	5m (9) to (	10)		0	(9)
Additional infiltration	e en en ig (e)						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timb	er frame or	0.35 for	masonr	y constr	uction		-	0	(11)
if both types of wall are pro deducting areas of openin		responding to	the great	er wall are	a (after					
If suspended wooden fl		ealed) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter	0						·	0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in c	ubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili									0.45	(18)
Air permeability value applies		has been don	e or a deg	ree air pei	rmeability	is being us	sed			_
Number of sides sheltered Shelter factor	d			(20) = 1 -	0 075 x (1	9)] =			1	(19)
Infiltration rate incorporati	na shelter factor			(21) = (18)		0/] –			0.92	(20)
Infiltration rate modified for	-	ad		() (,	, (==)				0.42	(21)
rii	Mar Apr Ma		Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		un our	Uui	/ lug	Ocp	001	Nov	000		
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	II							I		
Wind Factor $(22a)m = (22a)m $	, 	0.05	0.05	0.00	<u>د</u>	1.00	4.40	1.40		
(22a)m= 1.27 1.25 1	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

thermenergy

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	nd wind s	peed) =	= (21a) x	(22a)m				_		
	0.54	0.53	0.52	0.46	0.45	0.4	0.4	0.39	0.42	0.45	0.47	0.49			
		ctive air al ventila	-	rate for t	he appli	cable ca	se							(23a	
				endix N. (2	3b) = (23;	a) x Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0		
			• • • •		, ,	,		m Table 4h		) (200)			0		
			-	-	-			HR) (24a		2h)m + ('	23h) <b>x</b> ['	1 – (23c)		(23c)	,
(24a)m=	0			0	0						0		]	(24a)	)
· · ·	balance	d mech:	anical ve	ntilation	without	heat rec	overv (	MV) (24t	1 = (2)	2b)m + (2	23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)	)
	whole h	ouse ex	tract ven	tilation o	or positiv	/e input v	/entilati	on from (	utside			<u> </u>	1		
,					•	•		lc) = (22		.5 × (23b	)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)	)
,					•	•		on from					-		
1	, ,		r í	`	,	r È	,	0.5 + [(2	r Ó	<u> </u>			1	(0.4.4	N
(24d)m=	0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62	]	(24d)	)
			<u> </u>		, ,	r i	, <u>,</u>	4d) in bo	1 <i>, ,</i>		0.04	0.00	1	(25)	
(25)m=	0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62		(25)	
3. Hea	at losse	s and he	eat loss p	paramete	er:										
ELEN	IENT	Gros area		Openin m	-	Net Ar A ,n		U-val W/m2		A X U (W/ł	(	k-value kJ/m²·		A X k kJ/K	
Doors		aica	(111-)	11	_	1.89	л- Т х		= [	2.646	$\overline{}$	KJ/III-•	IX .	(26)	
Windov	ws Type	<u>1</u>					=	1/[1/( 1.4 )+			$\exists$			(20)	
Window	• •					12.18		1/[1/( 1.4 )+	l	16.15	$\exists$			. ,	
Window	• •					8.4		1/[1/( 1.4 )+	L I	11.14				(27)	
						4.2				5.57	$\dashv$ ,			(27)	
Walls T		66		24.78		41.22		0.18		7.42	╡╏		╡ ┝	(29)	
Walls T	ypez	16		1.89		14.11		0.18	=	2.59	╡╞		╡ ┝	(29)	
Roof		66		0		66	×	0.16	=	10.56				(30)	
		lements	, m²			148								(31)	
Party w						16	×	0	=	0	Ļ		_	(32)	
Interna						71					ļ			(32c)	)
Interna						48					Ĺ			(32d)	)
Interna	-					44								(32e)	)
			ows, use e sides of in				ated usin	g formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2		
			= S (A x		o ana par			(26)(30	) + (32) =				56.0	)7 (33)	
		Cm = S(	•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5870		
			. ,	? = Cm ÷	- TFA) ir	ר kJ/m²K			Indica	tive Value:	Low		100		
-	-				construct	ion are not	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f			
			tailed calcu				/							<b></b> .	
Inerma	ai bridg	es : S (L	x y) calo	culated (	using Ap	pendix k	`						6.8	8 (36)	

if details of thermal bridging are not known  $(36) = 0.05 \times (31)$ 



Total f	abric he	at loss							(33) +	(36) =			62.95	(37)
		at loss ca	alculated	l monthly	/						25)m x (5)		02.95	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	31.11	30.84	30.57	29.33	29.1	28.02	28.02	27.82	28.43	29.1	29.57	30.06		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	94.06	93.79	93.52	92.28	92.05	90.97	90.97	90.77	91.38	92.05	92.52	93.01		
										•	Sum(39)1.	12 /12=	92.28	(39)
Heat Ic (40)m=	oss para	1.54	1LP), W/	m²K 1.51	1.51	1.49	1.49	1.49	(40)m 1.5	= (39)m ÷	1.52	1.52		
(40)11-	1.04	1.54	1.00	1.51	1.51	1.43	1.43	1.43			Sum(40)1		1.51	(40)
Numbe	er of day	/s in mor	nth (Tab	le 1a)										``
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting enei	rgy requi	rement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		01		(42)
Annua <i>Reduce</i>	l averag	je hot wa	hot water	usage by a	5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.93		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	90.13	86.85	83.57	80.29	77.02	73.74	73.74	77.02	80.29	83.57	86.85	90.13		_
Enerav	content of	<sup>-</sup> hot water	used - cal	culated mo	onthlv = 4.	190 x Vd.r	m x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			<mark>m(44)</mark> 112 = ables 1b. 1		983.18	(44)
(45)m=	133.65	116.89	120.62	105.16	100.91	87.07	80.69	92.59	93.7	109.19	119.19	129.44		
(,											m(45) <sub>112</sub> =		1289.11	(45)
lf instan	taneous v	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	20.05	17.53	18.09	15.77	15.14	13.06	12.1	13.89	14.05	16.38	17.88	19.42		(46)
	storage		includir		alar or M		storage	within sa		ما		0		(47)
-		neating a					-			301		0		(47)
Otherv	•	o stored			•			ombi boil	ers) ente	er '0' in (	47)			
	-	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 age loss		•								0		(51)
		neating s			0 2 (100	1,1110,00	×y)					0		(01)
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
		m water	-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54
Enter	(50) or (	(54) in (5	5)									0		(55)



Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3					-		0		(58)
	•				month (	59)m = (	(58) ÷ 36	5 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	ostat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	45.93	39.97	42.59	39.6	39.25	36.36	37.58	39.25	39.6	42.59	42.83	45.93		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	179.58	156.87	163.21	144.76	140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36		(62)
										r contribut	tion to wate	er 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)
Output	from w	ater hea	ter	-			-			-				
(64)m=	179.58	156.87	163.21	144.76	140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36		
								Outp	out from w	ater heate	r (annual)₁	12	1780.56	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	55.92	48.86	50.75	44.87	43.36	38.04	36.22	40.6	41.05	46.95	50.34	54.52		(65)
(00)														
	lde (57)	n in calo	ulation (	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fi	rom com	munity h	leating	
inclu	. ,		culation of Table 5	. ,	-	ylinder is	s in the c	dwelling	or hot w	ater is fi	rom com	nunity h	leating	
inclu 5. Int	ternal ga	ains (see		5 and 5a	-	ylinder is	s in the c	dwelling	or hot w	ater is fi	rom com	nunity h	leating	
inclu 5. Int	ternal ga	ains (see	e Table 5	5 and 5a	-	ylinder is Jun	s in the c Jul	dwelling Aug	or hot w Sep	ater is fi Oct	rom com	munity h	leating	
inclu 5. Int	ernal ga	ains (see as (Table	e Table 5 e 5), Wat	5 and 5a	):		i		Ī	i	1		leating	(66)
inclu 5. Int Metabo (66)m= Lightin	ernal ga olic gain Jan 120.59 g gains	ains (see s (Table Feb 120.59 (calcula	e Table 5 e 5), Wat Mar 120.59 ted in Ap	ts Apr 120.59 Apr	): May 120.59 L, equati	Jun 120.59 ion L9 of	Jul 120.59 r L9a), a	Aug 120.59 Iso see	Sep 120.59 Table 5	Oct	Nov	Dec	leating	(66)
inclu 5. Int Metabo (66)m= Lightin	ernal ga olic gain Jan 120.59 g gains	ains (see s (Table Feb 120.59 (calcula	e Table 5 e 5), Wat Mar 120.59 ted in Ap	ts Apr 120.59 Apr	): May 120.59	Jun 120.59 ion L9 of	Jul 120.59 r L9a), a	Aug 120.59 Iso see	Sep 120.59 Table 5	Oct	Nov	Dec	leating	(66)
inclu 5. Int Metabo (66)m= Lightin (67)m=	olic gain Jan 120.59 g gains 39.11	ains (see s (Table Feb 120.59 (calcula 34.73	2 Table 5 2 5), Wat Mar 120.59 ted in Ap 28.25	and 5a ts Apr 120.59 opendix 21.39	): May 120.59 L, equati	Jun 120.59 ion L9 of 13.5	Jul 120.59 r L9a), a 14.58	Aug 120.59 Iso see 18.96	Sep 120.59 Table 5 25.44	Oct 120.59 32.3	Nov 120.59	Dec 120.59	leating	
inclu 5. Int Metabo (66)m= Lightin (67)m=	olic gain Jan 120.59 g gains 39.11	ains (see s (Table Feb 120.59 (calcula 34.73	2 Table 5 2 5), Wat Mar 120.59 ted in Ap 28.25	and 5a ts Apr 120.59 opendix 21.39	): May 120.59 L, equati 15.99	Jun 120.59 ion L9 of 13.5	Jul 120.59 r L9a), a 14.58	Aug 120.59 Iso see 18.96	Sep 120.59 Table 5 25.44	Oct 120.59 32.3	Nov 120.59	Dec 120.59	leating	
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17	): May 120.59 L, equati 15.99 dix L, eq	Jun 120.59 on L9 of 13.5 uation L 207.47	Jul 120.59 r L9a), a 14.58 13 or L1 195.92	Aug 120.59 Iso see 18.96 3a), also 193.2	Sep 120.59 Table 5 25.44 see Ta 200.05	Oct 120.59 32.3 ble 5 214.63	Nov 120.59 37.7	Dec 120.59 40.19	leating	(67)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17	): 120.59 L, equati 15.99 dix L, equati 224.77	Jun 120.59 on L9 of 13.5 uation L 207.47	Jul 120.59 r L9a), a 14.58 13 or L1 195.92	Aug 120.59 Iso see 18.96 3a), also 193.2	Sep 120.59 Table 5 25.44 see Ta 200.05	Oct 120.59 32.3 ble 5 214.63	Nov 120.59 37.7	Dec 120.59 40.19	leating	(67)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07	• Table 5 • 5), Wat Mar 120.59 ted in Ap 28.25 •ulated in 257.75 ated in Ap	Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07	): 120.59 L, equati 15.99 dix L, equ 224.77 L, equat	Jun 120.59 on L9 of 13.5 uation L 207.47 ion L15	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a)	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se	Sep 120.59 Table 5 25.44 see Ta 200.05 ee Table	Oct 120.59 32.3 ble 5 214.63 5	Nov 120.59 37.7 233.03	Dec 120.59 40.19 250.33	leating	(67) (68)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07	): 120.59 L, equati 15.99 dix L, equ 224.77 L, equat	Jun 120.59 on L9 of 13.5 uation L 207.47 ion L15	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a)	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se	Sep 120.59 Table 5 25.44 2 see Ta 200.05 ee Table	Oct 120.59 32.3 ble 5 214.63 5	Nov 120.59 37.7 233.03	Dec 120.59 40.19 250.33	leating	(67) (68)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m= Cookir (69)m= Pumps (70)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07 s and far 3	ains (see s (Table Feb 120.59 (calcula 34.73 ins (calcula 264.6 (calcula 49.07 ns gains 3	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>	5 and 5a ts Apr 120.59 ppendix 21.39 Appendix 243.17 ppendix 49.07 5a) 3	): 120.59 L, equati 15.99 dix L, equat 224.77 L, equat 49.07	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 200.05 200.05 200.05 200.05	Oct 120.59 32.3 ble 5 214.63 5 49.07	Nov 120.59 37.7 233.03 49.07	Dec 120.59 40.19 250.33 49.07	leating	(67) (68) (69)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m= Cookir (69)m= Pumps (70)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07 s and far 3	ains (see s (Table Feb 120.59 (calcula 34.73 ins (calcula 264.6 (calcula 49.07 ns gains 3	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>	5 and 5a ts Apr 120.59 ppendix 21.39 Appendix 243.17 ppendix 49.07 5a) 3	): May 120.59 L, equati 15.99 dix L, equat 224.77 L, equat 49.07 3	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 200.05 200.05 200.05 200.05	Oct 120.59 32.3 ble 5 214.63 5 49.07	Nov 120.59 37.7 233.03 49.07	Dec 120.59 40.19 250.33 49.07	leating	(67) (68) (69)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and fan 3 s e.g. ev -80.39	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 vaporatic	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul>	and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5)	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3	Oct 120.59 32.3 ble 5 214.63 5 49.07 3	Nov 120.59 37.7 233.03 49.07 3	Dec 120.59 40.19 250.33 49.07 3	leating	(67) (68) (69) (70)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and fan 3 s e.g. ev -80.39	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul>	and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5)	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3	Oct 120.59 32.3 ble 5 214.63 5 49.07 3	Nov 120.59 37.7 233.03 49.07 3	Dec 120.59 40.19 250.33 49.07 3	leating	(67) (68) (69) (70)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and far 3 s e.g. ev -80.39 heating 75.16	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39 gains (T	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>	and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab -80.39	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5) -80.39 52.84	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3 -80.39 48.69	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07 3 -80.39 54.57	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3 -80.39 57.02	Oct 120.59 32.3 ble 5 214.63 5 49.07 3 -80.39 63.11	Nov 120.59 37.7 233.03 49.07 3 -80.39	Dec 120.59 40.19 250.33 49.07 3 -80.39 73.28	leating	(67) (68) (69) (70) (71)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and far 3 s e.g. ev -80.39 heating 75.16	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39 gains (T 72.71 gains =	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>	and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab -80.39	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5) -80.39 52.84	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3 -80.39 48.69	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07 3 -80.39 54.57	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3 -80.39 57.02	Oct 120.59 32.3 ble 5 214.63 5 49.07 3 -80.39 63.11	Nov 120.59 37.7 233.03 49.07 3 -80.39 69.92	Dec 120.59 40.19 250.33 49.07 3 -80.39 73.28	leating	(67) (68) (69) (70) (71)

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



Orientation	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	0.77 0.77	x	8.4	×	10.63	×	0.57	x	0.7	=	24.7	(74)
North 0.9	0.77 0.77	x	8.4	x	20.32	x	0.57	x	0.7	=	47.2	(74)
North 0.9	<b>x</b> 0.77	x	8.4	×	34.53	×	0.57	x	0.7	=	80.2	(74)
North 0.9	0.77 0.77	x	8.4	×	55.46	×	0.57	x	0.7	=	128.82	(74)
North 0.9	0.77 0.77	x	8.4	×	74.72	×	0.57	x	0.7	=	173.54	(74)
North 0.9	0.77 0.77	x	8.4	×	79.99	×	0.57	x	0.7	=	185.78	(74)
North 0.9	0.77 0.77	x	8.4	×	74.68	x	0.57	x	0.7	=	173.45	(74)
North 0.9	0.77 0.77	x	8.4	×	59.25	×	0.57	x	0.7	=	137.61	(74)
North 0.9	0.77 0.77	x	8.4	×	41.52	×	0.57	x	0.7	=	96.43	(74)
North 0.9	0.77 0.77	x	8.4	x	24.19	x	0.57	x	0.7	=	56.18	(74)
North 0.9	0.77 0.77	x	8.4	×	13.12	x	0.57	x	0.7	=	30.47	(74)
North 0.9	0.77 0.77	x	8.4	×	8.86	×	0.57	x	0.7	=	20.59	(74)
South 0.9	0.77 0.77	x	12.18	×	46.75	x	0.57	x	0.7	=	157.45	(78)
South 0.9	0.77 0.77	x	12.18	×	76.57	x	0.57	x	0.7	=	257.87	(78)
South 0.9	0.77 0.77	x	12.18	×	97.53	x	0.57	x	0.7	=	328.48	(78)
South 0.9	0.77 0.77	x	12.18	×	110.23	x	0.57	x	0.7	=	371.25	(78)
South 0.9	0.77 0.77	x	12.18	×	114.87	×	0.57	x	0.7	=	386.87	(78)
South 0.9	0.77 0.77	x	12.18	×	110.55	x	0.57	x	0.7	=	372.31	(78)
South 0.9	0.77 0.77	x	12.18	x	108.01	x	0.57	x	0.7	=	363.77	(78)
South 0.9	0.77 0.77	x	12.18	×	104.89	×	0.57	x	0.7	=	353.27	(78)
South 0.9	0.77 0.77	x	12.18	×	101.89	×	0.57	x	0.7	=	343.14	(78)
South 0.9	0.77 0.77	x	12.18	×	82.59	x	0.57	x	0.7	=	278.14	(78)
South 0.9	<b>0.77</b>	x	12.18	×	55.42	x	0.57	x	0.7	=	186.64	(78)
South 0.9	<b>0.77</b>	x	12.18	×	40.4	×	0.57	x	0.7	=	136.05	(78)
West 0.9	<b>0.77</b>	x	4.2	×	19.64	×	0.57	x	0.7	=	22.81	(80)
West 0.9	0.77 0.77	x	4.2	×	38.42	×	0.57	x	0.7	=	44.62	(80)
West 0.9	0.77	x	4.2	×	63.27	x	0.57	x	0.7	=	73.48	(80)
West 0.9	0.77 0.77	x	4.2	×	92.28	×	0.57	x	0.7	=	107.17	(80)
West 0.9	0.77 0.77	x	4.2	x	113.09	×	0.57	x	0.7	=	131.34	(80)
West 0.9	0.77 0.77	x	4.2	×	115.77	x	0.57	x	0.7	=	134.45	(80)
West 0.9	0.77 0.77	x	4.2	×	110.22	x	0.57	x	0.7	=	128	(80)
West 0.9	0.77 0.77	x	4.2	x	94.68	x	0.57	x	0.7	=	109.95	(80)
West 0.9	0.77 0.77	x	4.2	×	73.59	×	0.57	x	0.7	=	85.46	(80)
West 0.9	0.77 0.77	x	4.2	×	45.59	×	0.57	x	0.7	=	52.94	(80)
West 0.9	0.77 0.77	x	4.2	×	24.49	×	0.57	x	0.7	=	28.44	(80)
West 0.9	0.77	x	4.2	×	16.15	×	0.57	x	0.7	=	18.76	(80)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m.	(82)m			
(83)m=	204.96	349.69	482.16	607.25	691.75	692.54	665.22	600.83	525.03	387.26	245.54	175.4	(83)
Total g	ains – ii	nternal a	ind solar	<sup>-</sup> (84)m =	= (73)m -	+ (83)m	, watts						
(84)m=	673.38	813.99	928.64	1026.38	1083.05	1058.61	1016.67	959.82	899.8	789.57	678.46	631.46	(84)





		perature											
Temperature	•	• •			-		ole 9, Th	1 (°C)				21	(85
Utilisation fac			<u> </u>		r`	, 							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00
6)m= 0.91	0.86	0.81	0.72	0.61	0.47	0.36	0.39	0.56	0.75	0.87	0.92		(86
Mean interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
7)m= 18.52	18.91	19.43	20.01	20.48	20.79	20.92	20.9	20.67	20.06	19.19	18.45		(87
Femperature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
<mark>8)m=</mark> 19.66	19.66	19.66	19.68	19.68	19.69	19.69	19.7	19.69	19.68	19.67	19.67		(88)
Jtilisation fac	tor for a	ains for	rest of d	welling,	h2.m (se	e Table	9a)			-			
9)m= 0.89	0.84	0.78	0.68	0.55	0.4	0.27	0.3	0.49	0.71	0.85	0.9		(89
Mean interna	l temper	ature in	the rest	of dwelli	na T2 (f	nllow ste	ns 3 to .	7 in Tahl	e 9c)				
0)m= 17.48	17.86	18.35	18.9	19.32	19.58	19.66	19.66	19.5	18.96	18.15	17.42		(90
,								lf	LA = Livin	g area ÷ (4	4) =	0.41	(91
A				- <b>1</b>	() () () () () () () () () () () () () (		. (4 . 61				l	-	
Mean interna 2)m= 17.91	1 temper 18.29	ature (10 18.79	19.36 nr the wh	01e dwe 19.79	1100 = 1	LA × 11 20.18	+ (1 – TL 20.16	A) × 12	10.41	18.57	17.04		(92
									19.41	10.07	17.84		(92
Apply adjustr 3)m= 17.91	18.29	18.79	19.36	19.79	20.08	20.18	20.16	19.98	19.41	18.57	17.84		(93
B. Space hea				10.70	20.00	20.10	20.10	10.00	10.41	10.07	17.04		(
Set Ti to the	mean int	ernal ter	mperatur		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
he utilisation	1	<u> </u>								i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jtilisation fac	0.82			0.55	0.40	0.2	0.22	0.5	0.7	0.02	0.00		(94
,		0.76	0.67	0.55	0.42	0.3	0.33	0.5	0.7	0.83	0.88		(94
Jseful gains, 5)m= 584.34	667.36	, VV = (92 703.89	+)111 X (04 685.98	+)m 600.86	444.8	307.78	319.27	453.03	552.18	559.81	555.77		(95
Monthly aver						007.70	010.21	400.00	002.10	000.01	000.11		(00
6)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
feat loss rate	e for mea	an intern	al tempe	erature.		[ =[(39)m ]	L x [(93)m	<u> </u>	1				
7)m= 1279.77	r	1149.54	· · · ·	745.04	498.08	325.43	341.73	537.19	811.04	1061.55	1268.6		(97
Space heatin	g require	ement fo	r each n	nonth, k	Nh/mon <sup>-</sup>	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
8)m= 517.4	395.55	331.57	200.96	107.27	0	0	0	0	192.59	361.25	530.35		
							Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2636.94	(98
		ement in	kWh/m²	/year							י 	43.23	(99
Space heatin	a reauire			,		ncluding	mioro 6	עם' –					`
•	• •	to Joel		ooting e			Thicro-C						
a. Energy rec	quiremer	nts – Indi	ividual h	eating s	ystems i	9							
a. Energy rec Space heatin	quiremer ng:					Ĭ						0	(20
a. Energy rec Space heatin Fraction of sp	quiremer ng: bace hea	at from se	econdary	y/supple		system	(202) = 1 ·	- (201) =				0	
a. Energy rec Space heatin Fraction of sp Fraction of sp	quiremer ng: bace hea bace hea	at from se at from m	econdary nain syst	y/supple em(s)		system	(202) = 1	– (201) = 02) × [1 –	(203)] =			1	(20
Space heatin a. Energy red Space heatin Fraction of sp Fraction of sp Fraction of to	quiremen ng: bace hea bace hea tal heatin	at from se at from m ng from 1	econdary nain syst main sys	y/supple em(s) stem 1		system	(202) = 1		(203)] =			1	(20 (20 (20 (20
a. Energy rec Space heatin Fraction of sp Fraction of sp	quiremen ng: bace hea bace hea tal heatin main spa	at from se at from m ng from i ace heati	econdary nain syst main sys ing syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1		(203)] =			1	(20

thermenergy



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Space	ī		r · · ·	1	d above)								1	
	517.4	395.55	331.57	200.96	107.27	0	0	0	0	192.59	361.25	530.35		
(211)m	= {[(98) 582.66	)m x (20 445.44	4)] } x 1 373.38	00 ÷ (20 226.31	, 	0		0	0	216.88	406.82	597.24	1	(211)
	582.66	445.44	373.38	226.31	120.8	0	0	-	0 I (kWh/yea		406.82 211) <sub>15,1012</sub>		2969.53	(211)
Space	e heating	a fuel (s	econdar	y), kWh/	month						/15,1012	2	2909.00	]()
•			00 ÷ (20	• •										
(215)m=	0	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>	<u>_</u>	0	(215)
	heating		tor (aala	ulated a										
Output	179.58	156.87	163.21	ulated a 144.76	140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36		
Efficier	ncy of wa	ater hea	iter								1		79.5	(216)
(217)m=	86.2	85.95	85.5	84.65	83.28	79.5	79.5	79.5	79.5	84.45	85.7	86.29		(217)
		•	kWh/m											
(219)m=		182.52	) <u>÷ (217)</u> 190.89	171	168.29	155.27	148.76	165.83	167.66	179.74	189.07	203.22		
								Tota	I = Sum(21	19a) <sub>112</sub> =	1		2130.57	(219)
	l totals									k	Wh/year		kWh/year	-
Space	heating	fuel use	ed, main	system	1								2969.53	]
Water	heating	fuel use	d										2130.57	
	sity for n	umns f	ans and	alactric	koon ho	•								
Electric	ny ioi p	umpo, n		electric	keep-no									
	al heating			electric	keep-no	L						30	]	(230c)
centra		g pump:	:	electric	кеер-по	L						30 45	]	(230c) (230e)
centra boiler	al heating with a fa	g pump: an-assis	ted flue	<wh td="" yea<=""><td>·</td><td>ſ</td><td></td><td>sum</td><td>of (230a).</td><td>(230g) =</td><td></td><td></td><td>75</td><td></td></wh>	·	ſ		sum	of (230a).	(230g) =			75	
centra boiler Total e	al heating with a fa	g pump: an-assis / for the	ted flue		·	ſ		sum	of (230a).	(230g) =	1		75 276.25	(230e)
centra boiler Total e Electric	al heating with a fa lectricity	g pump an-assis v for the ghting	: sted flue above, l		·	ſ		sum	of (230a).	(230g) =	:			(230e) (231)
centra boiler Total e Electric Electric	al heating with a fa lectricity city for lig	g pump an-assis v for the ghting erated b	: above, ł y PVs	⟨Wh/yea	·		+ (232).		. ,	(230g) =	:		276.25	(230e) (231) (232)
centra boiler Total e Electric Electric Total d	al heating with a fa lectricity city for lig city gene elivered	g pump an-assis for the ghting erated b energy	: above, l above y PVs for all u	⟨Wh/yea	r )(221)		+ (232).		. ,	(230g) =			276.25	(230e) (231) (232) (233)
centra boiler Total e Electric Electric Total d	al heating with a fa lectricity city for lig city gene elivered	g pump an-assis for the ghting erated b energy	: above, l above y PVs for all u	⟨Wh/yea ses (211	r )(221)	+ (231)			. ,				276.25 -760.49 4690.85	(230e) (231) (232) (233)
centra boiler Total e Electric Electric Total d	al heating with a fa lectricity city for lig city gene elivered	g pump an-assis for the ghting erated b energy	: above, l above y PVs for all u	⟨Wh/yea ses (211	r )(221)	+ (231) <b>Fu</b>			. ,	(230g) = <b>Fuel P</b> (Table	rice		276.25	(230e) (231) (232) (233)
centra boiler Total e Electric Total d 10a. F	al heating with a fa lectricity city for lig city gene elivered	g pump: an-assis for the ghting erated by energy ts - indiv	: above, l above y PVs for all u	⟨Wh/yea ses (211 eating sy	r )(221)	+ (231) <b>Fu</b> kW	el		. ,	Fuel P	P <b>rice</b> 12)		276.25 -760.49 4690.85 Fuel Cost	(230e) (231) (232) (233)
centra boiler Total e Electric Total d 10a. F	al heating with a fa lectricity city for lig city gene elivered Fuel cos heating	g pump an-assis y for the ghting erated by energy ts - indiv	: above, I y PVs for all u: <u>/idual he</u>	⟨Wh/yea ses (211 eating sy	r )(221)	+ (231) <b>Fu</b> kW (211	<b>el</b> /h/year		. ,	Fuel P (Table	Price 12)	45	276.25 -760.49 4690.85 <b>Fuel Cost</b> £/year	(230e) ](231) ](232) ](233) ](338)
centra boiler Total e Electric Total d 10a. F Space Space	al heating with a fa lectricity city for lig city gene elivered Fuel cos heating	g pump an-assis v for the ghting erated by energy ts - indiv - main s	: above, I y PVs for all u: vidual he system 1	⟨Wh/yea ses (211 eating sy	r )(221)	+ (231) <b>Fu</b> kW (211 (213	<b>el</b> /h/year 1) x		. ,	Fuel P (Table	Price 12)	45 × 0.01 =	276.25 -760.49 4690.85 <b>Fuel Cost</b> £/year 103.34	(230e) ](231) ](232) ](233) ](338) ](240)
centra boiler Total e Electric Total d 10a. F Space Space Space	al heating with a fa lectricity city for lig city gene elivered Fuel cos heating heating heating	g pump: an-assis v for the ghting erated by energy ts - indiv - main s - main s - secon	: above, I y PVs for all u: vidual he system 1	⟨Wh/yea ses (211 eating sy	r )(221)	+ (231) <b>Fu</b> kW (211 (213	<b>el</b> /h/year 1) x 3) x 5) x		. ,	Fuel P (Table	Price 12) 18	45 × 0.01 = × 0.01 =	276.25 -760.49 4690.85 <b>Fuel Cost</b> £/year 103.34 0	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](241)
centra boiler Total e Electric Total d 10a. F Space Space Space Water	al heating with a fa lectricity city for lig city gene elivered fuel cost heating heating heating	g pump: an-assis y for the ghting erated by energy ts - indiv - main s - main s - secon cost (oth	: above, I y PVs for all u: vidual he system 2 dary	kWh/yea ses (211 eating sy	r )(221)	+ (231) Fu kW (212 (213 (215	el /h/year 1) x 3) x 5) x 9)		. ,	<b>Fuel P</b> (Table 3.4 (13.	Price 12) 18	45 × 0.01 = × 0.01 = × 0.01 =	276.25 -760.49 4690.85 <b>Fuel Cost</b> £/year 103.34 0 0	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](241) ](242)
centra boiler Total e Electric Total d 10a. F Space Space Space Water Pumps (if off-p	al heating with a fa lectricity city for lig city gene elivered Fuel cos heating heating heating a fans ar eak tarif	g pump: an-assis an-assis for the ghting erated by erated by erated by erated by ts - indiv ts - indiv ts - indiv ts - indiv ts - secon cost (oth nd elect ff, list ea	: above, I above, I y PVs for all u vidual he system 2 dary her fuel) ric keep	<wh yea<br="">ses (211 eating sy</wh>	r )(221) stems:	+ (231) Fu kW (21) (21) (21) (21) (21) (21) (21) (21)	el /h/year 1) x 3) x 5) x 9) 1) / as app	(237b)	=	Fuel P (Table 3.4 13. 3.4 13. 7 fuel pri	Price 12) 18 19 19 19 19 19	45 45 × 0.01 = × 0.01 = × 0.01 = × 0.01 = × 0.01 = × 0.01 =	276.25 -760.49 4690.85 Fuel Cost £/year 103.34 0 0 74.14 9.89 Table 12a	(230e) ](231) ](232) ](233) ](338) ](338) ](338) ](240) ](241) ](242) ](247) ](249)
centra boiler Total e Electric Total d 10a. F Space Space Space Water I Pumps (if off-p Energy	al heating with a fa lectricity city for lig city gene elivered fuel cos heating heating heating heating a fans ar eak tarif	g pump: an-assis v for the ghting erated by erated by erated by erated by ts - indiv ts - indiv - main s - main s - secon cost (oth nd elect ff, list ea ting	: above, l above, l y PVs for all u vidual he system 2 dary her fuel) ric keep- ach of (23	<wh yea<br="">ses (211 eating sy</wh>	r )(221) stems:	+ (231) Fu kW (21) (213 (215 (215) (23)	el /h/year 1) x 3) x 5) x 9) 1) / as app	(237b)	=	Fuel P (Table 3.4 13. 3.4 13.	Price 12) 18 19 19 19 19 19	45 x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	276.25 -760.49 4690.85 Fuel Cost £/year 103.34 0 0 74.14 9.89	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](241) ](242) ](247)



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	one of (233) to (235) x)	13.19 × 0.01 =	-100.31	(252)
Appendix Q items: repeat lines (253) and (254) as	needed			-
Total energy cost(245)(247)	) + (250)(254) =		243.5	(255)
11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(255) x (25)	6)] ÷ [(4) + 45.0] =		0.96	(257)
SAP rating (Section 12)			86.54	(258)
12a. CO2 emissions – Individual heating systems	including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216 =	641.42	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	460.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=	1101.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	143.37	(268)
Energy saving/generation technologies				_
Item 1		0.519 =	-394.7	(269)
Total CO2, kg/year	SL	ım of (265)(271) =	889.22	(272)
CO2 emissions per m <sup>2</sup>	(2	72) ÷ (4) =	14.58	(273)
EI rating (section 14)			89	(274)
13a. Primary Energy				
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22 =	3622.82	(261)
Space heating (secondary)	(215) x	3.07 =	0	(263)
Energy for water heating	(219) x	1.22 =	2599.29	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=	6222.11	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25	(267)
Electricity for lighting	(232) x	0 =	848.09	(268)
Energy saving/generation technologies Item 1		3.07 =	-2334.71	(269)
'Total Primary Energy	su	um of (265)(271) =	4965.75	(272)
Primary energy kWh/m²/year	(2	72) ÷ (4) =	81.41	(273)



# **Regulations Compliance Report**

Printed on 24 Januar		•	na FSAP 2012 program, Version: 1	.0.5.59
Project Information: Assessed By: L	eighton Howe (S1	BO004042)	Building Type: Flat	
-	eignion nowe (Si	R0004042)	Building Type. Flat	
Dwelling Details:				
NEW DWELLING DE			Total Floor Area: 40m <sup>2</sup>	
Site Reference : A	AL-10		Plot Reference: Flat 2	2
Address : F	lat 2, Manor Cour	t, 152 Abbey Road, LONDO	N, NW6 4ST	
Client Details:				
Name: Address :				
This report covers if It is not a complete		thin the SAP calculations.		
1a TER and DER	report of regulati	ons compliance.		
Fuel for main heating	system: Mains da	IS		
Fuel factor: 1.00 (mai				
Target Carbon Dioxid	• •	TER)	24.68 kg/m <sup>2</sup>	
Dwelling Carbon Diox	dide Emission Rate	e (DER)	17.77 kg/m <sup>2</sup>	ОК
1b TFEE and DFEE				
Target Fabric Energy	Efficiency (TFEE)	1	66.2 kWh/m <sup>2</sup>	
Dwelling Fabric Energ	gy Efficiency (DFE	E)	60.5 kWh/m <sup>2</sup>	
				OK
2 Fabric U-values				
Element		Average	Highest	
External wal	I	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall		0.00 (max. 0.20)	-	OK
Floor		(no floor)	0.40 (	01/
Roof		0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridgin				
3 Air permeability	lging calculated fro	om linear thermal transmittar	ices for each junction	
	y at 50 pascals		5.00 (design value)	
Maximum	y at 50 pascals		10.0	ОК
			1010	
4 Heating efficiency				
Main Heating s	system:	Boiler systems with radiato Data from manufacturer Combi boiler Efficiency 88.0 % SEDBUK Minimum 88.0 %	rs or underfloor heating - mains ga 2009	s OK
Secondary hea	ating system:	None		
5 Cylinder insulation	on			
Hot water Stor	age:	No cylinder		N/A



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# **Regulations Compliance Report**

6 Controls			
Space heating controls Hot water controls:	Programmer and at leas No cylinder thermostat	t two room thermostats	OK
Boiler interlock:	No cylinder Yes		ок
7 Low energy lights			
Percentage of fixed lights wit Minimum	h low-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (South Eas Based on: Overshading: Windows facing: South Windows facing: West Ventilation rate: Blinds/curtains:	t England):	Medium Average or unknown 12.6m <sup>2</sup> 7.14m <sup>2</sup> 6.00 Dark-coloured curtain or roller blind Closed 100% of daylight hours	OK
10 Key features Party Walls U-value Photovoltaic array		0 W/m²K	

		<u>User</u>	Details:						
Assessor Name: Software Name:	Leighton Howe Stroma FSAP 2012		Stroma Softwa	re Ver				004042 n: 1.0.5.59	
Address :	Flat 2, Manor Court,		y Address: oad, LOND		V6 4ST				
1. Overall dwelling dime	ensions:								
		A	rea(m²)		Av. Hei	ght(m)		Volume(m <sup>3</sup> )	_
Ground floor			40	(1a) x	2	.4	(2a) =	96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	40	(4)					
Dwelling volume				(3a)+(3b)	)+(3c)+(3d)	)+(3e)+	(3n) =	96	(5)
2. Ventilation rate:									
Number of chimneys		condary eating	other 0	] = [	total	x 4	0 =	m <sup>3</sup> per hour	(6a)
Number of open flues		0 +	0	」 】 = 厂	0	x 2	20 =	0	](6b)
Number of intermittent fa		Ū	0		-	x 1	0 =		](02) ](7a)
				Ļ	2		0 =	20	
Number of passive vents				Ļ	0			0	(7b)
Number of flueless gas f	Ires				0	X 4	-0 =	0	(7c)
							Air ch	anges per ho	ur
	been carried out or is intended			ontinue fr	20 om (9) to (		- (5) =	0.21	(8)
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)-	1]x0.1 =	0	(9) (10)
	.25 for steel or timber fr	ame or 0.35	for masonry	/ constr	uction	[(0)	110.1 -	0	](10) ](11)
	resent, use the value corresp		•						
•	floor, enter 0.2 (unseale	ed) or 0.1 (sea	aled), else e	enter 0				0	(12)
If no draught lobby, en								0	(13)
Vercentage of window Window infiltration	s and doors draught str	ipped	0.25 - [0.2	x (14) ∸ 1	001 -			0	
Infiltration rate			(8) + (10) +		-	· (15) =		0	(15) (16)
	q50, expressed in cubi	c metres per			, , , , , , , , , , , , , , , , , , ,		area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17)]$	) ÷ 20]+(8), othe	rwise (18) = (1	6)				0.46	(18)
	es if a pressurisation test has	been done or a d	legree air per	meability	is being us	ed			-
Number of sides sheltere Shelter factor	эd		(20) = 1 - [0	) 075 v (1	(Q)] —			1	(19)
Infiltration rate incorpora	ting shelter factor		(20) = 1 - [0] (21) = (18)		[0]] =			0.92	(20)
Infiltration rate modified f	•		(21) - (10)	x (20) -				0.42	(21)
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp									
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	$2$ )m $\div$ 4	I	_1 _1		ıl			I	
(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		
		I						I	



Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m				-	
	0.54	0.53	0.52	0.47	0.46	0.4	0.4	0.39	0.42	0.46	0.48	0.5		
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se							(23a)
				endix N, (2	3b) = (23a	i) x Fmv (e	equation (	N5)) othe	rwise (23h	(23a) = (23a)			0	(23a)
			• • • •	iency in %	, ,					(200)			0	
			-	-	-					2b)m + (:	23h) v [ <sup>,</sup>	1 _ (23c)	$0$ $\div 1001$	(23c)
(24a)m=				0	0	0			0			$\frac{1-(230)}{0}$	] ]	(24a)
				_	_	-		-		1 2b)m + (2		, ,	J	~ /
(24b)m=				0	0						0	0	1	(24b)
				ntilation c									J	× ,
					•	•				.5 × (23b	))			
(24c)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input v	ventilati	on from	loft				1	
i	if (22b)r	n = 1, th	en (24d)	m = (22k	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		•	-	
(24d)m=	0.65	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)	•			-	
(25)m=	0.65	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62		(25)
3. He	at losse	s and he	eat loss i	paramete	er:									
ELEN	IENT	Gros	SS	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-valu	е	A X k
		area	(m²)	m	2	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²∙	K	kJ/K
Doors						1.89	x	1.4	=	2.646				(26)
Windo	ws Type	e 1				12.6	x1	/[1/( 1.4 )+	0.04] =	16.7				(27)
Windo	ws Type	2				7.14	x1	/[1/( 1.4 )+	0.04] =	9.47				(27)
Walls 7	Type1	51		19.74	4	31.26	5 X	0.18	=	5.63				(29)
Walls 7	Туре2	12	) -	1.89		10.11	x	0.18	=	1.86				(29)
Roof		40	I	0		40	x	0.16	=	6.4				(30)
Total a	rea of e	elements	, m²			103								(31)
Party v	vall					16	x	0	=	0				(32)
Interna	al wall **					71					ī		$\exists  \models$	(32c)
Interna	al floor					48					Ī		$\exists$	(32d)
Interna	al ceiling	I				44					Ī		$\dashv$	(32e)
				effective wi Internal wal			ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	 h 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30	) + (32) =				42.7	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5511.3	33 (34)
Therm	al mass	parame	eter (TMF	<sup>-</sup> = Cm ÷	- TFA) in	n kJ/m²K			Indica	tive Value	: Low		100	(35)
	-		ere the de tailed calci		constructi	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.88	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	· (36) =			49.58	3 (37)



Ventila	tion hea	t 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=	20.47	20.29	20.11	19.28	19.13	18.41	18.41	18.28	18.69	19.13	19.44	19.77		(38)
Heat tra	ansfer c	oefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	70.05	69.87	69.69	68.87	68.71	67.99	67.99	67.86	68.27	68.71	69.02	69.35		
										-	Sum(39)1.	12 /12=	68.87	(39)
r			HLP), W/	1	4.70				i	= (39)m ÷				
(40)m=	1.75	1.75	1.74	1.72	1.72	1.7	1.7	1.7	1.71	1.72	1.73 Sum(40) <sub>1</sub>	1.73	4 70	(40)
Numbe	r of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 / 1 2=	1.72	(40)
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
•			-							•				
4. Wa	ter heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
A			NI											(10)
		pancy, 9, N = 1	n + 1.76 x	[1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.0	)013 x (	TFA -13.		41		(42)
	A £ 13.9				(	- (	,	/ /]			- /			
			ater usag hot water							se target o		7.6		(43)
		-	person per			-	-	o domovo	a water at	io larget e	1			
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Hot wate			r day for ea		· ·			Ľ Š		•••				
(44)m=	74.36	71.66	68.95	66.25	63.54	60.84	60.84	63.54	66.25	68.95	71.66	74.36		
L			1								m(44) <sub>112</sub> =		811.21	(44)
Energy c	ontent of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	110.27	96.45	99.52	86.77	83.26	71.84	66.57	76.39	77.31	90.09	98.34	106.79		_
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1063.62	(45)
г		14.47	14.93	13.02	12.49	10.78	9.99	11.46	11.6	13.51	14.75	16.02		(46)
(46)m= Water s	16.54 storage		14.95	13.02	12.49	10.78	9.99	11.40	11.0	15.51	14.75	10.02		(46)
Storage	e volum	e (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comn	nunity h	eating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage		eclared I	occ fact	or ie kno	wp (k\\/k	v(davi):							(40)
			m Table				i/uay).					0		(48)
•			storage		oor			(48) x (49)	) –			0		(49)
0,			eclared of			or is not		(40) X (43)	, –			0		(50)
•			factor fr	•								0		(51)
	•	-	ee secti	on 4.3										
		from Ta	ble 2a m Table	2h								0		(52)
-					oor			(17) ~ (54)	V (EQ) v (	E2) -		0		(53)
		m water 54) in (5	storage	, KVVN/Y0	dl			(47) x (51)	) X (52) X (	55) =		0 0		(54) (55)
	. , .		culated f	for each	month			((56)m = (	55) × (41)	m	L'	0		
(56)m=		0			0	0	0	0	0	0	0			(56)
(50)11=	0	0		0	0				0	U	0	0		(50)





If cylinder contain	ns dedicate	ed solar sto	orage, (57)	m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	om Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circu	it loss (ar	nual) fro	om Table	e 3	-	-			-		0		(58)
Primary circu					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)	-		
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month	(61)m =	(60) ÷ 30	65 × (41	)m					_	
(61)m= 37.89	32.98	35.14	32.67	32.38	30	31	32.38	32.67	35.14	35.34	37.89		(61)
Total heat red	quired 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= 148.17	129.43	134.66	119.44	115.64	101.85	97.58	108.78	109.98	125.23	133.68	144.69		(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	-	
(add addition	al lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	vater hea	ter								_		_	
(64)m= 148.17	129.43	134.66	119.44	115.64	101.85	97.58	108.78	109.98	125.23	133.68	144.69		_
							Outp	out from w	ater heate	r (annual)₁	12	1469.11	(64)
Heat gains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 46.14	40.31	41.88	37.02	35.78	31.39	29.89	33.5	33.87	38.74	41.53	44.98		(65)
include (57	)m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fr	om com	munity h	eating	
5. Internal g	ains (see	e Table 5	5 and 5a	):									
Metabolic gai	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38		(66)
Lighting gains	s (calcula	ited in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 27.09	24.06	19.57	14.81	11.07	9.35	10.1	13.13	17.62	22.38	26.12	27.84		(67)
Appliances ga	ains (calo	culated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5	-			
(68)m= 181.39	183.28	178.53	168.43	155.69	143.71	135.7	133.82	138.56	148.66	161.41	173.39		(68)
Cooking gain	s (calcula	ated in A	ppendix	L, equa	tion L15	or L15a	), also se	e Table	e 5	-			
(69)m= 44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84		(69)
Pumps and fa	ans gains	(Table	5a)	-	-	-					-	-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	on (nega	tive valu	es) (Tab	ole 5)							-	
(71)m= -56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25		(71)
Water heating	g gains (	Table 5)										-	
(72)m= 62.02	59.99	56.29	51.41	48.09	43.6	40.17	45.02	47.04	52.07	57.69	60.46		(72)
Total interna	l gains =	=			(66)	)m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72)	)m	-	
(73)m= 346.47	343.3	330.35	310.63	290.82	272.62	261.95	267.94	279.2	299.08	321.18	337.66		(73)
6. Solar gair	IS:											-	
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ne applicat		tion.		
Orientation:	Access F	actor	Area		Flu	X		g_	т	FF able 6c		Gains	

m²

Table 6a

Table 6b

Table 6c

Table 6d

(W)



	_									_				_						
South	0.9x	0.77		x	12.	6	x	4	6.75	x		0.57	>	(	0.7		=	1	62.88	(78)
South	0.9x	0.77		x	12.	6	x	7	6.57	x		0.57	>	· [	0.7		=	2	66.76	(78)
South	0.9x	0.77		x	12.	6	x	g	97.53	×		0.57	>	(	0.7		=	3	39.81	(78)
South	0.9x	0.77		x	12.	6	x	1	10.23	×		0.57	>	] ،	0.7		=	3	84.06	(78)
South	0.9x	0.77		x	12.	6	x	1	14.87	×		0.57	>	(	0.7		=	4	00.21	(78)
South	0.9x	0.77		x	12.	6	x	1	10.55	×		0.57	>	] ،	0.7		=	3	85.15	(78)
South	0.9x	0.77		x	12.	6	x	1	08.01	×		0.57	<b>)</b>	- 	0.7		=	3	76.31	(78)
South	0.9x	0.77		x	12.	6	x	1	04.89	x		0.57	>	۔ ] ،	0.7		=	3	65.45	(78)
South	0.9x	0.77		x	12.	6	x	1	01.89	×		0.57	>	] ،	0.7		=	3	54.97	(78)
South	0.9x	0.77		x	12.	6	x	8	32.59	×		0.57	<b>)</b>	] ،	0.7		=	2	87.73	(78)
South	0.9x	0.77		x	12.	6	x	5	5.42	x		0.57	>	۔ ] ،	0.7		=	1	93.07	(78)
South	0.9x	0.77		x	12.	6	x		40.4	×		0.57	<b>)</b>	] ،	0.7		=	1	40.75	(78)
West	0.9x	0.77		x	7.1	4	x	1	9.64	] ×		0.57	_  ,	] ،	0.7		=	3	38.77	(80)
West	0.9x	0.77		x	7.1	4	x	3	8.42	Ī×		0.57	] ,	٦	0.7		=	7	75.85	(80)
West	0.9x	0.77		x	7.1	4	x	6	3.27	×		0.57	<b>_</b> ,	٦	0.7		=	1	24.92	(80)
West	0.9x	0.77		x	7.1	4	x	9	2.28	Ī×		0.57	,	ן י	0.7		=	1	82.18	(80)
West	0.9x	0.77		x	7.1	4	x	1	13.09	Ī×		0.57	,	ן י	0.7		=	2	23.27	(80)
West	0.9x	0.77		x	7.1	4	x	1	15.77	×		0.57	<b>_</b> ,	٦	0.7		=	2	28.56	(80)
West	0.9x	0.77		x	7.1	4	x	1	10.22	Ī×		0.57	,	ן י	0.7		=	2	217.6	(80)
West	0.9x	0.77		x	7.1	4	x	9	4.68	Ī×		0.57	<b>–</b> ,	٦	0.7		=	1	86.91	(80)
West	0.9x	0.77		x	7.1	4	x	7	3.59	Ī×		0.57	,	ן י	0.7		=	1	45.28	(80)
West	0.9x	0.77		x	7.1	4	x	4	5.59	Ī×		0.57	_ ,	ן י	0.7		=		90	(80)
West	0.9x	0.77		x	7.1	4	x	2	24.49	] ×		0.57	,	ן י	0.7		=	4	48.35	(80)
West	0.9x	0.77		x	7.1	4	x	1	6.15	] ×		0.57	,	۲	0.7		=	3	31.89	(80)
	•									-	-			-						
Solar g	ains in	watts, ca	alculate	ed	for eacl	n mont	h			(83)	n = S	Sum(74)m .	(82)	m						
(83)m=	201.66	342.61	464.72	2	566.24	623.48	6	613.71	593.91	55	2.37	500.25	377	.73	241.42	172	2.63			(83)
Total g	ains – i	nternal a	nd sol	ar	(84)m =	: (73)m	1+(	(83)m	, watts			-				-		-		
(84)m=	548.13	685.91	795.08	3	876.87	914.3	8	886.33	855.86	82	0.31	779.45	676	.81	562.6	510	).29			(84)
7. Me	an intei	rnal temp	peratur	e (	(heating	seaso	n)													
Temp	erature	during h	eating	р	eriods ir	n the liv	ving	area	from Tal	ble 9	), Th	1 (°C)							21	(85)
Utilisa	ation fac	ctor for g	ains fo	r li	iving are	ea, h1,r	n (s	see Ta	ble 9a)											
	Jan	Feb	Ма	·	Apr	Мау	'	Jun	Jul	4	Aug	Sep	0	ct	Nov	D	)ec	]		
(86)m=	0.88	0.82	0.75		0.66	0.55		0.43	0.32	0	.35	0.5	0.6	69	0.83	0.	89	]		(86)
Mean	interna	al temper	ature i	n I	iving are	ea T1 (	folle	ow ste	ps 3 to 7	7 in	Tabl	e 9c)								
(87)m=	18.45	18.92	19.47	-	20.04	20.49	_	20.79	20.92	1	0.9	20.69	20.	08	19.17	18	.36	]		(87)
Temp	erature	during h	eating		eriods ir	rest o	f dv	velling	from Ta	able	9 Т	h2 (°C)			-			4		
(88)m=	19.5	19.51	19.51	Ť	19.53	19.53	-	19.54	19.54	1	0, 1 0.54	19.54	19.	53	19.52	19	.52	1		(88)
				 r			_			I		I	I		1	I		1		
(89)m=	0.86	otor for ga	0.72	T	0.61	0.49	, 112 	2,m (Se 0.35	0.22	T Ó	.25	0.42	0.6	34	0.8	0	87	1		(89)
										1						L		1		x - /

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)





(90)m=	17.31	17.75	18.26	18.8	19.19	19.43	19.51	19.51	19.36	18.86	18.01	17.22		(90)
		ļ							1	L LA = Livin	g area ÷ (4	4) =	0.62	(91)
Moon	intorna	ltompor	oturo (fo	r tho wh	olo dwo	lling) – fl	Δ	+ (1 – fL	۸) <del> T</del> 2			l		
(92)m=	18.02	18.48	19.01	19.58	20	20.28	20.39	+ (1 – 1L 20.38	20.19	19.62	18.73	17.93		(92)
								4e, whe			10.70	17.00		(02)
(93)m=	18.02	18.48	19.01	19.58	20	20.28	20.39	20.38	20.19	19.62	18.73	17.93		(93)
			uirement			20120	20100		20110		10110			
					re obtain	ed at ste	en 11 of	Table 9	n so tha	t Ti m=('	76)m an	d re-calc	ulate	
			or gains	•					, 00 tha	(, , , , , , , , , , , , , , , , , , ,	r ojin an		alato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.84	0.77	0.7	0.61	0.51	0.39	0.28	0.31	0.46	0.65	0.78	0.85		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	457.72	531.16	559.82	538.29	465.31	344.59	242.63	251.57	354.77	436.65	441.45	433.85		(95)
Month	nly aver	age exte	rnal tem	perature	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 I	loss rate	i	an intern	· · ·	erature,	i	- ,	x [(93)m	– (96)m	]				
(97)m=	961.16	948.7	872.13	735.23	570.37	386.19	257.66	269.86	415.95	620.09	802.97	952.38		(97)
Space		<u> </u>	1			Nh/mont	h = 0.02	24 x [(97]	)m – (95	í <u> </u>	· · · · · · · · · · · · · · · · · · ·			
(98)m=	374.56	280.59	232.36	141.8	78.17	0	0	0	0	136.49	260.3	385.79		_
								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	1890.05	(98)
Space	e heatin	a require	omont in	$kM/h/m^{2}$	hiser							I I		
-		grequit		KVVII/111-	year								47.25	(99)
9a. En		• •			•	ystems i	ncluding	ı micro-C	CHP)				47.25	(99)
		quiremer			•	ystems i	ncluding	ı micro-C	CHP)				47.25	(99)
Space	ergy rec e heatir	quiremer ng:		vidual h	eating s				CHP)				47.25 0	(99)
<b>Spac</b> Fracti	ergy rec e heatir on of sp	quiremer ng: bace hea	nts – Indi	vidual h	eating sy y/supple							 		_
<b>Spac</b> Fracti Fracti	ergy rec e heatir on of sp on of sp	quiremer ng: bace hea bace hea	nts – Indi at from se	vidual h econdary nain syst	eating sy y/supple em(s)		system		- (201) =	(203)] =			0	(201)
<b>Spac</b> Fracti Fracti Fracti	ergy rec e heatir on of sp on of sp on of to	quiremer ng: bace hea bace hea tal heati	nts – Indi at from se at from m	ividual h econdar nain syst main sys	eating sy y/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			0	(201)
<b>Space</b> Fracti Fracti Fracti Efficie	ergy rec e heatir on of sp on of to ency of r	quiremen ng: bace hea bace hea tal heatin main spa	nts – Indi at from se at from m ng from ace heat	ividual h econdary nain syst main syst ing syste	eating sy y/supple em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			0 1 1	(201) (202) (204) (206)
<b>Space</b> Fracti Fracti Fracti Efficie	ergy rec e heatir on of sp on of to ency of r ency of s	quiremen ng: bace hea bace hea tal heatii main spa seconda	nts – Indi at from se at from m ng from ace heat ry/supple	econdary nain syst main syst ing syste ementary	eating s y/supple em(s) stem 1 em 1 y heating	mentary g system	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 –		Nov		0 1 1 88.8 0	(201) (202) (204) (206) (208)
<b>Spac</b> Fracti Fracti Fracti Efficie Efficie	ergy rec e heatir on of sp on of to ency of r ency of s	nguiremen ng: bace hea bace hea tal heatin main spa seconda	nts – Indi at from se at from m ng from ace heat ry/supple Mar	econdar nain syst main syst ing syste ementar	eating s y/supple em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 -	- (201) =	(203)] = Oct	Nov	Dec	0 1 1 88.8	(201) (202) (204) (206) (208)
<b>Spac</b> Fracti Fracti Fracti Efficie Efficie	ergy rec e heatin on of sp on of to ency of r ency of s Jan e heatin	quiremen ng: bace hea bace hea tal heatii main spa seconda Feb g require	nts – Indi at from se at from m ng from ace heat ry/supple Mar ement (c	econdary nain syst main syst ing syste ementary Apr alculated	eating s y/supple em(s) stem 1 em 1 y heating May d above	mentary g system Jun	system n, % Jul	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 – Sep	Oct			0 1 1 88.8 0	(201) (202) (204) (206) (208)
<b>Space</b> Fracti Fracti Efficie Efficie Space	ergy rec e heatin on of sp on of to ency of r ency of s Jan 2 heatin 374.56	quiremen ng: pace hea pace hea tal heatin main spa seconda Feb g require 280.59	nts – Indi at from se at from m ng from ace heat ry/supple Mar ement (c 232.36	econdary nain syst main syst ing syste ementary Apr alculated 141.8	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17	mentary g system Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 –		Nov 260.3	Dec 385.79	0 1 1 88.8 0	(201) (202) (204) (206) (208) (208)
<b>Space</b> Fracti Fracti Efficie Efficie Space	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $n = \{[(98)$	quiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20	nts – Indi at from se at from m ng from ace heat ry/supple Mar 232.36 (4)] } x 1	econdar nain syst main syst ing syste ementar Apr alculated 141.8 00 ÷ (20	eating s y/supple em(s) stem 1 em 1 y heating May d above 78.17	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (20 Aug	- (201) = 02) × [1 - Sep 0	Oct 136.49	260.3	385.79	0 1 1 88.8 0	(201) (202) (204) (206) (208)
<b>Space</b> Fracti Fracti Efficie Efficie Space	ergy rec e heatin on of sp on of to ency of r ency of s Jan 2 heatin 374.56	quiremen ng: pace hea pace hea tal heatin main spa seconda Feb g require 280.59	nts – Indi at from se at from m ng from ace heat ry/supple Mar ement (c 232.36	econdary nain syst main syst ing syste ementary Apr alculated 141.8	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17	mentary g system Jun	system n, % Jul	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 136.49 153.7	260.3 293.13	385.79 434.45	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Efficie Space (211)m	ergy rec e heatin on of sp on of to ency of s ency of s Jan 374.56 $n = \{[(98)$ 421.8	puiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98	nts – Indi at from se at from m ng from ace heat ry/supple Mar ement (c 232.36 (4)] } x 1 261.67	econdar nain syst main syst ing syste ementar alculated 141.8 00 ÷ (20 159.69	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 136.49 153.7	260.3	385.79 434.45	0 1 1 88.8 0	(201) (202) (204) (206) (208) (208)
Space Fracti Fracti Efficie Space (211)m	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $n = \{[(98)$ 421.8	guiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s	nts – Indi at from se at from m ng from ace heat ry/supple Mar 232.36 (4)] } x 1 261.67 econdar	vidual h econdary nain syst main syst ing syste ementary Apr alculated 141.8 00 ÷ (20 159.69	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 136.49 153.7	260.3 293.13	385.79 434.45	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m Space = {[(98)	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $n = \{[(98)$ 421.8 e heatin (98) (98) (98) (98) (98) (98) (98) (98)	quiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s 01)] } x 1	nts – Indi at from se at from m ng from ace heat ry/supple Mar 232.36 (4)] } x 1 261.67 econdar 00 ÷ (20	vidual h econdar nain syst main syst ing syste ementar Apr alculated 141.8 00 ÷ (20 159.69 y), kWh/ 8)	eating s y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03 month	mentary g system Jun 0	system	(202) = 1 - (204) = (20) = (	- (201) = 02) × [1 – 0 0 I (kWh/yea	Oct 136.49 153.7 ar) =Sum(2	260.3 293.13 211) <sub>15,1012</sub>	385.79 434.45 =	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $n = \{[(98)$ 421.8	guiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s	nts – Indi at from se at from m ng from ace heat ry/supple Mar 232.36 (4)] } x 1 261.67 econdar	vidual h econdary nain syst main syst ing syste ementary Apr alculated 141.8 00 ÷ (20 159.69	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (20) Aug 0 Tota 0	- (201) = 02) × [1 – 0 0 1 (kWh/yea	Oct 136.49 153.7 ar) =Sum(2 0	260.3 293.13 211) <sub>15,1012</sub> 0	385.79 434.45 = 0	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) (208) ear (211)
Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98) (215)m=	ergy rec e heatin on of sp on of to ency of r ency of s Jan a heatin 374.56 $n = \{[(98)$ 421.8 e heatin $m \times (20)$ 0	quiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s 0) 1)] } x 1 0	nts – Indi at from se at from m ng from ace heat ry/supple Mar 232.36 (4)] } x 1 261.67 econdar 00 ÷ (20	vidual h econdar nain syst main syst ing syste ementar Apr alculated 141.8 00 ÷ (20 159.69 y), kWh/ 8)	eating s y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03 month	mentary g system Jun 0	system	(202) = 1 - (204) = (20) Aug 0 Tota 0	- (201) = 02) × [1 – 0 0 1 (kWh/yea	Oct 136.49 153.7 ar) =Sum(2 0	260.3 293.13 211) <sub>15,1012</sub>	385.79 434.45 = 0	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space Fracti Fracti Efficie Space (211)m Space = {[(98) (215)m=	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $a = \{[(98)$ 421.8 e heatin $m \times (20)$ 0 heating	quirement ng: bace heat bace heat tal heat tal heat main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s 01)] } x 1 0	hts – Indi at from se at from m ng from m ace heat ry/supple Mar 232.36 (232.36 (232.36) (23	vidual h econdary nain syst main syst ing syste ementary Apr alculated 141.8 00 ÷ (20 159.69 y), kWh/ 8) 0	eating s y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03 month	mentary g system Jun 0	system	(202) = 1 - (204) = (20) Aug 0 Tota 0	- (201) = 02) × [1 – 0 0 1 (kWh/yea	Oct 136.49 153.7 ar) =Sum(2 0	260.3 293.13 211) <sub>15,1012</sub> 0	385.79 434.45 = 0	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) (208) ear (211)
Space Fracti Fracti Efficie Space (211)m Space = {[(98) (215)m=	ergy rec e heatin on of sp on of to ency of r ency of s Jan 374.56 $n = \{[(98)$ 421.8 $a = \{[(98)$ 421.8 $a = \{[(98)$ 421.8 $a = \{[(98)$ $a = \{[(98)$ a = [(98) a = [(98	quiremen ng: bace hea bace hea tal heatin main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s 01)] } x 1 0 g ater hea	hts – Indi at from se at from m ng from m ace heat ry/supple Mar 232.36 (4)] $\}$ x 1 261.67 (20) $\div$ (20) 0 (0) $\div$ (20) (0)	vidual h econdar nain syst main syst ing syste ementar Apr alculated 141.8 00 ÷ (20 159.69 y), kWh/ 8) 0	eating sy y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03 month 0	mentary g system Jun ) 0	system	(202) = 1 - (204) = (20 Aug 0 Tota 0 Tota	- (201) = 02) × [1 - Sep 0 1 (kWh/yea 0 1 (kWh/yea	Oct 136.49 153.7 ar) =Sum(2 0 ar) =Sum(2	260.3 293.13 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	385.79 434.45 = 0	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) (208) ear (211)
Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98) (215)m= Water Output	ergy rec e heatin on of sp on of to ency of r ency of s Jan e heatin 374.56 $n = \{[(98)$ 421.8 e heatin m x (20) n = keatin $m x (20)n = keatinm x (20)n = keatin$	quirement ng: bace heat bace heat tal heat tal heat main spa seconda Feb g require 280.59 )m x (20 315.98 g fuel (s 01)] } x 1 0	hts – Indi at from so at from m ng from ace heat ry/supple Mar 232.36 (2) $X 1$ 261.67 econdar $00 \div (20)$ 0 ter (calc 134.66	vidual h econdary nain syst main syst ing syste ementary Apr alculated 141.8 00 ÷ (20 159.69 y), kWh/ 8) 0	eating s y/supple em(s) stem 1 em 1 y heating May d above 78.17 06) 88.03 month	mentary g system Jun 0	system	(202) = 1 - (204) = (20) Aug 0 Tota 0	- (201) = 02) × [1 – 0 0 1 (kWh/yea	Oct 136.49 153.7 ar) =Sum(2 0	260.3 293.13 211) <sub>15,1012</sub> 0	385.79 434.45 = 0	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) (208) ear (211)



Space heating (main system 1)		(211)	x			0.2	16	=	459.74	(261)
			/year			Emiss kg CO	i <b>on fac</b> 2/kWh	tor	Emissions kg CO2/yea	r
12a. CO2 emissions – Individual heati	ng systems	s includi	ing mi	cro-CHP						
SAP rating (Section 12)									85.51	(258)
Energy cost factor (ECF)	[(255) x (256	6)] ÷ [(4)	+ 45.0]	=					1.04	(257)
Energy cost deflator (Table 12)									0.42	(256)
11a. SAP rating - individual heating sy	stems									
Total energy cost	(245)(247)	) + (250).	(254)	=					210.28	(255)
Appendix Q items: repeat lines (253) ar	nd (254) as	needeo	d							-
		one of	(233) to	o (235) x)		13.	19	x 0.01 =	-80.25	(252)
Additional standing charges (Table 12)									120	(251)
Energy for lighting		(232)	o appi			13.		x 0.01 =		(250)
(if off-peak tariff, list each of (230a) to (2	230a) senai		is ann	licable a	nd apply	L	10			J <sup>(2-73)</sup>
Pumps, fans and electric keep-hot		(231)				13.		x 0.01 =	9.89	(249)
Water heating cost (other fuel)		(219)				3.4		x 0.01 =	61.33	(247)
Space heating - secondary		(215)				13.		x 0.01 =	0	(242)
Space heating - main system 2		(213)						x 0.01 =	0	(241)
Space heating - main system 1		kWh/ (211)	•			(Table	, 	x 0.01 =	£/year	(240)
Toa. Fuel costs - Individual heating sys	Stems.	Fuel				Fuel P	rice		Fuel Cost	
10a. Fuel costs - individual heating sys		231) +	(232).	(2370)	-				3046.00	] <sup>(336)</sup>
Total delivered energy for all uses (211)	) (221) ± ( <sup>2</sup>	′231\⊥	(222)	(227h)	_				3548.65	(338)
Electricity generated by PVs									-608.39	(233)
Electricity for lighting				20.11	().	·9/ -			191.35	(232)
Total electricity for the above, kWh/year	r			sum	of (230a).	(230a) =	:		75	(2300)
boiler with a fan-assisted flue								45	]	(2000) (230e)
central heating pump:								30	1	(230c)
Electricity for pumps, fans and electric k	keen-hot								1102.27	]
Water heating fuel used									1762.27	]
Annual totals Space heating fuel used, main system 2	1					k	Wh/yea		<b>kWh/year</b> 2128.43	1
				Tota	I = Sum(2'				1762.27	(219)
(219)m= 172.39 151.13 158.15 141.7	139.31 12	28.11 1	22.74	136.82	138.34	148.92	156.52	168.14		_
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$										
(217)m= 85.95 85.64 85.15 84.29	83.01 7	9.5	79.5	79.5	79.5	84.09	85.41	86.05		(217)
·									-	

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	380.65	(264)
Space and water heating	(261) + (262) + (263) + (26	4) =		840.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	99.31	(268)
Energy saving/generation technologies Item 1		0.519	=	-315.76	(269)
Total CO2, kg/year		sum of (265)(271) =		662.87	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		16.57	(273)
EI 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)	(011)				
	(211) x	1.22	=	2596.69	(261)
Space heating (secondary)	(211) X (215) X	1.22	=	, 	(261) (263)
Space heating (secondary) Energy for water heating				2596.69	- · ·
	(215) x	3.07	=	2596.69 0	(263)
Energy for water heating	(215) x (219) x	3.07	=	2596.69 0 2149.97	(263) (264)
Energy for water heating Space and water heating	(215) x (219) x (261) + (262) + (263) + (26	3.07 1.22 4) =	=	2596.69 0 2149.97 4746.65	(263) (264) (265)
Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(215) x (219) x (261) + (262) + (263) + (26 (231) x	(3.07) (1.22) (4) =	=	2596.69 0 2149.97 4746.65 230.25	(263) (264) (265) (265) (267)

Primary energy kWh/m²/year

(272) ÷ (4) =





# **Regulations Compliance Report**

Approved Documen Printed on 24 Janua			na FSAP 2012 program, Version: 1.0.5.	59
Project Information	:			
Assessed By:	Leighton Howe (S	TRO004042)	Building Type: Flat	
Dwelling Details:				
NEW DWELLING D	ESIGN STAGE		Total Floor Area: 61m <sup>2</sup>	
Site Reference :	AL-10		Plot Reference: Flat 3	
Address :	Flat 3, Manor Cou	rt, 152 Abbey Road, LONDON	I, NW6 4ST	
Client Details:				
Name:				
Address :				
This report covers	items included v	vithin the SAP calculations.		
It is not a complete				
1a TER and DER				
Fuel for main heatin		as		
Fuel factor: 1.00 (ma	- /			
Target Carbon Dioxi			20.7 kg/m <sup>2</sup>	01/
Dwelling Carbon Dic 1b TFEE and DFE		te (DER)	15.78 kg/m²	OK
Target Fabric Energ		=)	58.0 kWh/m²	
Dwelling Fabric Energ	• • • •		53.0 kWh/m <sup>2</sup>	
	rgy Enciency (Dr		55.0 KWI/III	ок
2 Fabric U-values				
Element		Average	Highest	
External wa	all	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall		0.00 (max. 0.20)	-	OK
Floor		(no floor)		
Roof		0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)	ОК
2a Thermal bridgi				
		rom linear thermal transmittan	ces for each junction	
3 Air permeability	ity at 50 pascals		5.00 (design value)	
Maximum	ity at 50 pascais		10.0	ок
4 Heating efficient		Deiler eveterne with redictor		
Main Heating	system:	Data from manufacturer	rs or underfloor heating - mains gas	
		Combi boiler		
		Efficiency 88.0 % SEDBUK	2009	
		Minimum 88.0 %	2000	ок
Secondary he	eating system:	None		
5 Cylinder insulat	ion			
Hot water Sto		No cylinder		
				N/A



Therm Energy Ltd 01903 884357

# **Regulations Compliance Report**

Controls			
Space heating controls Hot water controls:	Programmer and at least No cylinder thermostat No cylinder	two room thermostats	OK
Boiler interlock:	Yes		ок
Low energy lights			
Percentage of fixed lights v Minimum	vith low-energy fittings	100.0% 75.0%	ОК
B Mechanical ventilation			
Not applicable			
Summertime temperature			
Overheating risk (South Ea	ist England):	Slight	ОК
Overshading: Windows facing: South Windows facing: North Windows facing: West		Average or unknown 12.18m <sup>2</sup> 7.98m <sup>2</sup> 4.2m <sup>2</sup>	
Ventilation rate: Blinds/curtains:		6.00 Dark-coloured curtain or roller Closed 100% of daylight hours	
10 Key features			
Party Walls U-value		0 W/m²K	

Party vvalis U-value Photovoltaic array

			User D	etails:						
Assessor Name: Software Name:	Leighton Howe Stroma FSAP 2	-		Strom Softwa	are Ver				004042 on: 1.0.5.59	
Address :	Flat 3, Manor Co			Address: ad, LONE		V6 4ST				
1. Overall dwelling dime	nsions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup> )	
Ground floor				61	(1a) x	2	2.4	(2a) =	146.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	(1e)+(1n	)	61	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	146.4	(5)
2. Ventilation rate:										_
Number of chimneys	main heating 0 +	secondar heating	у ヿ + Г	other 0	7 = [	total	X 4	40 =	m <sup>3</sup> per hour	](6a)
Number of open flues		0	」	0	」 L ヿ = Г	0		20 =	0	](6b)
Number of intermittent fa		0		0	JĽ	-		10 =		
					Ļ	3			30	(7a)
Number of passive vents						0	x ?	10 =	0	(7b)
Number of flueless gas fi	res					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	een carried out or is inte				continue fr	30 om (9) to (		÷ (5) =	0.2	(8)
Number of storeys in the Additional infiltration	ne dwelling (ns)						[(0)]	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or timb	er frame or	0.35 foi	r masonr	v constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pr deducting areas of openir	resent, use the value co									
If suspended wooden f	loor, enter 0.2 (uns	ealed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
Percentage of windows	s and doors draugh	t stripped		0.25 - [0.2	$(\mathbf{x}(1\mathbf{A}) + 1)$	001 -			0	(14)
Window infiltration				(8) + (10)		-	+ (15) =		0	(15)
Air permeability value,	a50 expressed in a	cubic metre						area	0	(16) (17)
If based on air permeabil	• •		•	•	•				0.45	(18)
Air permeability value applie	s if a pressurisation test	has been don	e or a deg	gree air pei	rmeability	is being u	sed			
Number of sides sheltere	d			(20) - 1	[0 075 v (1	0)1			1	(19)
Shelter factor	ing chalter factor			(20) = 1 -   (21) = (18)		[9)] =			0.92	(20)
Infiltration rate incorporat	-	and		(21) – (10)	)				0.42	(21)
Jan Feb	Mar Apr Ma	- i - i	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp			0 0.1		000				1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (22	I	I		1	1	1	1	1	J	
	1.23 1.1 1.03	3 0.95	0.95	0.92	1	1.08	1.12	1.18		
	I			I	I	I	ļ	Į	1	

thermenergy

Adjuste	ed infiltr	ation rat	e (allowii	ng for sh	nelter an	d wind s	peed) =	= (21a) x	(22a)m				_	
	0.54	0.53	0.52	0.46	0.45	0.4	0.4	0.39	0.42	0.45	0.47	0.49	]	
		c <i>tive air</i> al ventila	change i	ate for t	he appli	cable ca	se							(23a)
				ndix N. (2	3b) = (23a	i) x Fmv (e	equation	(N5)) , othe	rwise (23b	) = (23a)			0	(23a) (23b)
								m Table 4h		) (200)			0	(23b) (23c)
					Ũ		``	′HR) (24a	,	2h)m + ('	23h) <b>x</b> ['	1 – (23c)	-	(230)
(24a)m=	0			0	0	0					0	0	]	(24a)
	balance	d mech	I I I I I I I I I I I I I I I I I I I	ntilation	without	heat rec	L coverv (	 MV) (24t	(22)	2b)m + (2	23b)	<u> </u>	1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
	whole h	use ex	tract ven	tilation o	or positiv	re input v	ı ventilati	on from o	utside				1	
,					•	•		4c) = (22b		.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
,					•	•		ion from I				-	-	
1	· ,	· · · · · ·	<u> </u>		<i>.</i>	<u>`</u>	<u> </u>	0.5 + [(2	<u> </u>	<u> </u>			1	(5.4.1)
(24d)m=	0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62	J	(24d)
					, <u>,</u>	, <u> </u>	<u>, , , , , , , , , , , , , , , , , , , </u>	4d) in box	r`´´				1	
(25)m=	0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.58	0.59	0.6	0.61	0.62	J	(25)
3. He	at losse	s and he	eat loss p	aramete	er:									
ELEN	IENT	Gros		Openin	-	Net Ar		U-val		AXU		k-value		AXk
Doors		area	(m²)	m	2	A ,n		W/m2		(W/ł	\)     \	kJ/m²∙l	n	kJ/K
		. 1				1.89			=	2.646				(26)
	ws Type					12.18		1/[1/( 1.4 )+		16.15				(27)
	ws Type					7.98		1/[1/( 1.4 )+		10.58				(27)
	ws Type	3 				4.2	×	1/[1/( 1.4 )+	0.04] =	5.57	╡,			(27)
Walls 7		66		24.3	6	41.64	. х	0.18	=	7.5			$\dashv$ $\vdash$	(29)
Walls 7	ype2	16	;	1.89		14.11	×	0.18	=	2.59			$\exists$	(29)
Roof		66		0		66	×	0.16	=	10.56				(30)
		lements	, m²			148								(31)
Party v	vall					16	x	0	=	0				(32)
Interna	I wall **					71								(32c)
Interna	l floor					48								(32d)
Interna	l ceiling	l				44								(32e)
			ows, use e sides of in				ated usin	g formula 1	/[(1/U-valı	ıe)+0.04] a	s given in	paragraph	1 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =				55.5	9 (33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5874.	75 <mark>(34)</mark>
Therma	al mass	parame	ter (TMF	? = Cm ÷	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	Low		100	(35)
	-		ere the det tailed calcu		constructi	ion are not	t known p	precisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) calo	culated u	using Ap	pendix ł	<						6.88	(36)

if details of thermal bridging are not known  $(36) = 0.05 \times (31)$ 



Total f	abric he	at loss							(33) +	(36) =			62.47	(37)
		at loss ca	alculated	l monthly	V						25)m x (5)		02.47	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	31.11	30.84	30.57	29.33	29.1	28.02	28.02	27.82	28.43	29.1	29.57	30.06		(38)
Heat tr	ansfer o	coefficier	nt. W/K				1		(39)m	= (37) + (3	38)m			
(39)m=	93.58	93.31	93.04	91.8	91.57	90.49	90.49	90.28	90.9	91.57	92.04	92.53		
		1					1			•	Sum(39)1.	12 /12=	91.8	(39)
	· ·	ameter (H	, 1						· · ·	= (39)m ÷	· · ·	4.50		
(40)m=	1.53	1.53	1.53	1.5	1.5	1.48	1.48	1.48	1.49	1.5	1.51 Sum(40) <sub>1.</sub>	1.52	1.5	(40)
Numbe	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 / 12=	1.5	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting enei	rgy requi	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	849 x (TF	-13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		01		(42)
Reduce	the annua		hot water	usage by a	5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.93		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	90.13	86.85	83.57	80.29	77.02	73.74	73.74	77.02	80.29	83.57	86.85	90.13		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	0Tm / 3600			<mark>m(44)</mark> 112 = ables 1b, 1		983.18	(44)
(45)m=	133.65	116.89	120.62	105.16	100.91	87.07	80.69	92.59	93.7	109.19	119.19	129.44		
										I Total = Su	l m(45) <sub>112</sub> =	=	1289.11	(45)
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)		-			
(46)m=	20.05	17.53	18.09	15.77	15.14	13.06	12.1	13.89	14.05	16.38	17.88	19.42		(46)
	storage e volum		includin	na anv so	olar or M	/WHRS	storage	within sa	ame ves	sel		0		(47)
-		neating a					-			001		0		(-1)
Otherv	•	o stored			•			ombi boil	ers) ente	er '0' in (	47)			
a) If m	anufact	turer's de	eclared l	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 age loss		•								0		(51)
		neating s			0 2 (100	n, na o, ac	~y)					0		
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
		om water	-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (5	))									0		(55)



Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3					-		0		(58)
	•				month (	59)m = (	(58) ÷ 36	5 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	ostat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	45.93	39.97	42.59	39.6	39.25	36.36	37.58	39.25	39.6	42.59	42.83	45.93		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	179.58	156.87	163.21	144.76	140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36		(62)
										r contribut	tion to wate	er 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)
Output	from w	ater hea	ter	-			-			-				
(64)m=	179.58	156.87	163.21	144.76	140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36		
								Outp	out from w	ater heate	r (annual)₁	12	1780.56	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	55.92	48.86	50.75	44.87	43.36	38.04	36.22	40.6	41.05	46.95	50.34	54.52		(65)
(00)														
	lde (57)	n in calo	ulation (	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fi	rom com	munity h	leating	
inclu	. ,		culation of Table 5	. ,	-	ylinder is	s in the c	dwelling	or hot w	ater is fi	rom com	nunity h	leating	
inclu 5. Int	ternal ga	ains (see		5 and 5a	-	ylinder is	s in the c	dwelling	or hot w	ater is fi	rom com	nunity h	leating	
inclu 5. Int	ternal ga	ains (see	e Table 5	5 and 5a	-	ylinder is Jun	s in the c Jul	dwelling Aug	or hot w Sep	ater is fi Oct	rom com	munity h	leating	
inclu 5. Int	ernal ga	ains (see as (Table	e Table 5 e 5), Wat	5 and 5a	):		i		Ī	i	1		leating	(66)
inclu 5. Int Metabo (66)m= Lightin	ernal ga olic gain Jan 120.59 g gains	ains (see s (Table Feb 120.59 (calcula	e Table 5 e 5), Wat Mar 120.59 ted in Ap	ts Apr 120.59 Apr	): May 120.59 L, equati	Jun 120.59 ion L9 of	Jul 120.59 r L9a), a	Aug 120.59 Iso see	Sep 120.59 Table 5	Oct	Nov	Dec	leating	(66)
inclu 5. Int Metabo (66)m= Lightin	ernal ga olic gain Jan 120.59 g gains	ains (see s (Table Feb 120.59 (calcula	e Table 5 e 5), Wat Mar 120.59 ted in Ap	ts Apr 120.59 Apr	): May 120.59	Jun 120.59 ion L9 of	Jul 120.59 r L9a), a	Aug 120.59 Iso see	Sep 120.59 Table 5	Oct	Nov	Dec	leating	(66)
inclu 5. Int Metabo (66)m= Lightin (67)m=	olic gain Jan 120.59 g gains 39.11	ains (see s (Table Feb 120.59 (calcula 34.73	2 Table 5 2 5), Wat Mar 120.59 ted in Ap 28.25	and 5a ts Apr 120.59 opendix 21.39	): May 120.59 L, equati	Jun 120.59 ion L9 of 13.5	Jul 120.59 r L9a), a 14.58	Aug 120.59 Iso see 18.96	Sep 120.59 Table 5 25.44	Oct 120.59 32.3	Nov 120.59	Dec 120.59	leating	
inclu 5. Int Metabo (66)m= Lightin (67)m=	olic gain Jan 120.59 g gains 39.11	ains (see s (Table Feb 120.59 (calcula 34.73	2 Table 5 2 5), Wat Mar 120.59 ted in Ap 28.25	and 5a ts Apr 120.59 opendix 21.39	): May 120.59 L, equati 15.99	Jun 120.59 ion L9 of 13.5	Jul 120.59 r L9a), a 14.58	Aug 120.59 Iso see 18.96	Sep 120.59 Table 5 25.44	Oct 120.59 32.3	Nov 120.59	Dec 120.59	leating	
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17	): May 120.59 L, equati 15.99 dix L, eq	Jun 120.59 on L9 of 13.5 uation L 207.47	Jul 120.59 r L9a), a 14.58 13 or L1 195.92	Aug 120.59 Iso see 18.96 3a), also 193.2	Sep 120.59 Table 5 25.44 see Ta 200.05	Oct 120.59 32.3 ble 5 214.63	Nov 120.59 37.7	Dec 120.59 40.19	leating	(67)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17	): 120.59 L, equati 15.99 dix L, equati 224.77	Jun 120.59 on L9 of 13.5 uation L 207.47	Jul 120.59 r L9a), a 14.58 13 or L1 195.92	Aug 120.59 Iso see 18.96 3a), also 193.2	Sep 120.59 Table 5 25.44 see Ta 200.05	Oct 120.59 32.3 ble 5 214.63	Nov 120.59 37.7	Dec 120.59 40.19	leating	(67)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07	• Table 5 • 5), Wat Mar 120.59 ted in Ap 28.25 •ulated in 257.75 ated in Ap	Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07	): 120.59 L, equati 15.99 dix L, equ 224.77 L, equat	Jun 120.59 on L9 of 13.5 uation L 207.47 ion L15	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a)	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se	Sep 120.59 Table 5 25.44 9 see Ta 200.05 ee Table	Oct 120.59 32.3 ble 5 214.63 5	Nov 120.59 37.7 233.03	Dec 120.59 40.19 250.33	leating	(67) (68)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> </ul>	Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07	): 120.59 L, equati 15.99 dix L, equ 224.77 L, equat	Jun 120.59 on L9 of 13.5 uation L 207.47 ion L15	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a)	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se	Sep 120.59 Table 5 25.44 9 see Ta 200.05 ee Table	Oct 120.59 32.3 ble 5 214.63 5	Nov 120.59 37.7 233.03	Dec 120.59 40.19 250.33	leating	(67) (68)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m= Cookir (69)m= Pumps (70)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07 s and far 3	ains (see s (Table Feb 120.59 (calcula 34.73 ins (calcula 264.6 (calcula 49.07 ns gains 3	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>	5 and 5a ts Apr 120.59 ppendix 21.39 Appendix 243.17 ppendix 49.07 5a) 3	): 120.59 L, equati 15.99 dix L, equat 224.77 L, equat 49.07	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 200.05 200.05 200.05 200.05	Oct 120.59 32.3 ble 5 214.63 5 49.07	Nov 120.59 37.7 233.03 49.07	Dec 120.59 40.19 250.33 49.07	leating	(67) (68) (69)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliat (68)m= Cookir (69)m= Pumps (70)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 ng gains 49.07 s and far 3	ains (see s (Table Feb 120.59 (calcula 34.73 ins (calcula 264.6 (calcula 49.07 ns gains 3	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>	5 and 5a ts Apr 120.59 ppendix 21.39 Appendix 243.17 ppendix 49.07 5a) 3	): May 120.59 L, equati 15.99 dix L, equat 224.77 L, equat 49.07 3	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 200.05 200.05 200.05 200.05	Oct 120.59 32.3 ble 5 214.63 5 49.07	Nov 120.59 37.7 233.03 49.07	Dec 120.59 40.19 250.33 49.07	leating	(67) (68) (69)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and fan 3 s e.g. ev -80.39	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 vaporatic	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul>	and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5)	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07	Oct 120.59 32.3 ble 5 214.63 5 49.07 3	Nov 120.59 37.7 233.03 49.07 3	Dec 120.59 40.19 250.33 49.07 3	leating	(67) (68) (69) (70)
inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and fan 3 s e.g. ev -80.39	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul>	and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5)	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07	Oct 120.59 32.3 ble 5 214.63 5 49.07 3	Nov 120.59 37.7 233.03 49.07 3	Dec 120.59 40.19 250.33 49.07 3	leating	(67) (68) (69) (70)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and far 3 s e.g. ev -80.39 heating 75.16	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39 gains (T	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>	and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab -80.39	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5) -80.39 52.84	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3 -80.39 48.69	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07 3 -80.39 54.57	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3 -80.39 57.02	Oct 120.59 32.3 ble 5 214.63 5 49.07 3 -80.39 63.11	Nov 120.59 37.7 233.03 49.07 3 -80.39	Dec 120.59 40.19 250.33 49.07 3 -80.39 73.28	leating	(67) (68) (69) (70) (71)
inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal ga olic gain Jan 120.59 g gains 39.11 nces ga 261.88 g gains 49.07 s and far 3 s e.g. ev -80.39 heating 75.16	ains (see Feb 120.59 (calcula 34.73 ins (calc 264.6 (calcula 49.07 ns gains 3 raporatic -80.39 gains (T 72.71 gains =	<ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>	and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39	): May 120.59 L, equati 15.99 dix L, equati 224.77 L, equati 49.07 3 es) (Tab -80.39	Jun 120.59 ion L9 of 13.5 uation L 207.47 ion L15 49.07 3 le 5) -80.39 52.84	Jul 120.59 r L9a), a 14.58 13 or L1 195.92 or L15a) 49.07 3 -80.39 48.69	Aug 120.59 Iso see 18.96 3a), also 193.2 , also se 49.07 3 -80.39 54.57	Sep 120.59 Table 5 25.44 200.05 ee Table 49.07 3 -80.39 57.02	Oct 120.59 32.3 ble 5 214.63 5 49.07 3 -80.39 63.11	Nov 120.59 37.7 233.03 49.07 3 -80.39 69.92	Dec 120.59 40.19 250.33 49.07 3 -80.39 73.28	leating	(67) (68) (69) (70) (71)

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



Orientation	n: Access F Table 6d	actor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North (	).9x 0.77	x	7.98	x	10.63	×	0.57	x	0.7	=	23.46	(74)
North (	).9x 0.77	x	7.98	x	20.32	x	0.57	x	0.7	=	44.84	(74)
North (	).9x 0.77	x	7.98	x	34.53	x	0.57	x	0.7	=	76.19	(74)
North (	).9x 0.77	x	7.98	x	55.46	x	0.57	x	0.7	=	122.38	(74)
North (	).9x 0.77	x	7.98	x	74.72	x	0.57	x	0.7	=	164.86	(74)
North (	).9x 0.77	x	7.98	x	79.99	x	0.57	x	0.7	=	176.49	(74)
North (	).9x 0.77	x	7.98	x	74.68	x	0.57	x	0.7	=	164.78	(74)
North (	).9x 0.77	x	7.98	x	59.25	x	0.57	x	0.7	=	130.73	(74)
North (	).9x 0.77	x	7.98	x	41.52	x	0.57	x	0.7	=	91.61	(74)
North (	).9x 0.77	x	7.98	x	24.19	×	0.57	x	0.7	=	53.37	(74)
North (	).9x 0.77	X	7.98	x	13.12	×	0.57	x	0.7	=	28.94	(74)
North (	).9x 0.77	x	7.98	x	8.86	×	0.57	x	0.7	=	19.56	(74)
South (	).9x 0.77	x	12.18	x	46.75	×	0.57	x	0.7	=	157.45	(78)
South (	).9x 0.77	X	12.18	x	76.57	×	0.57	x	0.7	=	257.87	(78)
South (	).9x 0.77	x	12.18	x	97.53	×	0.57	x	0.7	=	328.48	(78)
South (	).9x 0.77	X	12.18	x	110.23	x	0.57	x	0.7	=	371.25	(78)
South (	).9x 0.77	X	12.18	x	114.87	x	0.57	x	0.7	=	386.87	(78)
South (	).9x 0.77	x	12.18	x	110.55	x	0.57	x	0.7	=	372.31	(78)
South (	).9x 0.77	x	12.18	x	108.01	x	0.57	x	0.7	=	363.77	(78)
South (	).9x 0.77	x	12.18	x	104.89	x	0.57	x	0.7	=	353.27	(78)
South (	).9x 0.77	x	12.18	x	101.89	x	0.57	x	0.7	=	343.14	(78)
South (	).9x 0.77	X	12.18	x	82.59	x	0.57	x	0.7	=	278.14	(78)
South (	).9x 0.77	X	12.18	x	55.42	x	0.57	x	0.7	=	186.64	(78)
South (	).9x 0.77	X	12.18	x	40.4	×	0.57	x	0.7	=	136.05	(78)
West (	).9x 0.77	X	4.2	x	19.64	x	0.57	x	0.7	=	22.81	(80)
West (	).9x 0.77	x	4.2	x	38.42	x	0.57	x	0.7	=	44.62	(80)
West (	).9x 0.77	x	4.2	x	63.27	x	0.57	x	0.7	=	73.48	(80)
West (	).9x 0.77	x	4.2	x	92.28	x	0.57	x	0.7	=	107.17	(80)
West (	).9x 0.77	x	4.2	x	113.09	x	0.57	x	0.7	=	131.34	(80)
West (	).9x 0.77	X	4.2	x	115.77	×	0.57	x	0.7	=	134.45	(80)
West (	).9x 0.77	X	4.2	x	110.22	×	0.57	x	0.7	=	128	(80)
West (	).9x 0.77	X	4.2	x	94.68	×	0.57	x	0.7	=	109.95	(80)
West (	).9x 0.77	x	4.2	x	73.59	×	0.57	x	0.7	=	85.46	(80)
West (	).9x 0.77	X	4.2	x	45.59	×	0.57	x	0.7	=	52.94	(80)
West (	).9x 0.77	x	4.2	x	24.49	×	0.57	x	0.7	=	28.44	(80)
West (	).9x 0.77	x	4.2	x	16.15	×	0.57	x	0.7	=	18.76	(80)

Solar g	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m												
(83)m=	203.73	347.33	478.15	600.8	683.07	683.25	656.54	593.95	520.2	384.46	244.02	174.37	(83)
Total g	ains – iı	nternal a	ind solar	<sup>-</sup> (84)m =	= (73)m -	+ (83)m	, watts						-
(84)m=	672.14	811.63	924.63	1019.94	1074.37	1049.32	1008	952.94	894.98	786.76	676.94	630.43	(84)





emperatu	re during h	neating p	eriods ir	n the livir	ng area	from 1 at	ole 9, Th	1 (°C)				21	(85
tilisation f	actor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)	_	-	-				
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 0.91	0.86	0.81	0.72	0.61	0.48	0.36	0.4	0.56	0.75	0.87	0.92		(86
lean interi	nal tempei	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
)m= 18.53	3 18.92	19.44	20.02	20.48	20.79	20.92	20.9	20.68	20.06	19.2	18.46		(87
emperatu	re during l	neating p	beriods ir	n rest of	dwelling	from Ta	able 9. T	h2 (°C)					
)m= 19.60		19.67	19.68	19.69	19.7	19.7	19.7	19.69	19.69	19.68	19.67		(8
tilisation f	actor for g	ains for	rest of d	welling	h2 m (se	e Table	.9a)						
)m= 0.89		0.78	0.68	0.55	0.4	0.27	0.3	0.49	0.71	0.85	0.9		(8
Leon inter	nal temper	ı əture in	the rest	of dwelli	na T2 (f	l ollow ste	ne 3 to .	I 7 in Tabl					
)m= 17.49		18.36	18.91	19.32	19.58	19.67	19.66	19.5	18.97	18.16	17.43		(9
,										g area ÷ (4	4) =	0.41	(9
			and a f		() ()	· • • • •	. (4 . 0				Ĺ	0.11	
	18.3 18.3	18.8	19.36	ole dwe	lling) = f 20.08	LA × 11 20.18	+ (1 – fL 20.17	A) × 12 19.98	19.42	18.59	17.85		(9
·	stment to t									10.59	17.00		(0
)m= 17.92	-	18.8	19.36	19.8	20.08	20.18	20.17	19.98	19.42	18.59	17.85		(9
·					_0.00	_00							
Snace h	pating reg	uirement											
				e obtoin		am 11 af	Table O	h	4 T: ('	70)		vlete	
et Ti to th	e mean in	ternal ter	mperatu		ied at st	ep 11 of	Table 9	b, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
et Ti to th	e mean in on factor fe	ternal ter	mperatu		ied at sto	ep 11 of Jul	Table 9	b, so tha Sep	it Ti,m=( Oct	76)m an Nov	d re-calc	ulate	
et Ti to th e utilisatio Jar	e mean in on factor fe	ternal ter or gains Mar	mperatu using Ta Apr	ble 9a	·		1			,		ulate	
et Ti to the utilisation Jar tilisation f	e mean in on factor f Feb actor for g	ternal ter or gains Mar	mperatu using Ta Apr	ble 9a	·		1			,		ulate	(9
et Ti to the ne utilisatio Jar tilisation f )m= 0.87	e mean in on factor f Feb actor for g	ternal ter or gains Mar ains, hm 0.76	mperatur using Ta Apr i: 0.67	ble 9a May 0.56	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ulate	(9
et Ti to the ne utilisatio Jar tilisation f )m= 0.87 seful gain	e mean in on factor fo Feb actor for g 0.82 s, hmGm	ternal ter or gains Mar ains, hm 0.76	mperatur using Ta Apr i: 0.67	ble 9a May 0.56	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ulate	``
et Ti to the ne utilisation tilisation f )m= 0.87 seful gain )m= 583.3 lonthly av	e mean in on factor fo Feb actor for g 0.82 s, hmGm	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem	mperatur using Ta Apr : 0.67 4)m x (8- 682.87 perature	ble 9a May 0.56 4)m 597.85	Jun 0.42 442.66	Jul 0.3	Aug 0.33	Sep 0.5	Oct 0.7	Nov 0.83	Dec	ulate	(9
et Ti to the e utilisation tilisation f )m= 0.87 seful gain )m= 583.3 lonthly av )m= 4.3	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5	mperatur using Ta Apr : 0.67 4)m x (8- 682.87 perature 8.9	ble 9a May 0.56 4)m 597.85 9 from Ta 11.7	Jun 0.42 442.66 able 8 14.6	Jul 0.3 306.45 16.6	Aug 0.33 317.94 16.4	Sep 0.5 451.24 14.1	Oct 0.7 550.49 10.6	Nov 0.83	Dec	ulate	(9
et Ti to the e utilisation f Jar tilisation f )m= $0.87$ seful gain )m= $583.3$ lonthly av )m= $4.3$ eat loss ra	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern	mperatur using Ta Apr 1: 0.67 4)m x (8- 682.87 perature 8.9 nal tempe	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature,	Jun 0.42 442.66 able 8 14.6 Lm , W =	Jul 0.3 306.45 16.6 =[(39)m	Aug 0.33 317.94 16.4 x [(93)m	Sep 0.5 451.24 14.1 – (96)m	Oct 0.7 550.49 10.6 ]	Nov 0.83 558.66 7.1	Dec 0.88 554.93 4.2	ulate	(9 (9
et Ti to the utilisation f illisation f m = 0.87 seful gain m = 583.3 lonthly av m = 4.3 eat loss ra m = 1274.3	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49	mperatur using Ta Apr : 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78	Jul 0.3 306.45 16.6 =[(39)m 324.03	Aug 0.33 317.94 16.4 x [(93)m 340.26	Sep 0.5 451.24 14.1 - (96)m 534.8	Oct 0.7 550.49 10.6 ] 807.52	Nov 0.83 558.66 7.1 1057.11	Dec 0.88 554.93	ulate	(9 (9
et Ti to the e utilisation tilisation f )m= 0.87 seful gain )m= 583.3 lonthly av )m= 4.3 eat loss ra )m= 1274.3 pace heat	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 pr each n	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 741.51 nonth, k\	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon	Jul 0.3 306.45 16.6 =[(39)m 324.03 th = 0.02	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95	Oct 0.7 550.49 10.6 ] 807.52 )m] x (4	Nov 0.83 558.66 7.1 1057.11 1)m	Dec 0.88 554.93 4.2 1263.38	ulate	(9 (9
et Ti to the e utilisation tilisation f )m= 0.87 seful gain )m= 583.3 lonthly av )m= 4.3 eat loss ra )m= 1274.3 pace heat	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49	mperatur using Ta Apr : 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78	Jul 0.3 306.45 16.6 =[(39)m 324.03	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08		(9 (9 (9
et Ti to the ne utilisation (Jar (tilisation f )m= $0.87$ (seful gain )m= $583.3$ (lonthly av )m= $4.3$ (leat loss ra )m= $1274.3$ pace heat )m= $514.2$	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ting requir 4 393.12	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 or each n 199.97	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51 nonth, kV 106.89	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon	Jul 0.3 306.45 16.6 =[(39)m 324.03 th = 0.02	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	ulate 2621.05	(9 (9 (9
et Ti to the ne utilisation (Jar (tilisation f )m= $0.87$ (seful gain )m= $583.3$ (lonthly av )m= $4.3$ (leat loss ra )m= $1274.3$ pace heat )m= $514.2$	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 or each n 199.97	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51 nonth, kV 106.89	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon	Jul 0.3 306.45 16.6 =[(39)m 324.03 th = 0.02	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08		(9 (9 (9
he utilisation Jar Jar Julisation f m = 0.87 Joseful gain m = 583.3 Jonthly av m = 4.3 Jeat loss ra m = 1274.3 pace heat m = 514.2 pace heat	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ting requir 4 393.12	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 or each n 199.97	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 741.51 nonth, kV 106.89	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon 0	Jul 0.3 306.45 16.6 =[(39)m 324.03 th = 0.02 0	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0 Tota	Sep 0.5 451.24 14.1 – (96)m 534.8 )m – (95 0 Il per year	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05	(9) (9) (9)
et Ti to the e utilisation filisation f m = 0.87 seful gain m = 583.3 lonthly av m = 4.3 eat loss ra m = 1274.3 pace heat m = 514.2 pace heat . Energy r	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ting requir 4 393.12 ting requir equirement ting:	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in hts - Ind	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 r each n 199.97 kWh/m <sup>2</sup> ividual h	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 741.51 nonth, k\ 106.89 2/year eating sy	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon <sup>-</sup> 0	Jul 0.3 306.45 16.6 =[(39)m 2 324.03 th = 0.02 0 ncluding	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97) 0 Tota micro-C	Sep 0.5 451.24 14.1 – (96)m 534.8 )m – (95 0 Il per year	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05 42.97	(9 (9 (9 (9 (9
et Ti to the e utilisation f jm= $0.87$ seful gain m= $583.3$ lonthly av m= $4.3$ eat loss range m= $1274.1$ pace heat m= $514.2$ pace heat space heat m= $514.2$	e mean im on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ing requir 4 393.12 ing requir equirement ting: space hea	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in hts - Indi	mperatur using Ta Apr 1: 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 r each n 199.97 kWh/m <sup>2</sup> ividual h	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 741.51 nonth, k\ 106.89 2/year eating sy y/supple	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon <sup>-</sup> 0	Jul 0.3 306.45 16.6 =[(39)m 324.03 th = 0.02 0 ncluding	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0 Tota micro-C	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0 1 per year CHP)	Oct 0.7 550.49 10.6 ] 807.52 6)m] x (4 191.23	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05	(9 (9 (9 (9 (9 (9
et Ti to the e utilisation filisation f )m= $0.87$ seful gain )m= $583.3$ lonthly av )m= $4.3$ eat loss ra )m= $1274.3$ pace heat )m= $514.2$ pace heat . Energy r pace heat raction of raction of	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ing requir 4 393.12 ing requir equirement ting: space heat	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in hts - Ind at from so	mperatur using Ta Apr 1: 0.67 4)m x (8- 682.87 perature 8.9 al tempe 960.61 r each n 199.97 kWh/m <sup>2</sup> ividual h econdar nain syst	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51 nonth, k\ 106.89 c/year eating sy y/supple em(s)	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon <sup>-</sup> 0	Jul 0.3 306.45 16.6 =[(39)m : 324.03 th = 0.02 0 ncluding	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0 Tota micro-C (202) = 1 ·	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0 1 per year CHP) - (201) =	Oct 0.7 550.49 10.6 ] 807.52 i)m] x (4 191.23 (kWh/year	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05 42.97	(9 (9 (9 (9 (9 (9 (9 (2 (2
et Ti to the ne utilisation (Jar (Jar) (J	e mean im on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ing requir 4 393.12 ing requir equirement ting: space hea	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in hts - Ind at from so	mperatur using Ta Apr 1: 0.67 4)m x (8- 682.87 perature 8.9 al tempe 960.61 r each n 199.97 kWh/m <sup>2</sup> ividual h econdar nain syst	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51 nonth, k\ 106.89 c/year eating sy y/supple em(s)	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon <sup>-</sup> 0	Jul 0.3 306.45 16.6 =[(39)m : 324.03 th = 0.02 0 ncluding	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0 Tota micro-C	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0 1 per year CHP) - (201) =	Oct 0.7 550.49 10.6 ] 807.52 i)m] x (4 191.23 (kWh/year	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05 42.97 0	(9 (9 (9 (9 (9 (9 (9 (2 (2
et Ti to the ne utilisation (Jar (Jar) (J	e mean in on factor for actor for g 0.82 s, hmGm 5 665.67 erage exte 4.9 ate for me 54 1250.67 ing requir 4 393.12 ing requir equirement ting: space heat	ternal ter or gains Mar ains, hm 0.76 , W = (94 701.43 ernal tem 6.5 an intern 1144.49 ement fo 329.64 ement in at from so at from r ng from	mperatur using Ta Apr 0.67 4)m x (8- 682.87 perature 8.9 nal tempe 960.61 or each n 199.97 kWh/m <sup>2</sup> ividual h econdar nain syst main syst	ble 9a May 0.56 4)m 597.85 e from Ta 11.7 erature, 1 741.51 nonth, kV 106.89 ?/year eating sy y/supple em(s) stem 1	Jun 0.42 442.66 able 8 14.6 Lm , W = 495.78 Wh/mon <sup>-</sup> 0	Jul 0.3 306.45 16.6 =[(39)m : 324.03 th = 0.02 0 ncluding	Aug 0.33 317.94 16.4 x [(93)m 340.26 24 x [(97 0 Tota micro-C (202) = 1 ·	Sep 0.5 451.24 14.1 - (96)m 534.8 )m - (95 0 1 per year CHP) - (201) =	Oct 0.7 550.49 10.6 ] 807.52 i)m] x (4 191.23 (kWh/year	Nov 0.83 558.66 7.1 1057.11 1)m 358.88	Dec 0.88 554.93 4.2 1263.38 527.08	2621.05 42.97 0 1	(9) (9) (9) (9) (9) (9) (9) (9) (9) (9)

thermenergy



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heating	g require	ement (c	alculated	d above)	)							-	
	514.24	393.12	329.64	199.97	106.89	0	0	0	0	191.23	358.88	527.08		
(211)m			1	00 ÷ (20	, 			-					1	(211)
	579.1	442.7	371.21	225.19	120.37	0	0	0 Tota	0 I (kWh/yea	215.35	404.15	593.56	0054.00	7(214)
Space	- hoatin	a fuol (e	ocondar	y), kWh/	month			TOTA	ii (Kwii/yee		15,1012	<u></u>	2951.63	(211)
•			econdar 00 ÷ (20	• •	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	
I								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	l												-
Output	from wa	ater hea 156.87	ter (calc 163.21	ulated at 144.76	oove) 140.15	123.44	118.26	131.84	133.29	151.78	162.02	175.36	1	
Efficier	ncy of wa			144.70	140.13	123.44	110.20	131.04	155.29	131.70	102.02	175.50	79.5	(216)
(217)m=	· ·	85.93	85.49	84.64	83.27	79.5	79.5	79.5	79.5	84.43	85.68	86.28		(217)
Fuel fo	r water l	heating,	kWh/mo	onth			1				1	1	1	
(219)m		<u>m x 100</u> 182.55	) ÷ (217) 190.92	m 171.03	168.3	155.27	148.76	165.83	167.66	179.77	189.1	203.25	1	
(219)11=	200.55	102.55	190.92	171.03	100.5	155.27	140.70		I = Sum(2		109.1	203.23	2130.78	(219)
Annua	l totals										Wh/year		kWh/year	
Space	heating	fuel use	ed, main	system	1								2951.63	]
Water	heating	fuel use	d										2130.78	Ī
Electric	city for p	umps, fa	ans and	electric l	keep-hot	t								-
		-				-								
centra	al heatin	g pump:	:			-						30	]	(230c)
	al heatin with a fa					-						30 45	]	(230c) (230e)
boiler	with a fa	an-assis	sted flue	⟨Wh/yea	·	-		sum	of (230a).	(230g) =			] ] 	
boiler Total e	with a fa	an-assis	sted flue		·	-		sum	of (230a).	(230g) =			75	(230e)
boiler Total e Electric	with a fa	an-assis v for the ghting	sted flue above, l		·	-		sum	of (230a).	(230g) =				(230e) ](231)
boiler Total e Electric Electric	with a fa lectricity city for lig city gene	an-assis for the ghting erated by	sted flue above, ł y PVs		r		+ (232).			(230g) =			276.25	(230e) (231) (232)
boiler Total e Electric Electric Total d	with a fa lectricity city for li- city gene lelivered	an-assis v for the ghting erated by energy	sted flue above, l y PVs for all u	⟨Wh/yea	r )(221)		+ (232).			(230g) =			276.25	(230e) (231) (232) (233)
boiler Total e Electric Electric Total d	with a fa lectricity city for li- city gene lelivered	an-assis v for the ghting erated by energy	sted flue above, l y PVs for all u	⟨Wh/yea ses (211	r )(221)	+ (231)							276.25 -760.49 4673.17	(230e) (231) (232) (233)
boiler Total e Electric Electric Total d	with a fa lectricity city for li- city gene lelivered	an-assis v for the ghting erated by energy	sted flue above, l y PVs for all u	⟨Wh/yea ses (211	r )(221)	+ (231) <b>Fu</b>				(230g) = <b>Fuel P</b> (Table	rice		276.25	(230e) (231) (232) (233)
boiler Total e Electric Total d 10a. F	with a fa lectricity city for lig city gene lelivered Fuel cos	an-assis v for the ghting erated by energy ts - indiv	sted flue above, l y PVs for all u	⟨Wh/yea ses (211 eating sy	r )(221)	+ (231) <b>Fu</b> kW	el			Fuel P	r <b>ice</b> 12)		276.25 -760.49 4673.17	(230e) (231) (232) (233)
boiler Total e Electric Total d 10a. F	with a fa lectricity city for lif city gene lelivered Fuel cos heating	an-assis v for the ghting erated by energy ts - indiv	above, I above, I y PVs for all u vidual he	<wh yea<br="">ses (211 eating sy</wh>	r )(221)	+ (231) <b>Fu</b> kW (211	<b>el</b> /h/year			Fuel P (Table	rice 12)	45	276.25 -760.49 4673.17 <b>Fuel Cost</b> £/year	(230e) ](231) ](232) ](233) ](338)
boiler Total e Electric Total d 10a. F Space Space	with a fa lectricity city for lif city gene lelivered Fuel cos heating	an-assis y for the ghting erated by energy ts - indiv ts - indiv	sted flue above, F y PVs for all us vidual he system 1 system 2	<wh yea<br="">ses (211 eating sy</wh>	r )(221)	+ (231) Fu kW (21) (21)	<b>el</b> /h/year 1) x			Fuel P (Table	<b>rice</b> 12)	45 × 0.01 =	276.25 -760.49 4673.17 <b>Fuel Cost</b> £/year 102.72	(230e) ](231) ](232) ](233) ](338) ](240)
boiler Total e Electric Total d 10a. F Space Space Space	with a fa lectricity city for life city generation lelivered Fuel cos heating heating heating	an-assis y for the ghting erated by l energy ts - indiv - main s - main s - secon	sted flue above, F y PVs for all us vidual he system 1 system 2	<wh yea<br="">ses (211 eating sy</wh>	r )(221)	+ (231) Fu kW (21) (21)	<b>el</b> /h/year 1) x 3) x 5) x			Fuel P (Table	<b>rice</b> 12) <sup>18</sup>	45 x 0.01 = x 0.01 =	276.25 -760.49 4673.17 <b>Fuel Cost</b> £/year 102.72 0	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](241)
boiler Total e Electric Total d 10a. F Space Space Space Water	with a fa lectricity city for life city gene lelivered <b>-uel cos</b> heating heating heating	an-assis y for the ghting erated by l energy ts - indiv - main s - main s - secon cost (oth	sted flue above, f y PVs for all us vidual he system 1 system 2 dary	<wh yea<br="">ses (211 eating sy</wh>	r )(221)	+ (231) Fu kW (21) (21) (21)	el /h/year 1) x 3) x 5) x 9)			<b>Fuel P</b> (Table 3.4 0 13.	<b>Price</b> 12) 8	45 x 0.01 = x 0.01 = x 0.01 =	276.25 -760.49 4673.17 <b>Fuel Cost</b> £/year 102.72 0 0	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](241) ](242)
boiler Total e Electric Total d 10a. F Space Space Space Water Pumps (if off-p	with a fa lectricity city for life city gene lelivered Fuel cos heating heating heating a, fans an peak tarif	an-assis y for the ghting erated by l energy ts - indiv - main s - main s - secon cost (oth nd elect ff, list ea	sted flue above, l y PVs for all u vidual he system 2 dary her fuel) ric keep	<wh yea<br="">ses (211 eating sy ?</wh>	r )(221) stems:	+ (231) Fu kW (21) (21) (21) (21) (21) (23)	el /h/year 1) x 3) x 5) x 9) 1) y as app	(237b)	=	Fuel P         (Table         3.4         0         13.         3.4         13.         13.         13.         13.         13.	rice 12) <sup>18</sup> 19 19 19 19	<ul> <li>45</li> <li>45</li> <li>x 0.01 =</li> <li>rding to</li> </ul>	276.25 -760.49 4673.17 Fuel Cost £/year 102.72 0 0 74.15 9.89 Table 12a	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](240) ](241) ](242) ](247) ](249)
boiler Total e Electric Total d 10a. F Space Space Space Water Pumps (if off-p Energy	with a fa lectricity city for life city gene lelivered <b>-uel cos</b> heating heating heating a, fans an peak tarify	an-assis y for the ghting erated by l energy ts - indiv - main s - main s - secon cost (othe nd elect ff, list eat ting	above, F above, F y PVs for all us vidual he system 2 dary her fuel) ric keep- ach of (23	<wh yea<br="">ses (211 eating sy ?</wh>	r )(221) stems:	+ (231) Fu kW (21) (21) (21) (21) (21) (23)	el /h/year 1) x 3) x 5) x 9) 1) y as app	(237b)	=	Fuel P (Table 3.4 0 13. 3.4 13.	rice 12) <sup>18</sup> 19 19 19 19	45 x 0.01 = x 0.01 = x 0.01 = x 0.01 = x 0.01 =	276.25 -760.49 4673.17 Fuel Cost £/year 102.72 0 0 74.15 9.89	(230e) ](231) ](232) ](233) ](338) ](338) ](240) ](240) ](241) ](242) ](247)



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	one of (233) to (235) x)	13.19 × 0.01 =	-100.31	(252)
Appendix Q items: repeat lines (253) and (254) as	needed			_
Total energy cost(245)(247)	) + (250)(254) =		242.89	(255)
11a. SAP rating - individual heating systems				
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(255) x (25	6)] ÷ [(4) + 45.0] =		0.96	(257)
SAP rating (Section 12)			86.57	(258)
12a. CO2 emissions – Individual heating systems	s including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/yea	
Space heating (main system 1)	(211) x	0.216 =	637.55	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	460.25	(264)
Space and water heating	(261) + (262) + (263) + (264)	=	1097.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	143.37	(268)
Energy saving/generation technologies				_
Item 1		0.519 =	-394.7	(269)
Total CO2, kg/year		um of (265)(271) =	885.41	(272)
CO2 emissions per m <sup>2</sup>	(2	272) ÷ (4) =	14.51	(273)
EI rating (section 14)			89	(274)
13a. Primary Energy				
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22 =	3600.99	(261)
Space heating (secondary)	(215) x	3.07 =	0	(263)
Energy for water heating	(219) x	1.22 =	2599.55	(264)
Space and water heating	(261) + (262) + (263) + (264)	=	6200.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25	(267)
Electricity for lighting	(232) x	0 =	848.09	(268)
Energy saving/generation technologies Item 1		3.07 =	-2334.71	(269)
'Total Primary Energy	S	um of (265)(271) =	4944.18	(272)
Primary energy kWh/m²/year	(2	272) ÷ (4) =	81.05	(273)



# **Regulations Compliance Report**

Printed on 24 Janu	ary 2023 at 14:47:1		a FSAP 2012 program, Version: 1.0.5	5.59
Project Informatio				
Assessed By:	Leighton Howe (S	TRO004042)	Building Type: Flat	
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 32m <sup>2</sup>	
Site Reference :	AL-10		Plot Reference: Flat 4	
Address :	Flat 4, Manor Cou	rrt, 152 Abbey Road, LONDON	I, NW6 4ST	
Client Details:				
Name:				
Address :				
This report cover	s items included w	vithin the SAP calculations.		
-	te report of regulat			
1a TER and DER				
	ng system: Mains g	as		
Fuel factor: 1.00 (n	• /	·		
-	xide Emission Rate		28.67 kg/m <sup>2</sup>	
-	ioxide Emission Ra	te (DER)	19.54 kg/m²	OK
1b TFEE and DF		- \		
-	gy Efficiency (TFEE		74.5 kWh/m²	
Dweiling Fabric En	ergy Efficiency (DF		69.8 kWh/m <sup>2</sup>	ок
2 Fabric U-values	S			
Element		Average	Highest	
External v	vall	0.18 (max. 0.30)	0.18 (max. 0.70)	ОК
Party wall		0.00 (max. 0.20)	-	ОК
Floor		(no floor)		
Roof		0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridg	jing			
		rom linear thermal transmittan	ces for each junction	
3 Air permeabilit				
•	ility at 50 pascals		5.00 (design value)	01/
Maximum			10.0	OK
4 Heating efficie	ncy			
Main Heatin	g system:	Boiler systems with radiator	s or underfloor heating - mains gas	
		Data from manufacturer		
		Combi boiler		
		Efficiency 88.0 % SEDBUK	2009	
		Minimum 88.0 %		OK
Secondary	neating system:	None		
	ioating bystom.			
5 Cylinder insula	ition			
Hot water St	torage:	No cylinder		
				N/A



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# **Regulations Compliance Report**

6 Controls			
Space heating controls Hot water controls:	Programmer and at leas No cylinder thermostat	t two room thermostats	OK
Boiler interlock:	No cylinder Yes		ок
7 Low energy lights			
Percentage of fixed lights wit Minimum	h low-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (South Eas Based on: Overshading: Windows facing: South Windows facing: West Ventilation rate: Blinds/curtains:	t England):	Medium Average or unknown 12.6m <sup>2</sup> 7.14m <sup>2</sup> 6.00 Dark-coloured curtain or roller blind Closed 100% of daylight hours	OK
10 Key features Party Walls U-value Photovoltaic array		0 W/m²K	

			User D	Details:						
Assessor Name: Software Name:	Leighton I Stroma FS			Strom	a Num are Ver				004042 on: 1.0.5.59	
			Property							
Address :		or Court, 152 A	bbey Roa	ad, LONI	DON, NV	V6 4ST				
1. Overall dwelling dir	nensions:		٨٣٩	e (m 2)		Av. 11a	: o: la 4 ( ma )		Valuma(m)	2)
Ground floor			Are	<b>a(m²)</b> 32	(1a) x		<b>ight(m)</b>	(2a) =	<b>Volume(m</b> <sup>2</sup> 76.8	<b>)</b> (3a)
Total floor area TFA =	(1a)+(1b)+(1c)-	-(1d)+(1e)+(1	n)	32	(4)				10.0	
Dwelling volume	(	(		02		)+(3c)+(3d	l)+(3e)+	.(3n) =	76.8	(5)
-					. , . ,		, , ,		70.0	
2. Ventilation rate:	main	seconda	iry	other		total			m³ per hou	ır
Number of chimneys	heating	<b>heating</b>	+ [	0	7 = Г	0	x 4	40 =	0	(6a)
Number of open flues			 _ + _	0	」 ( ] = [	0	x 2	20 =	0	(6b)
Number of intermittent				-	」 [ 「	2	x ^	10 =	20	(7a)
Number of passive ver	its					0	x ^	10 =	0	(7b)
Number of flueless gas						0	x 4	40 =	0	(7c)
5						•				
								Air ch	anges per he	our
Infiltration due to chimr	neys, flues and	fans = (6a)+(6b)+	(7a)+(7b)+(	(7c) =	Г	20	· [	÷ (5) =	0.26	(8)
If a pressurisation test ha			ed to (17),	otherwise o	continue fr	om (9) to (	(16)			_
Number of storeys in Additional infiltration	i the dwelling (r	IS)					[(9).	-1]x0.1 =	0	(9)
Structural infiltration:	0.25 for steel of	or timber frame o	or 0.35 fo	r masoni	rv constr	uction	[(0)	1,0.1 -	0	(10)
if both types of wall are deducting areas of ope	e present, use the v	alue corresponding			•				0	
If suspended woode	n floor, enter 0.	2 (unsealed) or (	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e									0	(13)
Percentage of windo	ws and doors d	raught stripped							0	(14)
Window infiltration				0.25 - [0.2		- 1	( )		0	(15)
Infiltration rate	50			(8) + (10)					0	(16)
Air permeability valu If based on air permea				•	•	etre of e	nvelope	area	5	(17)
Air permeability value app	•					is beina u:	sed		0.51	(18)
Number of sides shelte				gree an per	, nearly s	io sonig a			1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpor	ating shelter fa	ctor		(21) = (18	) x (20) =				0.47	(21)
Infiltration rate modified	d for monthly wi	nd speed			-		-	-		
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	speed from Tab	ole 7			-		-	-		
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m =	(22)m ÷ 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		

thermenergy

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.6 0.59 0.58 0.52 0.51 0.45 0.45 0.44 0.47 0.51 0.53 0.55	
Calculate effective air change rate for the applicable case	
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (23b) 0 (23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c)]$	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	÷ 100] (24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	, , , , , , , , , , , , , , , , , , ,
(24b)m = 0  0  0  0  0  0  0  0  0  0	(24b)
c) If whole house extract ventilation or positive input ventilation from outside	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)	
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	(0.1.1)
(24d)m= 0.68 0.67 0.67 0.63 0.63 0.6 0.6 0.6 0.6 0.61 0.63 0.64 0.65	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.68 0.67 0.67 0.63 0.63 0.6 0.6 0.6 0.6 0.61 0.63 0.64 0.65	(25)
3. Heat losses and heat loss parameter:	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Doors 1.89 x 1.4 = 2.646	(26)
Windows Type 1 $12.6$ $x1/[1/(1.4) + 0.04] = 16.7$	(27)
Windows Type 2 $7.14$ $x^{1/[1/(1.4)+0.04]} = 9.47$	(27)
Walls Type1 42 19.74 22.26 x 0.18 = 4.01	(29)
Walls Type2         12         1.89         10.11         x         0.18         =         1.86	(29)
Roof 32 0 32 x 0.16 = 5.12	(30)
Total area of elements, m <sup>2</sup>	(31)
Party wall $16 \times 0 = 0$	(32)
Internal wall **	(32c)
Internal floor 48	(32d)
Internal ceiling 44	(32e)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph ** include the areas on both sides of internal walls and partitions	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	39.8 (33)
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) =	5358.33 (34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K Indicative Value: Low	100 (35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.	
Thermal bridges : S (L x Y) calculated using Appendix K	6.88 (36)
if details of thermal bridging are not known $(36) = 0.05 \times (31)$ Total fabric heat loss $(33) + (36) =$	46.68 (37)



Ventila	tion hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.26	17.09	16.91	16.09	15.94	15.22	15.22	15.09	15.5	15.94	16.25	16.57		(38)
Heat tr	ansfer c	coefficie	nt, W/K		-	-			(39)m	= (37) + (3	38)m	-		
(39)m=	63.94	63.77	63.59	62.77	62.62	61.9	61.9	61.77	62.18	62.62	62.93	63.25		
										-	Sum(39)1.	12 /12=	62.77	(39)
	· ·		HLP), W/	· · · · · ·					· · /	= (39)m ÷	<u> </u>			
(40)m=	2	1.99	1.99	1.96	1.96	1.93	1.93	1.93	1.94	1.96	1.97	1.98	4.00	(40)
Numbe	er of day	rs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1.</sub>	12 / 1 Z=	1.96	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
	ed occu A > 13.9		N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		21		(42)
	A £ 13.9			i onp	( 0.0000			)_)] : 0.0			,			
			ater usag							a targat a		.02		(43)
		-	hot water person pei			-	-	o acmeve	a water us	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			r day for ea		,			-			1100	Dee		
(44)m=	69.33	66.81	64.29	61.76	59.24	56.72	56.72	59.24	61.76	64.29	66.81	69.33		
									-	I Total = Su	m(44) <sub>112</sub> =	-	756.3	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x C	0Tm / 3600	) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	102.81	89.92	92.79	80.89	77.62	66.98	62.07	71.22	72.07	84	91.69	99.57		
lf inoton		ator boot	na of noint	of upp /m	botwata	( atorogo)	ontor 0 in	haven /AG		Total = Su	m(45) <sub>112</sub> =	-	991.63	(45)
			ng at point	· ·										(40)
	<sup>15.42</sup> storage		13.92	12.13	11.64	10.05	9.31	10.68	10.81	12.6	13.75	14.93		(46)
	-		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
-		. ,	and no ta				-					-		
Otherw	vise if no	stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage						<i>.</i>							
,			eclared I		or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
0,			r storage eclared o			or is not		(48) x (49)	) =			0		(50)
•			factor fr	•								0		(51)
		-	ee secti				• •							
	e factor											0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
			storage	e, kWh/y€	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	(50) or (	. , .						((50)				0		(55)
	storage	loss cal	culated t	ror each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)





If cylinder contains dedic	ated solar stor	age, (57)n	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss	annual) fro	m Table	3	-		-		-		0		(58)
Primary circuit loss	alculated for	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by facto	r from Table	e H5 if th	nere 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 calculate	ed for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 35.33 30.7	5 32.76	30.46	30.19	27.97	28.91	30.19	30.46	32.76	32.95	35.33		(61)
Total heat required	or water he	ating ca	lculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 138.14 120.6	7 125.55	111.35	107.81	94.95	90.97	101.41	102.53	116.75	124.63	134.9		(62)
Solar DHW input calcula	ed using Appe	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional lines	if FGHRS a	and/or V	VWHRS	applies	, see Ap	pendix C	G)		-	-		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	eater											
(64)m= 138.14 120.6	7 125.55	111.35	107.81	94.95	90.97	101.41	102.53	116.75	124.63	134.9		_
						Outp	out from wa	ater heate	r (annual)₁	12	1369.67	(64)
Heat gains from wat	er heating,	kWh/mc	onth 0.2	5´[0.85	× (45)m	ı + (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m= 43.02 37.5	39.04	34.51	33.36	29.26	27.86	31.23	31.58	36.12	38.72	41.94		(65)
include (57)m in c	alculation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains (s	ee Table 5	and 5a)	:									
Metabolic gains (Ta	ole 5), Watt	S										
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 72.82 72.8	2 72.82	72.82	72.82	72.82	72.82	72.82	72.82	72.82	72.82	72.82		(66)
Lighting gains (calc	lated in Ap	pendix L	_, equat	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m= 22.75 20.2	16.43	12.44	9.3	7.85	8.48	11.03	14.8	18.79	21.93	23.38		(67)
Appliances gains (c	alculated in	Append	lix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 152.33 153.9	1 149.92	141.44	130.74	120.68	113.96	112.38	116.36	124.84	135.54	145.61		(68)
Cooking gains (calc	ulated in Ap	pendix l	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m= 43.5 43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5		(69)
Pumps and fans gai	ns (Table 5	a)										
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evapora	tion (negati	ive value	es) (Tab	le 5)								
(71)m= -48.55 -48.5	5 -48.55	-48.55	-48.55	-48.55	-48.55	-48.55	-48.55	-48.55	-48.55	-48.55		(71)
Water heating gains	(Table 5)	ı										
(72)m= 57.82 55.9	3 52.48	47.93	44.83	40.64	37.45	41.97	43.86	48.55	53.78	56.37		(72)
Total internal gains	; =	l		(66)	m + (67)m	n + (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m	I	
(73)m= 303.66 300.8	1 289.6	272.59	255.64	239.94	230.66	236.15	245.79	262.95	282.03	296.12		(73)
6. Solar gains:					•	•	•	•		•		
Solar gains are calculat	ed using solar	flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	le orientat	ion.		
Orientation: Acces	Factor	<b>A</b>		<b>_</b> 1							<b>a</b> .	
Table		Area m²		Flu	x ole 6a		g_ able 6b	_	FF able 6c		Gains (W)	

thermenergy

South	0.9x	0.77		x	12.	.6	x	4	6.75	x		0.57	x	0.7		=	162.88	(78)
South	0.9x	0.77		x	12.	.6	x	7	6.57	x		0.57	x	0.7		=	266.76	(78)
South	0.9x	0.77		x	12.	.6	x	g	7.53	x		0.57	x	0.7		=	339.81	(78)
South	0.9x	0.77		x	12.	.6	x	1	10.23	X		0.57	x	0.7		=	384.06	(78)
South	0.9x	0.77		x	12.	.6	x	1	14.87	x		0.57	x	0.7		=	400.21	(78)
South	0.9x	0.77		x	12.	.6	x	1	10.55	×		0.57	x	0.7		=	385.15	(78)
South	0.9x	0.77		x	12.	.6	x	1	08.01	Ī×		0.57	×	0.7		=	376.31	(78)
South	0.9x	0.77		x	12.	.6	x	1	04.89	-   x		0.57	x	0.7		=	365.45	(78)
South	0.9x	0.77		x	12.	.6	x	1	01.89	×		0.57	x	0.7		=	354.97	(78)
South	0.9x	0.77		x	12.	.6	x	8	2.59	X		0.57	x	0.7		=	287.73	(78)
South	0.9x	0.77		x	12.	.6	x	5	5.42	-   x		0.57	×	0.7		=	193.07	(78)
South	0.9x	0.77		x	12.	.6	x		40.4	_   x		0.57	x	0.7		=	140.75	(78)
West	0.9x	0.77		x	7.1	4	x	1	9.64	Ī×		0.57	×	0.7		=	38.77	(80)
West	0.9x	0.77		x	7.1	4	x	3	8.42	-   x		0.57	x	0.7		=	75.85	(80)
West	0.9x	0.77		x	7.1	4	x	6	3.27	] ×		0.57	×	0.7		=	124.92	(80)
West	0.9x	0.77		x	7.1	4	x	9	2.28	] ×		0.57	×	0.7		=	182.18	(80)
West	0.9x	0.77		x	7.1	4	x	1	13.09	-   x		0.57	x	0.7		=	223.27	(80)
West	0.9x	0.77		x	7.1	4	x	1	15.77	] ×		0.57	x	0.7		=	228.56	(80)
West	0.9x	0.77		x	7.1	4	x	1	10.22			0.57	x	0.7		=	217.6	(80)
West	0.9x	0.77		x	7.1	4	x	9	4.68	×		0.57	x	0.7		=	186.91	(80)
West	0.9x	0.77		x	7.1	4	x	7	3.59	Ī×		0.57	×	0.7		=	145.28	(80)
West	0.9x	0.77		x	7.1	4	x	4	5.59	] ×		0.57	×	0.7		=	90	(80)
West	0.9x	0.77		x	7.1	4	x	2	4.49	_   x		0.57	x	0.7		=	48.35	(80)
West	0.9x	0.77		x	7.1	4	x	1	6.15	×		0.57	x	0.7		=	31.89	(80)
	-									-								
Solar g	jains in	watts, ca	alculat	ed	for eacl	n mont	h			(83)r	n = S	um(74)m	(82)m	1				
(83)m=	201.66	342.61	464.7	2	566.24	623.48	6	613.71	593.91	552	2.37	500.25	377.7	3 241.42	172	.63		(83)
Total g	ains – i	nternal a	and so	lar	(84)m =	= (73)m	1+(	83)m	, watts	-								
(84)m=	505.32	643.42	754.3	2	838.83	879.13	8	853.65	824.57	788	3.51	746.04	640.6	523.45	468	.76		(84)
7. Me	an intei	rnal temp	peratu	e (	(heating	seaso	n)											
Temp	erature	during h	neating	j p	eriods ir	n the liv	ving	area	from Tal	ble 9	), Th	1 (°C)					21	(85)
Utilisa	ation fac	ctor for g	ains fo	or li	iving are	ea, h1,r	n (s	see Ta	ble 9a)						_			
	Jan	Feb	Ма	r	Apr	May	'	Jun	Jul	A	ug	Sep	Oc	t Nov	D	ec		
(86)m=	0.86	0.8	0.72		0.63	0.52		0.4	0.3	0.	33	0.47	0.67	0.81	0.8	37		(86)
Mean	interna	l temper	ature i	n l	iving are	ea T1 (	follo	ow ste	ps 3 to 7	7 in <sup>-</sup>	Tabl	e 9c)						
(87)m=	18.27	18.78	19.37	,	19.98	20.45		20.77	20.9	20	.89	20.66	20.02	2 19.04	18.	17		(87)
Temp	erature	during h	neating		eriods ir	n rest o	f dv	velling	from Ta	able	9, T	h2 (°C)			-			
(88)m=	19.33	19.34	19.34	<u> </u>	19.36	19.36	-	19.38	19.38	1	.38	19.37	19.3	6 19.36	19.	35		(88)
Utilisa	ation fac	tor for g	ains fo	n or r	est of d	wellina	. h2	.m (se	e Table	9a)		,			•			
(89)m=	0.84	0.77	0.68	-	0.58	0.45	-	0.32	0.2	<del>r í</del>	22	0.39	0.61	0.78	0.8	35		(89)
							_			I		I I 7 in Tobl		<b>I</b>	1			

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)







(90)m=	17.02	17.5	18.05	18.61	19.01	19.27	19.35	19.34	19.19	18.67	17.77	16.93		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.78	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fL	A) x T2			•		
(92)m=	18	18.5	19.08	19.68	20.14	20.44	20.56	20.55	20.34	19.73	18.77	17.9		(92)
	adiustr	nent to t	he mear	internal	l temper	I ature fro	n Table	e 4e, whe	ere appro	opriate				
(93)m=	18	18.5	19.08	19.68	20.14	20.44	20.56	20.55	20.34	19.73	18.77	17.9		(93)
	ace heat	tina reau	uirement											
					re obtair	ned at ste	ep 11 of	Table 9	o. so tha	t Ti.m=(	76)m an	d re-calc	ulate	
				using Ta										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:				-						
(94)m=	0.82	0.75	0.68	0.59	0.49	0.37	0.28	0.3	0.44	0.62	0.76	0.83		(94)
Usefu	ıl gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	412.74	483.32	511.55	492.96	427.64	319.43	228.88	236.45	327.34	398.66	399.85	390.42		(95)
Month	nly avera	age exte	rnal 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		· · ·	· · ·	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	876.04	867.46	800.15	676.91	528.37	361.53	245.42	256.29	388.15	571.48	734.06	866.7		(97)
Space	i			i	nonth, k\	Wh/mon	th = 0.02	24 x [(97]	)m – (95	)m] x (4′	1)m			
(98)m=	344.69	258.14	214.71	132.44	74.95	0	0	0	0	128.58	240.63	354.35		_
								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	1748.49	(98)
Space	e heating	g require	ement in	kWh/m²	²/year								54.64	(99)
9a. En	ergy req	uiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatin					, 	0		,					
-		-	t from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =			ļ	1	(202)
Fracti	on of to	al heati	na from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			-	ing syste									88.8	(206)
	-	-		• •		aoveter	. 0/							4
EIIICIE				ementar		g system	i	1			r		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	i			alculate	i	i	i		i		i	·1		
	344.69	258.14	214.71	132.44	74.95	0	0	0	0	128.58	240.63	354.35		
(211)m	n = {[(98]	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	388.16	290.7	241.79	149.14	84.4	0	0	0	0	144.79	270.98	399.04		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	1969.02	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month							-		
= {[(98	)m x (20	1)]}x1	00 ÷ (20	(8)				-						
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) = Sum(2)	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	l										•		
Output	from wa	ater hea	ter (calc	le hatelu	hove)									
				ſ		·	r		-			· · · · · ·		
	138.14	120.67	125.55	111.35	107.81	94.95	90.97	101.41	102.53	116.75	124.63	134.9		(216)



(217)m= 85.92 85.61 85	.13 84.3	83.07	79.5	79.5	79.5	79.5	84.12	85.39	86.03	]	(217)
Fuel for water heating, kW					1	1		I	1	<b>_</b>	
$(219)m = (64)m \times 100 \div ($ (219)m = 160.77 140.95 14	<u>217)m</u> 7.48 132.1	129.79	119.44	114.43	127.56	128.97	138.8	145.95	156.81	1	
						l = Sum(2				1643.06	(219)
Annual totals							k	Wh/yea	r	kWh/year	], ,
Space heating fuel used, r	nain system	1								1969.02	]
Water heating fuel used										1643.06	]
Electricity for pumps, fans	and electric	keep-ho	t								
central heating pump:									30	]	(230c)
boiler with a fan-assisted	flue								45	]	(230e)
Total electricity for the abo	ve, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										160.68	(232)
Electricity generated by P	/s									-608.39	(233)
Total delivered energy for	all uses (211	)(221)	+ (231)	+ (232)	(237b)	=				3239.37	(338)
10a. Fuel costs - individu	al heating sy	vstems:									-
			<b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table			<b>Fuel Cost</b> £/year	
Space heating - main system	em 1		(21	1) x			3.4	18	x 0.01 =	68.52	(240)
Space heating - main syst	em 2		(21:	3) x			C	)	x 0.01 =	0	(241)
Space heating - secondary	/		(21	5) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other	fuel)		(219	9)			3.4	18	x 0.01 =	57.18	(247)
Pumps, fans and electric k	eep-hot		(23	1)			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of Energy for lighting	of (230a) to (	· • • ·	eparately (232		licable a	nd apply	· · · ·		rding to $\frac{1}{x 0.01} =$		(250)
Additional standing charge	es (Table 12)									120	(251)
			one	of (233) t	o (235) x)		13.	19	x 0.01 =	-80.25	(252)
Appendix Q items: repeat	lines (253) a	nd (254)	as need	ded							_
Total energy cost			247) + (25	50)(254)	=					196.54	(255)
11a. SAP rating - individu	ial heating sy	ystems									
Energy cost deflator (Table	e 12)									0.42	(256)
Energy cost factor (ECF)		[(255) x	(256)] ÷ [(	4) + 45.0]	=					1.07	(257)
SAP rating (Section 12)										85.05	(258)
12a. CO2 emissions – Ind	dividual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
				<b>ergy</b> /h/year			<b>Emiss</b> kg CO	<b>ion fac</b> 2/kWh	tor	<b>Emissions</b> kg CO2/yea	ır
Space heating (main syste	em 1)		(21	1) x			0.2	16	=	425.31	(261)



Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	354.9	(264)
Space and water heating	(261) + (262) + (263) + (26	4) =		780.21	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	83.4	(268)
Energy saving/generation technologies Item 1		0.519	=	-315.76	(269)
Total CO2, kg/year		sum of (265)(271) =		586.77	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		18.34	(273)
EI 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)			=		(261)
Space heating (main system 1) Space heating (secondary)	kWh/year	factor	=	kWh/year	)(261) )(263)
	kWh/year (211) x	factor		kWh/year	
Space heating (secondary)	kWh/year (211) x (215) x	factor 1.22 3.07 1.22	=	kWh/year 2402.2 0	(263)
Space heating (secondary) Energy for water heating	kWh/year (211) x (215) x (219) x	factor 1.22 3.07 1.22	=	kWh/year 2402.2 0 2004.53	(263) (264)
Space heating (secondary) Energy for water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26	factor 1.22 3.07 1.22 4) =	=	kWh/year 2402.2 0 2004.53 4406.73	(263) (264) (265)
Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26 (231) x	factor 1.22 3.07 1.22 4) = 3.07	= =	kWh/year 2402.2 0 2004.53 4406.73 230.25	(263) (264) (265) (267)
Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (26 (231) x	factor 1.22 3.07 1.22 4) = 3.07 0	=	kWh/year 2402.2 0 2004.53 4406.73 230.25 493.3	(263) (264) (265) (267) (268)

