Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.51 *Printed on 21 June 2022 at 16:45:39*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 50.03m²

Site Reference: Great Russell Street LEAN

Plot Reference: FLAT A

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 24.73 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

23.17 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 73.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 59.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK
Floor 0.08 (max. 0.25) 0.08 (max. 0.70) OK

Roof (no roof)

Openings 1.30 (max. 2.00) 1.30 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Database: (rev 499, product index 018119):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant Model: ecoTEC sustain 28

Model qualifier: VUW 286/7-2 (H-GB)

(Combi)

Efficiency 89.1 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

OK

5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls	TTZC by plumbing and	electrical services	ок
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights wit	th low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames va	alley):	Not significant	OK
Based on:	•	_	
Overshading:		Average or unknown	
Windows facing: East		8.61m²	
Ventilation rate:		6.00	
10 Key features			
Party Walls U-value		0 W/m²K	
Floors U-value		0.08 W/m ² K	

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			010943 on: 1.0.5.51	
Address :	· ·	Property	Address	FLAT A	4				
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		;	50.03	(1a) x		3	(2a) =	150.09	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (50.03	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	150.09	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	3	x ′	10 =	30	(7a)
Number of passive vents	;			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			ontinuo fr	30		÷ (5) =	0.2	(8)
Number of storeys in the		eu 10 (17),	ourerwise (onunue n	om (9) to ((10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	uction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	arron annotation and in an abis an atm		(8) + (10)					0	(16)
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre or e	envelope	area	5	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.45	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.45	(21)
Infiltration rate modified f	- 1 	1	1 4	0.5.5	0-4	l Na	Data	1	
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]	
(<u> </u>	1	<u> </u>	I	I	I	I	
Wind Factor (22a)m = (22						1		1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.57	0.56	0.55	0.49	0.48	0.43	0.43	0.42	0.45	0.48	0.51	0.53		
Calculate effe If mechanic		-	rate for t	ne appli	cable ca	se						0	(2:
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(2:
If balanced wit		0		, ,	, ,	. ,	,, .	`	, (,			0	(2:
a) If balance		•	•	_					2h\m + (23h) v [1 – (23c)		(2,
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
b) If balance	ed mecha	L anical ve	entilation	without	heat red	coverv (N	иV) (24b)m = (2)	2b)m + (1 23b)		l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	tilation o	r positiv	re input v	ventilatio	on from o	utside		<u> </u>		l	
,				•			c) = (22k		.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•					•	•	•	
<u>`</u>		<u> </u>	<u> </u>		· `		0.5 + [(2					Ī	(6
24d)m= 0.66	0.66	0.65	0.62	0.62	0.59	0.59	0.59	0.6	0.62	0.63	0.64		(2
Effective air			<u> </u>	<u> </u>	ŕ	ŕ		`				1	(0
25)m= 0.66	0.66	0.65	0.62	0.62	0.59	0.59	0.59	0.6	0.62	0.63	0.64		(2
3. Heat losse	s and he	eat loss p	oaramete	er:									
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		A X k kJ/K
oors	arca	(111)	"	ı	1.99	x		.i.\ =	2.587		K3/111 -1		(2
Vindows							1.3 /[1/(1.3)+			\dashv			•
loor					8.61			'	10.64	<u>_</u>			(2
				_	50.03	=	0.075	≓ ¦	3.7522		20	100	=:
Valls Type1	72.3	_	8.61	=	63.69	=	0.18	=	11.46	닠 ¦	60	382	
Valls Type2	16.4		1.99		14.48	3 ×	0.17	=	2.42		60	868	3.8 (2
otal area of e	elements	, m²			138.8	<u> </u>							(3
Party wall					16.96	x	0	=	0		45	76	===
Party ceiling					50.03	3				Į	30	150	0.9 (3
nternal wall *					94.32						75	70	74 (3
for windows and * include the are						ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
abric heat lo				o ana pan			(26)(30)	+ (32) =				30.86	(3
leat capacity		•	-,					((28).	(30) + (32	2) + (32a).	(32e) =	15028.9	(3
hermal mass	^	,	P = Cm ÷	- TFA) ir	n kJ/m²K			,	÷ (4) =	, , ,	` '	300.4	(3
or design asses	•	•		•			ecisely the	indicative	values of	TMP in T	able 1f	000.1	
an be used inste						,						Γ	
hermal bridg	•	,			•	<						8.93	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 X (3	1)			(33) +	(36) =			39.79	(3
entilation he		alculated	l monthly	/					$= 0.33 \times ($	25)m x (5)	39.19	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 32.91	32.6	32.29	30.83	30.56	29.29	29.29	29.05	29.78	30.56	31.11	31.68		(3
leat transfer	nefficier	nt \///K				<u> </u>		(39)m	= (37) + (37)	38)m	1	ı	
39)m= 72.7	72.39	72.08	70.62	70.35	69.08	69.08	68.84	69.57	70.35	70.9	71.47		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.45	1.45	1.44	1.41	1.41	1.38	1.38	1.38	1.39	1.41	1.42	1.43		
					l .	l .	l .		Average =	Sum(40) ₁	12 /12=	1.41	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	1				ı	1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		69		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.36		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								LOOP		1 1101			
(44)m= 81.8	78.82	75.85	72.87	69.9	66.92	66.92	69.9	72.87	75.85	78.82	81.8		
. ,				ļ	<u> </u>				I Total = Su	M(44) ₁₁₂ =	<u> </u> =	892.33	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	n x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 121.3	106.09	109.48	95.45	91.58	79.03	73.23	84.03	85.04	99.1	108.18	117.48		
									Total = Su	m(45) ₁₁₂ =	=	1169.99	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	to (61)					
(46)m= 18.2	15.91	16.42	14.32	13.74	11.85	10.98	12.61	12.76	14.87	16.23	17.62		(46)
Water storage Storage volum) includir	na anv s	olar or M	/M/HRS	etorana	within es	ama vas	امء		0		(47)
If community h	•	•				_		airio voo	001		0		(47)
Otherwise if no	_			_			, ,	ers) ente	er '0' in ((47)			
Water storage			`					,	·	,			
a) If manufact	turer's d	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	r storage	, kWh/y	ear			(48) x (49)) =			0		(50)
b) If manufact			-										<i>,</i>
Hot water stor If community h	•			le 2 (KVV	h/litre/da	ay)					0		(51)
Volume factor	_		011 4.3								0		(52)
Temperature f			2b								0		(53)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,					, , , ,	,		0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain				_	-	-	-	_			-	хН	(/
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
	<u> </u>	<u>ļ</u>									<u> </u>		. ,
Primary circuit	•	•			E0\	(EO) - OC	SE /44\				0		(58)
Primary circuit (modified by					•	. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0		0	0	0	0		(59)
(00)111-											, ,		(30)

Combi loss	calculated	for each	month (′61)m =	(60) <u>+</u> 3	65 v (41)m							
(61)m= 18.1		18.03	17.34	17.83	17.17	17.68	17.	78 T	17.26	17.95	17.49	18.16	1	(61)
` '		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>!</u>					<u> </u>	ļ	J (59)m + (61)m	` '
(62)m= 139.4		127.5	112.78	109.42	96.2	90.91	101	_	102.3	117.05	125.67	135.63		(62)
Solar DHW inp		<u> </u>	endix G o			ļ								` ,
(add addition														
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from	water hea	ter						•					1	
(64)m= 139.4	9 122.46	127.5	112.78	109.42	96.2	90.91	101.	.82	102.3	117.05	125.67	135.63		
		ı	ı					Outp	ut from wa	ater heate	er (annual)	112	1381.23	(64)
Heat gains f	rom water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (6	1)m	ı] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	_
(65)m= 44.8	8 39.37	40.91	36.07	34.91	30.57	28.77	32.3	39	32.59	37.44	40.34	43.6]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder i	s in the	dwell	ing (or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	•							•		
Metabolic ga														
Jar		Mar	Apr	May	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
(66)m= 84.5	5 84.55	84.55	84.55	84.55	84.55	84.55	84.	55	84.55	84.55	84.55	84.55	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5				•	
(67)m= 13.5	2 12	9.76	7.39	5.52	4.66	5.04	6.5	5	8.79	11.16	13.03	13.89]	(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5	•	•	•	
(68)m= 147.3	148.84	144.99	136.79	126.44	116.71	110.21	108	.68	112.53	120.73	131.08	140.81]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	•	•		
(69)m= 31.4	5 31.45	31.45	31.45	31.45	31.45	31.45	31.4	45	31.45	31.45	31.45	31.45]	(69)
Pumps and	fans gains	(Table	Ба)			•	•	•			•	•	•	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)			•					•	
(71)m= -67.6	4 -67.64	-67.64	-67.64	-67.64	-67.64	-67.64	-67.	64	-67.64	-67.64	-67.64	-67.64		(71)
Water heating	ng gains (T	able 5)						•			•			
(72)m= 60.3	2 58.58	54.98	50.1	46.92	42.46	38.67	43.	53	45.26	50.32	56.03	58.6		(72)
Total intern	al gains =	:	•		(66)m + (67)m	n + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	•	
(73)m= 272.5	270.79	261.1	245.64	230.25	215.19	205.28	210	.12	217.95	233.58	251.51	264.67		(73)
6. Solar ga	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	tions 1	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area		Flu			т.	g_ abla 6b	-	FF		Gains	
	Table 6d		m²		Ta	ble 6a		1 6	able 6b	_ '	able 6c		(W)	,
East 0.9	× 0.77	X	8.6	31	X .	19.64	X		0.63	x	0.7	=	51.68	(76)
East 0.9		X	8.6	51	x ;	38.42	X		0.63	x	0.7	=	101.1	(76)
East 0.9	× 0.77	×	8.6	§1	x (63.27	X		0.63	x	0.7	=	166.49	(76)
East 0.9		X	8.6	61	x	92.28	X		0.63	x	0.7	=	242.82	(76)
East 0.9	× 0.77	X	8.6	81	X 1	13.09	X		0.63	X	0.7	=	297.58	(76)

East	0.9x	0.77	X	8.6	1	x	11	5.77	x		0.63	x	0.7	=	304.63	(76)
East	0.9x	0.77	Х	8.6	1	x	11	0.22	x		0.63	x	0.7	=	290.02	(76)
East	0.9x	0.77	Х	8.6	1	x	94	4.68	x		0.63	x	0.7	=	249.12	(76)
East	0.9x	0.77	х	8.6	1	х	73	3.59	x		0.63	x	0.7	=	193.64	(76)
East	0.9x	0.77	X	8.6	1	х	4	5.59	x		0.63	x [0.7	=	119.96	(76)
East	0.9x	0.77	х	8.6	1	x	24	4.49	x		0.63	x	0.7	=	64.44	(76)
East	0.9x	0.77	х	8.6	1	x [16	6.15	x		0.63	×	0.7	=	42.5	(76)
	-								•							_
Solar ga	ains in	watts, ca	alculated	for each	n month				(83)m	n = S	um(74)m .	(82)m				
(83)m=	51.68	101.1	166.49	242.82	297.58	30	4.63	290.02	249	.12	193.64	119.96	64.44	42.5		(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	(73)m	+ (8	3)m ,	watts								
(84)m=	324.2	371.89	427.59	488.46	527.83	51	9.82	495.3	459	.25	411.59	353.54	315.95	307.17		(84)
7. Mea	ın inter	nal temp	erature	(heating	season)										
Tempe	erature	during h	eating p	eriods ir	the livi	ng a	area f	rom Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisat	tion fac	tor for g	ains for I	iving are	a, h1,m	(se	e Tal	ble 9a)								_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.91	0	.76	0.59	0.6	65	0.89	0.99	1	1		(86)
Mean i	interna	l temper	ature in	living are	ea T1 (fo	ollov	w ster	ns 3 to 7	in T	 Table	e 9c)		•	•	•	
(87)m=	19.62	19.77	20.04	20.41	20.73	1	0.93	20.98	20.		20.82	20.4	19.96	19.61		(87)
Tompo	roturo	during h	ooting n	oriodo in	root of	du	امطالم	from To	مام (22 (°C)		·	!		
(88)m=	19.72	during h	19.73	19.75	19.76	1	9.78	19.78	19.		12 (C) 19.77	19.76	19.75	19.74		(88)
_											10.17	10.70	10.10	10.7 1		(==)
г		tor for g				1	<u> </u>		T	_ 1	0.00	0.00	Ι 4		1	(89)
(89)m=	1	1	0.99	0.96	0.86		.65	0.44	0.	5	0.82	0.98	1	1		(69)
		l temper	1		of dwell	-	`		ps 3	to 7			Т	T	Ī	
(90)m=	17.92	18.14	18.53	19.07	19.5	19	9.73	19.77	19.	77	19.64	19.08	18.43	17.91		(90)
											T	LA = Livi	ng area ÷ (4) =	0.48	(91)
Mean_i	interna	I temper	ature (fo	r the wh	ole dwe	lling	g) = fL	A × T1	+ (1	– fL	A) × T2				•	
(92)m=	18.73	18.92	19.25	19.71	20.09	2	0.3	20.35	20.	35	20.2	19.71	19.16	18.73		(92)
		nent to t							1			·	_	1	Ī	>
(93)m=	18.58	18.77	19.1	19.56	19.94	20	0.15	20.2	20	.2	20.05	19.56	19.01	18.58		(93)
•		iting requ						44.6	-				(70)		1 4	
		mean int factor fo				ned	at ste	p 11 of	labi	le 9t	o, so tha	t II,m=	(76)m an	d re-calc	culate	
Г	Jan	Feb	Mar	Apr	May	Γ.	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
L Utilisat		tor for g	l							- 3			1			
(94)m=	1	0.99	0.99	0.96	0.87	0	.69	0.49	0.5	55	0.84	0.97	1	1		(94)
Useful	gains,	hmGm	, W = (94	1)m x (84	4)m		•						•	•		
(95)m=	323.39	369.98	421.71	466.56	458.39	35	7.69	244.85	254	.59	344.05	344.41	314.38	306.58		(95)
Month	ly aver	age exte	rnal tem	perature	from T	able	8						-	-	•	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Г		e for mea				_		- , ,		_		Ī		1	1	,
` '		1003.76	908.15	752.96	579.47		3.67	248.79	261		414.14	630.36	844.24	1027.54		(97)
· -		g require				т —				Ť		<u> </u>		E00.00	1	
(98)m=	531.96	425.9	361.91	206.21	90.09		0	0	0	,	0	212.75	381.5	536.39		

			Tota	l per year	(kWh/year	·) = Sum(9	8) _{15,912} =	2746.71	(98)
Space heating requirement in kWh/m²/ye	ar							54.9	(99)
a. Energy requirements – Individual heat	ing systems i	including	j micro-C	CHP)					
Space heating:							_		_
Fraction of space heat from secondary/su		/ system						0	(201)
Fraction of space heat from main system	` '		(202) = 1 -	,				1	(202)
Fraction of total heating from main syster	n 1		(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiency of main space heating system	1							90	(206)
Efficiency of secondary/supplementary he	eating syster	n, %						0	(208)
Jan Feb Mar Apr I	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated al	oove)								
531.96 425.9 361.91 206.21 90	0.09 0	0	0	0	212.75	381.5	536.39		
211)m = {[(98)m x (204)] } x 100 ÷ (206)									(211
591.07 473.22 402.13 229.12 10	0.09 0	0	0	0	236.39	423.89	595.99		_
			lota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	3051.9	(211
Space heating fuel (secondary), kWh/mo	nth								
= {[(98)m x (201)] } x 100 ÷ (208) 215)m= 0 0 0 0	0 0	0	0	0	0	0	0		
213)111= 0 0 0 0					ar) =Sum(2			0	(215
Vater heating Dutput from water heater (calculated above 139.49 122.46 127.5 112.78 10	e) 9.42 96.2	90.91	101.82	102.3	117.05	125.67	135.63		
Efficiency of water heater	<u>!</u>							87	(216
217)m= 89.36 89.31 89.2 88.92 88	3.33 87	87	87	87	88.91	89.24	89.38		(217
uel for water heating, kWh/month		-		-	-	-			
$219)m = (64)m \times 100 \div (217)m$ $219)m = 156.1 137.12 142.94 126.84 $	3.87 110.57	104.5	117.03	117.58	131.65	140.83	151.75		
130.1 137.12 142.34 120.04 12	.5.07	104.5		I = Sum(2		140.00	131.73	1560.79	(219
Annual totals						Wh/year		kWh/yea	
Space heating fuel used, main system 1						,		3051.9	
Vater heating fuel used							Ī	1560.79	_
Electricity for pumps, fans and electric kee	p-hot						L		
central heating pump:							30		(230
boiler with a fan-assisted flue							45		(230
otal electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231
Electricity for lighting							Ī	238.68	(232
							_		╡.
otal delivered energy for all uses (211)	(221) + (231)	+ (232).	(237b)	=				4926.37	(338

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	659.21	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	337.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =	:		996.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	123.88	(268)
Total CO2, kg/year	su	m of (265)(271) =		1159.14	(272)
Dwelling CO2 Emission Rate	(2)	72) ÷ (4) =		23.17	(273)
El rating (section 14)				84	(274)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.51 Printed on 21 June 2022 at 16:45:38

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 49.42m² Site Reference: **Great Russell Street LEAN Plot Reference:** FLAT B

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

24 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 23.74 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 68.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 61.0 kWh/m²

OK 2 Fabric U-values

Element Average

Highest External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor (no floor)

Roof 0.12 (max. 0.20) 0.12 (max. 0.35) OK Openings 1.30 (max. 2.00) 1.30 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 5.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Database: (rev 499, product index 018119): Main Heating system:

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant Model: ecoTEC sustain 28

Model qualifier: VUW 286/7-2 (H-GB)

(Combi)

Efficiency 89.1 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls	TTZC by plumbing and e	electrical services	ок
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	th low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames va	alley):	Not significant	ok
Based on:			
Overshading:		Average or unknown	
Windows facing: East		7.44m²	
Ventilation rate:		6.00	
10 Key features			
Roofs U-value		0.12 W/m²K	
Party Walls U-value		0 W/m²K	

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			010943 on: 1.0.5.51	
Address :	F	Property	Address	FLAT E	3				
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			49.42	(1a) x	2	2.9	(2a) =	143.32	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	49.42	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	143.32	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	3	x ′	10 =	30	(7a)
Number of passive vents				Ī	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(neen carried out or is intended, proced			ontinuo fr	30		÷ (5) =	0.21	(8)
Number of storeys in the		eu 10 (17),	otrierwise (onunue n	om (9) to ((10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	uction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	250 amaza dia adia adia ada		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$		•	•	etre or e	envelope	area	5	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.46	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.46	(21)
Infiltration rate modified f	- 1 	1	1 4	0.5.5	0-4	l Na	Data	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(-2)::-	7 7.0 0.0	I 3.0	1 5.7		I 7.5	I 7.5	I 7./	I	
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4				,		1	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rat	e (allowi	na for sh	nelter an	d wind s	need) =	(21a) x	(22a)m					
0.59	0.57	0.56	0.51	0.49	0.44	0.44	0.42	0.46	0.49	0.52	0.54]	
Calculate effec	ctive air		1		cable ca	se se	<u> </u>	<u> </u>	<u> </u>]	
If mechanica												0	(23a)
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)	i	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)n				•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n									0.5]			•	
(24d)m= 0.67	0.66	0.66	0.63	0.62	0.6	0.6	0.59	0.61	0.62	0.63	0.65]	(24d)
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	· (25)		!	•	4	
(25)m= 0.67	0.66	0.66	0.63	0.62	0.6	0.6	0.59	0.61	0.62	0.63	0.65]	(25)
3. Heat losse	c and he	nat loce r	aramata	or:			•			•		1	
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value		X k I/K
Doors	aroa	(111)			1.99	 x	1.3	 =	2.587		NO/III		(26)
Windows					7.44	_	/[1/(1.3)+	!	9.19	=			(27)
Walls Type1	60.6	00	7.44	\neg		=		— i		╡ ,	60	7 7747	—: i
Walls Type2	69.8		7.44	=	62.45	=	0.18	=	11.24	-	60	3747	= '
• •	18.5		1.99	_	16.6	=	0.17	=	2.77	믁 ¦	60	996	(29)
Roof	49.4		0		49.42	2 X	0.12	=	5.93		9	444.7	8 (30)
Total area of e	iements	, m²			137.9								(31)
Party wall					16.39) ×	0	=	0		45	737.5	= '
Party floor					49.42	2				Į	40	1976.	8 (32a)
Internal wall **					85.26						75	6394.	5 (32c)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	า 3.2	
Fabric heat los							(26)(30)) + (32) =				31.73	(33)
Heat capacity		•	- /					((28)	(30) + (32	2) + (32a).	(32e) =	14296.63	(34)
Thermal mass		,	P = Cm -	- TFA) ir	ı kJ/m²K			= (34)	÷ (4) =	, , ,	, ,	289.29	(35)
For design assess	sments wh	ere the de	tails of the	•			ecisely the	e indicative	values of	TMP in T	able 1f	200.20	(**)
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						8.95	(36)
if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he	at loss							(33) +	(36) =			40.68	(37)
Ventilation hea			·	/		i			= 0.33 × (25)m x (5)) 1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 31.76	31.44	31.13	29.68	29.41	28.15	28.15	27.92	28.64	29.41	29.96	30.54]	(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 72.43	72.12	71.81	70.36	70.09	68.83	68.83	68.59	69.31	70.09	70.64	71.21		
Stroma FSAP 201	2 Version	: 1.0.5.51 ((SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	70.3 6 age	2 (39)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.47	1.46	1.45	1.42	1.42	1.39	1.39	1.39	1.4	1.42	1.43	1.44		
()				<u> </u>		<u> </u>	<u> </u>	<u> </u>		Sum(40) ₁ .	. _{.12} /12=	1.42	(40)
Number of day	s in mo	nth (Tabl	e 1a)						ŭ	, ,	1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		67		(42)
if TFA £ 13.9	•										,		
Annual averag Reduce the annua									se tarnet n		.93		(43)
not more that 125	-				-	-	o acmeve	a water ut	so larger c	,,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ССР	1 001	1407	Dec		
(44)m= 81.33	78.37	75.41	72.46	69.5	66.54	66.54	69.5	72.46	75.41	78.37	81.33		
(44)111= 01.33	70.07	75.41	72.40	05.5	00.04	00.54	05.5			im(44) ₁₁₂ =		887.22	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600					007.22	()
(45)m= 120.61	105.48	108.85	94.9	91.06	78.58	72.81	83.55	84.55	98.53	107.56	116.8		
()				l		<u> </u>				Im(45) ₁₁₂ =	l .	1163.28	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			()2	1		` ′
(46)m= 18.09	15.82	16.33	14.23	13.66	11.79	10.92	12.53	12.68	14.78	16.13	17.52		(46)
Water storage	loss:	<u> </u>		!		!	!		l .	<u>Į</u>	<u>[</u>		
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage											,		
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-								1		(54)
Hot water stora If community h	-			ie z (KVV	n/iitre/ua	iy)					0		(51)
Volume factor	•		511 4.5								0		(52)
Temperature fa			2b							-	0		(53)
Energy lost fro				aar			(47) x (51)) x (52) x (53) =				(54)
Enter (50) or (•	, 1	Jai			(11) X (01)) X (02) X (-	-	0		(55)
Water storage		,	or each	month			((56)m = (55) × (41)	m		O		(00)
					T _					T _	I _ I		(50)
(56)m= 0 If cylinder contains	0 s dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	m where (0 (H11) is fro	0 m Append	ix H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by				,	•	. ,	, ,		r thermo	ostat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
		-		-		-	-	-			-		

Combi lo		1		$\overline{}$		-	·	-		r				T		1	(04)
	18.18	16.36	18.02		17.33	17.83	Ь_	7.16	17.68	17.		17.25	17.94	17.48	18.15		(61)
				_			_			È É	_		` 	` 	`	(59)m + (61)m	,,
· ' _	138.79	121.84	126.8		112.23	108.88	<u> </u>	5.74	90.49	101		101.8	116.47	125.04	134.95		(62)
			_										r contribu	ition to wate	er heating)		
(add add				S			ap	-	·	.			1	1		1	,,
(63)m=	0	0	0		0	0		0	0	0)	0	0	0	0		(63)
Output fr		ater heat	ter	_			_									•	
(64)m= 1	138.79	121.84	126.8	7	112.23	108.88	9	5.74	90.49	101	.33	101.8	116.47	125.04	134.95		-
											Outp	ut from wa	ater heat	er (annual) ₁	12	1374.43	(64)
Heat gai	ns fro	m water	heatir	ıg,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (6	1)m] + 0.8 >	([(46)m	+ (57)m	+ (59)m]	
(65)m=	44.65	39.16	40.7		35.89	34.73	3	0.42	28.63	32.	22	32.43	37.25	40.13	43.37		(65)
include	e (57)	m in calc	ulatio	n o	f (65)m	only if o	ylir	nder i	s in the o	llawb	ing	or hot w	ater is t	from com	munity h	eating	
5. Inter	rnal ga	ains (see	Table	e 5	and 5a)):											
Metaboli	ic gain	s (Table	5), W	atts	S												
	Jan	Feb	Ma	\neg	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m=	83.65	83.65	83.65	5	83.65	83.65	8	3.65	83.65	83.	65	83.65	83.65	83.65	83.65		(66)
Lighting	gains	(calculat	ted in	Apı	pendix l	_, equat	ion	L9 o	r L9a), a	lso s	ee -	Table 5			•	-	
(67)m=	13.72	12.19	9.91	Ī	7.5	5.61	_	4.74	5.12	6.6	65	8.93	11.34	13.23	14.1		(67)
Applianc	es ga	ins (calc	ulated	in	Append	lix L, eq	uat	ion L	13 or L1	3a),	also	see Ta	ble 5	-!	ļ.	•	
·· —	145.73	147.24	143.4	$\overline{}$	135.32	125.08	_	15.45	109.02	107	_	111.32	119.43	129.67	139.3		(68)
Cooking	gains	(calcula	ted in	— Ap	pendix	L, equa	tior	ո L15	or L15a	. .), als	o se	e Table	5			ı	
Ě	31.37	31.37	31.37	÷	31.37	31.37	_	1.37	31.37	31.	_	31.37	31.37	31.37	31.37		(69)
Pumps a	and fai	ns gains	(Table	 е 5а	 a)				<u> </u>						l	I	
(70)m=	3	3	3	1	3	3		3	3	3		3	3	3	3		(70)
Losses e	e a ev	anoratio	n (nec	L ati	ve valu	es) (Tah	le:	5)	<u> </u>	<u> </u>			<u> </u>		<u> </u>		
	-66.92	-66.92	-66.9		-66.92	-66.92	1	66.92	-66.92	-66	.92	-66.92	-66.92	-66.92	-66.92]	(71)
Water he										<u> </u>						I	` '
_	60.01	58.28	54.7	÷	49.84	46.68	4	2.25	38.48	43.	31	45.04	50.06	55.74	58.3	1	(72)
Total int					10.01	10.00	<u> </u>			<u> </u>			<u> </u>	71)m + (72)			(/
	270.56	268.8	259.1	<u>л</u> Т	243.76	228.47	2.	13.53	203.71	208	_	216.38	231.93	· · · · · ·	262.8	1	(73)
6. Solar			239.1	†	243.70	220.47		13.33	203.71	200	.57	210.30	231.93	249.74	202.0		(10)
			usina sa	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applica	ble orientat	ion.		
Orientati			•	J	Area	. 00.0 00	ш	Flu	•			g_	о арриос	FF		Gains	
Onoman		Table 6d	aotoi		m ²				ble 6a		Т	able 6b	٦	Table 6c		(W)	
East	0.9x	0.77		x	7.4	4	x	1	9.64	x		0.63	x [0.7		44.66	(76)
East	0.9x	0.77		x	7.4	_	x		38.42]		0.63		0.7	╡ -	87.36](76)
East	0.9x	0.77		x	7.4		x		3.27] ^ x		0.63	^ L x [0.7	╡ -	143.87](76)
East	0.9x]]			≓ ;		=		=
East	Ļ	0.77		X	7.4		X		02.28	l x		0.63	×	0.7	_ =	209.82	(76)
∟ası	0.9x	0.77		X	7.4	4	X	1	13.09	X		0.63	X	0.7	=	257.15	(76)

East	0.9x	0.77	X	7.4	4	x	1	15.77	X		0.63	X	0.7	=	263.23	(76)
East	0.9x	0.77	X	7.4	4	x	1	10.22	X		0.63	x	0.7	=	250.61	(76)
East	0.9x	0.77	X	7.4	4	x	9	94.68	X		0.63	x	0.7	=	215.27	(76)
East	0.9x	0.77	X	7.4	4	x	7	'3.59	X		0.63	x	0.7	=	167.32	(76)
East	0.9x	0.77	X	7.4	4	x	4	5.59	X		0.63	x	0.7	=	103.66	(76)
East	0.9x	0.77	X	7.4	4	x	2	24.49	X		0.63	X	0.7	=	55.68	(76)
East	0.9x	0.77	X	7.4	4	x	1	6.15	X		0.63	x	0.7	=	36.72	(76)
Solar g	ains in	watts, ca	alculated	for eac	n month				(83)n	n = S	um(74)m .	(82)m	_		•	
(83)m=	44.66	87.36	143.87	209.82	257.15		63.23	250.61	215	5.27	167.32	103.66	55.68	36.72		(83)
Ū			and solar	` ,		·		· •			1	1			1	
(84)m=	315.21	356.16	403.01	453.58	485.61	4	76.76	454.32	423	3.84	383.7	335.59	305.42	299.52		(84)
7. Me	an inter	nal temp	perature	(heating	seasor)										
Temp	erature	during h	neating p	eriods ir	the livi	ng	area	from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	ı (s	ee Ta	ble 9a)							•	
	Jan	Feb	Mar	Apr	May	L	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.92	_ (0.79	0.63	0.6	69	0.91	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in 1	Γable	e 9c)					
(87)m=	19.56	19.7	19.97	20.34	20.67]	20.9	20.97	20.	.96	20.79	20.36	19.9	19.55		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, TI	h2 (°C)					
(88)m=	19.71	19.72	19.72	19.75	19.75	1	9.77	19.77	19.	.77	19.76	19.75	19.74	19.73		(88)
Utilisa	ation fac	tor for a	ains for	est of d	wellina.	h2.	m (se	e Table	9a)				•	•	•	
(89)m=	1	1	0.99	0.96	0.88	Т	0.69	0.47	0.5	53	0.84	0.98	1	1		(89)
Mean	interna	l temner	ature in	the rest	of dwell	ina	T2 (f	ollow ste	ens ?	R to 7	7 in Tahl	le 9c)			ı	
(90)m=	17.82	18.04	18.42	18.97	19.43	Ť	9.71	19.76	19.	_	19.59	19.01	18.35	17.82		(90)
		ļ						ļ			1	fLA = Liv	ring area ÷ (4) =	0.48	(91)
Moon	intorna	l tompor	ature (fo	r the wh	ala dwa	llin	a) – f	ΙΛ ν Τ1	⊥ /1	fl	۸) ی T2					
(92)m=	18.66	18.84	19.17	19.63	20.03	_	9) – 1 20.28	20.35	20.		20.17	19.66	19.1	18.66		(92)
		<u> </u>	he mean								l					, ,
(93)m=	18.51	18.69	19.02	19.48	19.88	т —	20.13	20.2	20.		20.02	19.51	1	18.51		(93)
8. Spa	ace hea	ting requ	uirement													
						ned	at st	ep 11 of	Tab	le 9b	o, so tha	ıt Ti,m=	=(76)m ar	d re-cald	culate	
the ut		1	or gains										1		Ī	
1 14:11:04	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(94)m=	ation rac	0.99	ains, hm	0.96	0.89	Τ,	0.72	0.53	0.5	50	0.85	0.98	0.99	1		(94)
		<u> </u>	, W = (94			<u>L'</u>	J.12	0.55	0	55	0.00	0.90	0.99			(01)
(95)m=		354.27	397.78	435.84	431.11	3.	45.55	241.53	250).11	327.97	327.3	303.8	298.86		(95)
			rnal tem			abl	e 8	ļ	<u> </u>			ļ				
(96)m=	4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16	5.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	, <u>W</u> =	=[(39)m	x [(9	3)m	– (96)m]				
(97)m=	1029.62	994.65	899.07	744.67	573.26	3	80.83	247.65	260	0.03	410.36	624.43	837.08	1019.03		(97)
-			ement fo			Wh		th = 0.02	24 x	[(97)m – (95				ı	
(98)m=	532.18	430.34	372.96	222.35	105.76		0	0)	0	221.02	383.96	535.8		

Total per year (kWh/year) = Sum(98) _{15,912} =	2804.37	(98)
Space heating requirement in kWh/m²/year	56.75	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		7(004)
Fraction of space heat from secondary/supplementary system	0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1	(204)
Efficiency of main space heating system 1	90	(206)
Efficiency of secondary/supplementary heating system, %	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/ye	ar
Space heating requirement (calculated above) 532.18		
		(211)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ 591.31 478.15 414.4 247.06 117.51 0 0 0 245.57 426.62 595.34 $		(211)
Total (kWh/year) =Sum(211) _{15,1012} =	3115.97	(211)
Space heating fuel (secondary), kWh/month		
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$		
(215)m= 0 0 0 0 0 0 0 0 0 0 0		_
Total (kWh/year) =Sum(215) _{15,1012} =	0	(215)
Water heating		
Output from water heater (calculated above) 138.79 121.84 126.87 112.23 108.88 95.74 90.49 101.33 101.8 116.47 125.04 134.95		
Efficiency of water heater	87	(216)
(217)m= 89.36 89.32 89.22 88.97 88.45 87 87 87 88.94 89.24 89.38		(217)
Fuel for water heating, kWh/month		
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 155.31 136.41 142.2 126.14 123.1 110.04 104.01 116.47 117.01 130.96 140.11 150.98 $		
Total = Sum(219a) ₁₁₂ =	1552.74	(219)
Annual totals kWh/year	kWh/year	
Space heating fuel used, main system 1	3115.97	
Water heating fuel used	1552.74	1
Electricity for pumps, fans and electric keep-hot		
central heating pump:		(230c)
boiler with a fan-assisted flue		(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =	75	(231)
Electricity for lighting	242.35	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =	4986.06	(338)
12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kWh/year kg CO2/kWh	Emissions	

kWh/year

kg CO2/year

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	673.05	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216	335.39	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1008.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	125.78	(268)
Total CO2, kg/year	sum	of (265)(271) =	1173.15	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	23.74	(273)
El rating (section 14)			83	(274)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.51 *Printed on 21 June 2022 at 16:45:38*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING CREATED BY CHANGE OF USETotal Floor Area: 85.3m²Site Reference :Great Russell Street LEANPlot Reference: FLAT C

Address: Third Floor Flat, Russell House, 37 Great Russell Street, LONDON, WC1B 3PP

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.05 kg/m²
Dwelling Carbon Dioxide Emission Rate (DER) 26.36 kg/m²

Excess emissions = $6.31 \text{ kg/m}^2 (31.5 \%)$

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 85.4 kWh/m²

Excess energy = $24.19 \text{ kg/m}^2 (39.5 \%)$

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.08 (max. 0.25)	0.08 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 15.00 **OK**

4 Heating efficiency

Main Heating system: Database: (rev 499, product index 018119):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant Model: ecoTEC sustain 28

Model qualifier: VUW 286/7-2 (H-GB)

(Combi)

Efficiency 89.1 % SEDBUK2009

Minimum 88.0 %

OK

Fail

Fail

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls TTZC by plumbing and electrical services OK

Hot water controls: No cylinder thermostat

No cylinder

Boiler interlock: Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0%

OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):

Not significant

OK

Based on:

Overshading: Average or unknown

Windows facing: South 6.81m²
Windows facing: North 7.41m²
Ventilation rate: 6.00

10 Key features

Roofs U-value 0.12 W/m²K
Party Walls U-value 0 W/m²K
Floors U-value 0.08 W/m²K

			User D	otaile: -						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRC	0010943	
Software Name:	Stroma FSAP 20	12		Softwa				Versio	n: 1.0.5.51	
		Р	roperty i	Address	FLAT (
Address :	Third Floor Flat, Ru	ıssell Ho	use, 37 (Great Ru	ssell St	reet, LO	NDON, Y	NC1B3	PP	
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	-	Volume(m ³	*)
Ground floor			8	35.3	(1a) x	2	2.75	(2a) =	234.58	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) [35.3	(4)					
Dwelling volume				•	(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	234.58	(5)
2. Ventilation rate:										
		econdar heating	у 	other	_	total			m³ per hou	r
Number of chimneys	0 +	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				, E	3	x -	10 =	30	(7a)
Number of passive vents	6					0	x ·	10 =	0	(7b)
Number of flueless gas f					<u> </u>	0	x	40 =	0	(7c)
Trainber of hadiess gas i	1100					0			0	(70)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	'a)+(7b)+(7c) =		30		÷ (5) =	0.13	(8)
If a pressurisation test has b		led, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
deducting areas of openi	resent, use the value corre ings); if equal user 0.35	sportaing to	ine great	ei waii aie	a (anter					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	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,	•		•	•	•	etre of e	envelope	area	15	(17)
If based on air permeabi	•								0.88	(18)
Air permeability value applie Number of sides sheltere		as been dor	ne or a deg	gree air pei	meability	is being u	sed			7(40)
Shelter factor	eu			(20) = 1 -	0.075 x (1	9)] =			0.92	(19) (20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		/ -			0.92	(21)
Infiltration rate modified t		d		() (-)	(- /				0.61	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00		79			1.101		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	1	
, , , , , , , , , , , , , , , , , , , ,		1	L	I	*	L,	<u> </u>	<u> </u>	J	
Wind Factor (22a)m = (2			T						1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration r	ate (allowi	ina for el	nelter an	d wind s	:need) –	(21a) v	(22a)m						
1.04 1.02	0.99	0.89	0.87	0.77	0.77	0.75	0.81	0.87	0.91	0.95	1		
Calculate effective a									1	1	_		
If mechanical vent											0		(23a)
If exhaust air heat pum	o using App	endix N, (2	(3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0		(23b)
If balanced with heat re	covery: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0		(23c)
a) If balanced med	hanical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]		
(24a)m= 0 0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If balanced med	hanical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		_		
(24b)m = 0 0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole house of if (22b)m < 0.5			•	•				.5 × (23k	o)				
(24c)m= 0 0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If natural ventila	tion or wh	ole hous	se positiv	e input	ventilatio	on from I	oft				_		
if (22b)m = 1,	hen (24d)	m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			_		
(24d)m= 1.04 1.02	0.99	0.9	0.88	0.8	0.8	0.78	0.83	0.88	0.92	0.96			(24d)
Effective air chang	e rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				_		
(25)m= 1.04 1.02	0.99	0.9	0.88	0.8	0.8	0.78	0.83	0.88	0.92	0.96			(25)
3. Heat losses and	neat loss	paramet	er:										
ELEMENT Gr	oss a (m²)	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-valu kJ/m²-		A X kJ/ł	
Doors	<u> </u>			1.99		1.3	 	2.587		,		,	(26)
Windows Type 1				6.81		/[1/(1.3)+	!	8.42	=				(27)
Windows Type 2						/[1/(1.3)+			=				
• •				7.41				9.16	를 ,				(27)
Floor				85.3	_	0.075	=	6.39750	<u>)1</u> [_		(28)
	.52	14.2	2	37.3	X	0.3	_ =	11.19	_		_		(29)
· —	7.41	1.99		35.42	2 X	0.15	=	5.49	_		_		(29)
Roof 49	.42	0		49.42	2 X	0.12	=	5.93					(30)
Total area of elemen	ts, m²			223.6	5								(31)
Party wall				43.2	Х	0	=	0					(32)
* for windows and roof win					ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2		
** include the areas on bo			is and par	titions		(26)(30)	1 ± (32) =						٦(٥٥)
Fabric heat loss, W/k	`	U)				(20)(30)		(20) . (2)	2) . (225)	(220) -	49.		(33)
Heat capacity Cm =	,) Cm	. T[A] :	. l. 1/m21/				. , ,	2) + (32a).	(32e) =	6555		(34)
Thermal mass paran	•		,			ooisoly the		tive Value		abla 1f	25	<u> </u>	(35)
can be used instead of a			CONSTRUCT	ion are not	i kilowii pi	ecisely lile	rinaicative	values of	TIVIT III I	able II			
Thermal bridges : S	L x Y) cal	culated	using Ap	pendix ł	<						33.5	 55	(36)
if details of thermal bridgi	g are not kr	nown (36) =	= 0.05 x (3	1)									_
Total fabric heat loss							(33) +	(36) =			82.7	71	(37)
Ventilation heat loss	calculated	monthly	У				(38)m	= 0.33 × ((25)m x (5))	7		
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 80.15 78.58	77.01	69.59	68.2	61.74	61.74	60.54	64.23	68.2	71.01	73.94			(38)
Heat transfer coeffici	ent, W/K						(39)m	= (37) + (38)m		_		
(39)m= 162.86 161.2	159.72	152.3	150.91	144.45	144.45	143.25	146.94	150.91	153.72	156.65			_
Stroma FSAP 2012 Version	n: 1.0.5.51	(SAP 9.92)	- http://w	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	152.	Page 2	_ <mark>(3+9</mark>)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.91	1.89	1.87	1.79	1.77	1.69	1.69	1.68	1.72	1.77	1.8	1.84		
` /		<u> </u>							L Average =	Sum(40) ₁ .	12 /12=	1.79	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					•	•		•					
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		56		(42)
Annual average Reduce the annual not more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		4.9		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ОСР	1 000	1101			
(44)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		
()								<u> </u>	<u> </u>	m(44) ₁₁₂ =	l	1138.8	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		
		•			•	•			Total = Su	m(45) ₁₁₂ =	=	1493.14	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎) to (61)					
(46)m= 23.22	20.31	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(46)
Water storage Storage volume		\ includin	a any c	olar or M	WHDC	ctorogo	within co	amo voc	col				(47)
_	` '		-			•		airie ves	3 C I		0		(47)
If community h Otherwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			(o. o, o		, /			
a) If manufacti	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufacti			-										
Hot water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	•		on 4.3										(50)
Temperature fa			2h							—	0		(52) (53)
Energy lost fro				oor			(47) x (51)) v (52) v (53) -				
Enter (50) or (•	, KVVII/yt	zai			(47) X (31)) X (32) X (JJ) =		0		(54) (55)
Water storage	, ,	•	or each	month			((56)m = (55) × (41):	m		<u> </u>		(00)
									1	<u> </u>			(56)
(56)m= 0 If cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Append	ix H	(30)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month (61)m = (60) + 365 x (41)m = (60) 18,75 = 18,89 = 18,55 = 17,78 = 18,24 = 17,5 = 17,99 = 18,15 = 17,85 = 18,42 = 18,03 = 18,77 = (61) Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (69)m + (61)m (62)m = 173,56 = 152,29 = 158,27 = 139,59 = 135,12 = 118,36 = 111,45 = 125,4 = 128,18 = 144,9 = 156,09 = 168,82 = (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter 0" if no solar contribution to water heating (33)me = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 =	On mala: Jana		£		(04)	(00) - (OCE /44	\							
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 173.58 152.29 158.27 139.59 135.12 118.36 111.45 125.4 126.18 144.9 156.09 168.62 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m 0 0 0 0 0 0 0 0 0					<u>, , , , , , , , , , , , , , , , , , , </u>	`	- `	<u> </u>	15	17.CE	10.40	10.02	10.7	1	(61)
(62) 173.56 152.29 158.27 139.39 135.12 118.36 111.45 125.4 126.18 144.9 156.09 168.62 (62) Solar DHW Input calculated using Appendix G or Appendix H (negative quantity) (enter "0" if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)me				<u> </u>	<u> </u>	<u> </u>		<u> </u>			<u> </u>	<u> </u>		(FO) : (C1)	(01)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter 10° if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		-i						`	_		` 	ì ´	` ´ 	(59)m + (61)m 1	(62)
(63) (64) (64) (64) (64) (64) (64) (64) (64) (64) (64) (64) (64) (65) (66) (66) (67) (67) (67) (67) (67) (67) (67) (68) (68) (69) (69) (69) (69) (69) (69) (69) (69) (69) (69) (69) (69) (69) (60) (6	` '				<u> </u>			ļ						J	(02)
Colyman											r contribu	tion to wate	er neating)		
Output from water heater (64)m= 173.56 152.29 158.27 139.59 135.12 118.36 111.45 125.4 126.18 144.9 156.09 168.62 Output from water heating, kWh/month 0.25 10.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 56.16 49.24 51.09 44.95 43.42 37.91 35.57 40.2 40.5 46.66 50.41 54.52 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5). Watts Metabolic gains (Table 5), Watts Metabolic gains (Table 5), Watts Metabolic gains (Table 5) and 5a: Metabolic gains (Table 5) and 5a: Metabolic gains (Table 5) watts Metabol	`		r					i 		_	0	Ι ο		1	(63)
Column 173.56 152.29 158.27 139.59 135.12 118.36 111.45 125.4 126.18 144.9 156.09 168.62		!								O		<u> </u>		J	(00)
Coupul from water heater (annual)	· —			120.50	125 12	110 26	111 45	125		126 19	144.0	156.00	169.62	1	
Heat gains from water heating, kWh/month 0.25 ' [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m = \$6.16	(04)111= 173.3	132.29	130.27	139.39	133.12	110.50	111.43	L				1		1709.82	1(64)
(65)me 56.16 49.24 51.09 44.95 43.42 37.91 35.57 40.2 40.5 46.66 50.41 54.52 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating St. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)me 127.79			h4'	1-10/15 /		- ′ - 0	F (45)](04)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec						r -	 	<u> </u>	_			 	 	!]]	(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 127.79 12	` '				l .		<u>.</u>	L]	(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	·	<u> </u>		. ,		ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal	gains (see	e Table 5	and 5a):										
(66)m= 127.79 12	Metabolic ga	_ i _ `		ts	ı	i					i		1	1	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 21.24					— <u> </u>	-	_	_	Ť	· ·	_	_		ļ	
(67)m= 21.24	(66)m= 127.7	9 127.79	127.79	127.79	127.79	127.79	127.79	127	.79	127.79	127.79	127.79	127.79		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 230.16 232.55 226.53 213.72 197.54 182.34 172.19 169.8 175.82 188.63 204.8 220.01 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 35.78 3	Lighting gair	ns (calcula	ted in A	pendix	L, equat	ion L9	or L9a), a	lso s	ee T	Table 5	•			•	
(68)m= 230.16 232.55 226.53 213.72 197.54 182.34 172.19 169.8 175.82 188.63 204.8 220.01 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 35.78 35.	(67)m= 21.2	18.86	15.34	11.61	8.68	7.33	7.92	10.	29	13.82	17.54	20.48	21.83		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 35.78 3	Appliances (gains (calc	ulated ir	n Append	dix L, eq	uation	_13 or L1	3a), a	also	see Tal	ble 5			_	
(69)m= 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 35.78 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(68)m= 230.1	6 232.55	226.53	213.72	197.54	182.34	172.19	169	9.8	175.82	188.63	204.8	220.01		(68)
Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L1	or L15a), als	o se	e Table	5				
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(69)m= 35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.	78	35.78	35.78	35.78	35.78		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	Pumps and	fans gains	(Table	5a)											
(71)m=	(70)m= 3	3	3	3	3	3	3	3	1	3	3	3	3]	(70)
Water heating gains (Table 5) (72)m= 75.49 73.28 68.67 62.42 58.36 52.65 47.81 54.03 56.25 62.71 70.02 73.29 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 391.22 389.03 374.88 352.09 328.93 306.66 292.26 298.46 310.22 333.23 359.63 379.46 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains	Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	-				-			-	
(72)m= 75.49 73.28 68.67 62.42 58.36 52.65 47.81 54.03 56.25 62.71 70.02 73.29 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 391.22 389.03 374.88 352.09 328.93 306.66 292.26 298.46 310.22 333.23 359.63 379.46 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains	(71)m= -102.2	23 -102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102	.23	-102.23	-102.23	-102.23	-102.23]	(71)
Total internal gains =	Water heatir	ng gains (T	able 5)	•			•				•		•	•	
(73)m= 391.22 389.03 374.88 352.09 328.93 306.66 292.26 298.46 310.22 333.23 359.63 379.46 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains	(72)m= 75.49	73.28	68.67	62.42	58.36	52.65	47.81	54.	03	56.25	62.71	70.02	73.29]	(72)
(73)m= 391.22 389.03 374.88 352.09 328.93 306.66 292.26 298.46 310.22 333.23 359.63 379.46 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains	Total intern	al gains =				(6	6)m + (67)m	n + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	•	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains				352.09	328.93	306.66	292.26	298	.46	310.22	333.23	359.63	379.46]	(73)
Orientation: Access Factor Area Flux g_ FF Gains	6. Solar ga	ins:													
0 –	Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applical	ble orientat	tion.		
Table 6d m² Table 6a Table 6b Table 6c (W)	Orientation:														
		Table 6d		m²		Ta	able 6a		Т	able 6b	Т	able 6c		(W)	
North 0.9x 0.77 x 7.41 x 10.63 x 0.63 x 0.7 = 24.08 (74)	North 0.9	× 0.77	Х	7.4	11	x	10.63	x		0.63	х	0.7	=	24.08	(74)
North 0.9x 0.77 x 7.41 x 20.32 x 0.63 x 0.7 = 46.02 (74)	North 0.9	0.77	х	7.4	11	x	20.32	x		0.63	x [0.7	=	46.02	(74)
North 0.9x 0.77 x 7.41 x 34.53 x 0.63 x 0.7 = 78.2 (74)	North 0.9	0.77	X	7.4	¥1	x	34.53	x		0.63	x [0.7		78.2	(74)
North 0.9x 0.77 x 7.41 x 55.46 x 0.63 x 0.7 = 125.6 (74)	North 0.9	× 0.77	X	7.4	11	x	55.46	x		0.63	x [0.7		125.6	(74)
	North 0.9	× 0.77	x	7.4	11	x	74.72	x		0.63	x [0.7	=	169.2	(74)
	North 0.9	0.77	X	7.4	11	x	74.72	X		0.63	X	0.7	=	169.2	(74)

	_								_						
North	0.9x	0.77	X	7.4	1	X	7	79.99	X	0.63	X	0.7	=	181.13	(74)
North	0.9x	0.77	X	7.4	11	X	7	4.68	X	0.63	X	0.7	=	169.11	(74)
North	0.9x	0.77	X	7.4	1 1	X	5	9.25	X	0.63	X	0.7	=	134.17	(74)
North	0.9x	0.77	X	7.4	1	X	4	1.52	X	0.63	X	0.7	=	94.02	(74)
North	0.9x	0.77	X	7.4	1	X	2	24.19	X	0.63	X	0.7	=	54.78	(74)
North	0.9x	0.77	X	7.4	1 1	X	1	3.12	x	0.63	X	0.7	=	29.71	(74)
North	0.9x	0.77	X	7.4	1	X		8.86	x	0.63	X	0.7	=	20.07	(74)
South	0.9x	0.77	X	6.8	31	X	4	6.75	x	0.63	X	0.7	=	97.3	(78)
South	0.9x	0.77	Х	6.8	31	X	7	6.57	x	0.63	X	0.7	=	159.35	(78)
South	0.9x	0.77	х	6.8	31	X	9	7.53	x	0.63	X	0.7	=	202.99	(78)
South	0.9x	0.77	X	6.8	31	X	1	10.23	x	0.63	X	0.7	=	229.42	(78)
South	0.9x	0.77	X	6.8	31	X	1	14.87	X	0.63	X	0.7	=	239.07	(78)
South	0.9x	0.77	X	6.8	31	X	1	10.55	x	0.63	x	0.7	=	230.07	(78)
South	0.9x	0.77	X	6.8	31	X	1	08.01	x	0.63	X	0.7	=	224.8	(78)
South	0.9x	0.77	X	6.8	31	X	1	04.89	x	0.63	X	0.7	=	218.31	(78)
South	0.9x	0.77	X	6.8	31	X	1	01.89	x	0.63	x	0.7		212.05	(78)
South	0.9x	0.77	x	6.8	31	X	8	32.59	x	0.63	x	0.7	_ =	171.88	(78)
South	0.9x	0.77	X	6.8	31	X	5	55.42	x	0.63	X	0.7	=	115.34	(78)
South	0.9x	0.77	x	6.8	31	X		40.4	x	0.63	x	0.7		84.08	(78)
(83)m=	121.38	watts, ca 205.37 nternal a	281.19	355.03	408.27	4	11.21 83)m	393.91 , watts	(83)m 352	1 = Sum(74)m .48 306.06	(82)m		104.15]	(83)
(84)m=	512.6	594.4	656.07	707.12	737.2	Ť	17.87	686.17	650	.94 616.28	559.8	8 504.68	483.61	1	(84)
7 Mod	an intor	nal temp	oratura	(hoating	20220	2)			1						
ı				`			area :	from Tal	0 مار	Th1 (°C)				21	(85)
•		tor for ga				_			JIC 3,	(0)				21	(00)
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	0.98	0.95	+	0.88	0.76	0.7		0.98	1	1	1	(86)
`	intorno	l tompor				حال:	vu oto	<u> </u>			!	 	<u> </u>	1	
(87)m=	18.86	l tempera 19.05	19.38	19.87	20.31	_	20.7	20.88	20.		19.99	19.39	18.9	1	(87)
L								<u> </u>		ļ	10.00	10.00	10.0		(-)
1 empe (88)m=	19.39	19.41	eating p	eriods ir	19.49	_	/elling 19.55	19.55	19.	9, Th2 (°C) 56 19.52	19.49	19.47	19.44	1	(88)
L								<u> </u>		19.52	19.48	19.47	19.44		(00)
		tor for ga				_	· ·	ì	T	ı	1	1	1	1	(00)
(89)m=	1	0.99	0.99	0.97	0.92		0.79	0.58	0.6	0.87	0.97	0.99	1		(89)
Mean	interna		ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7 in Tab	le 9c)		ī	-	
(90)m=	16.64	16.92	17.4	18.14	18.77		19.33	19.5	19.		18.34	_!	16.71		(90)
											fLA = Li	ving area ÷ (4) =	0.45	(91)
Mean	interna	l tempera	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fLA) × T2					
(92)m=	17.65	17.89	18.3	18.92	19.47	<u> </u>	19.95	20.13	20.	11 19.79	19.09	18.33	17.7		(92)
Apply	adjustr	nent to th	ne mean	interna	tempe	ratu	ire fro	m Table	4e,	where appr	opriate				

(02)m	47 E	47.74	40.45	10.77	10.22	10.0	10.00	10.06	10.64	10.04	10.10	47.55		(93)
(93)m=	17.5	17.74	18.15	18.77	19.32	19.8	19.98	19.96	19.64	18.94	18.18	17.55		(93)
			uirement		o obtain	and at at	on 11 of	Table 0	o co tha	t Ti m_/	76)m an	d re-calc	ulato	
			or gains	•		eu ai sii		Table 9	J, 50 IIIa	t 11,111=(r Ojili ali	u re-caic	uiate	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm								1	1		
(94)m=	0.99	0.99	0.98	0.96	0.92	0.81	0.64	0.68	0.88	0.97	0.99	1		(94)
Г			, W = (94	<u> </u>				T	I I			I I		(05)
` /	509.72	588.65	644.58	681.42	676.36	578.83	438.72	445.87	542.63	542.87	500.03	481.46		(95)
	ly avera	age exte	rnal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(96)m=											7.1	4.2		(90)
(97)m= [an intern 1860.56			751.29	488.03	x [(93)m 510.29	- (96)m 813.89	1258.4	1703.41	2091.89		(97)
			ement fo				l	l .			<u> </u>	2091.09		(37)
· -	1219.74		904.68	592.15	352.12	0	0.02	0	0	532.35	866.43	1198.16		
(30)111=	1210.74	330.02	304.00	002.10	332.12				l per year			<u> </u>	6661.66	(98)
_			_					Tota	ii pei yeai	(KVVII/yeai) = Sum(9	O)15,912 =	0001.00	╡``
Space	heating	g require	ement in	kWh/m²	/year								78.1	(99)
9a. Ene	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	heatir	_										,		_
Fraction	on of sp	ace hea	at from so	econdar	y/supple	mentary	system						0	(201)
Fraction	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of r	nain spa	ace heat	ing syste	em 1								90	(206)
Efficier	ncy of s	econda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	heatin	g require	ement (c	alculate	d above))	1				1			
L	1219.74	996.02	904.68	592.15	352.12	0	0	0	0	532.35	866.43	1198.16		
(211)m	= {[(98]	m x (20	(4)] } x 1	00 ÷ (20	16)									(211)
	1355.27	1106.69	1005.2	657.95	391.24	0	0	0	0	591.5	962.7	1331.29		
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>=</u>	7401.84	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month							·		
	m x (20	1)] } x 1	00 ÷ (20	8)			ı				Г			
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ır) =Sum(2	215) _{15,1012}	=	0	(215)
Water h	neating	l												
			ter (calc						1		1			
L	173.56	152.29	158.27	139.59	135.12	118.36	111.45	125.4	126.18	144.9	156.09	168.62		7
Efficiend							ı				1		87	(216)
(217)m=	89.62	89.59	89.54	89.41	89.15	87	87	87	87	89.34	89.53	89.62		(217)
		•	kWh/mo											
(219)m (219)m=		<u>m x 100</u> 169.98) ÷ (217) 176.76	m 156.11	151.57	136.05	128.11	144.14	145.03	162.19	174.34	188.16		
(=10)111=	. 55.57	. 55.55	L 5., 6	1 .50.11	.51.07	1 .30.00	L		I = Sum(2		Lo-	1 .30.10	1926.1	(219)
Annual	totale										Wh/year		kWh/year	
		fuel use	ed, main	system	1					N.	• • • • · · · y c ai		7401.84	7
•	3			•									-	_

Water heating fuel used				1926.1	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (2	230a)(230g) =		75	(231)
Electricity for lighting				375.08	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			9778.02	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				_
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	•		etor =		ar](261)
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	_
	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216 0.519 0.216	=	kg CO2/yea	(261)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216 0.519 0.216	=	kg CO2/yea 1598.8 0 416.04	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 1598.8 0 416.04 2014.83	(261) (263) (264) (265)
Space heating (secondary) 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) + (264) (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 1598.8 0 416.04 2014.83 38.93	(261) (263) (264) (265) (267)

El rating (section 14)

(274)