Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.51 Printed on 07 July 2022 at 08:39:32

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 GREEN 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: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 36.44 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

26.12 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

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:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.42 kWh/day

Permitted by DBSCG: 2.03 kWh/day OK

OK

Primary pipework ins	sulated: Yes		ОК
6 Controls			
Space heating contro	ols TTZC by plumbing an	d electrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for	DHW	OK
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 temperat	ure		
Overheating risk (Th	names valley):	Not significant	oK
Based on:			
Overshading:		Average or unknown	
Windows facing: Eas	st	8.61m²	
Ventilation rate:		6.00	
10 Key features			
Party Walls U-value	•	0 W/m²K	
Floors U-value		0.08 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 :	· ·	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	ımeter (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		
	!		<u>. </u>	!	!	!	!		Average =	Sum(40) ₁	12 /12=	1.41	(40)
Number of day	1	<u> </u>	· ·						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(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 > 13.9 if TFA £ 13.9	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	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	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(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		
Francisco de la contracto de l					400 \/-/		T / 200			m(44) ₁₁₂ =		892.33	(44)
Energy content of													
(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	1160.00	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		10tal = Su	m(45) ₁₁₂ =	•	1169.99	(43)
(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	loss:	1	ļ	Į	Į	<u> </u>	<u> </u>	<u> </u>	1	!			
Storage volum	` '					_		ame ves	sel		170		(47)
If community h Otherwise if no	-			-			, ,	ora) onto	or 'O' in <i>(</i>	′ 47 \			
Water storage		not wate	:i (tili5 ii	iciuues i	IIStaritai	ieous co	ווטט וטוווו	ers) erite	ei O III ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	42		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	77		(50)
b) If manufact			-										(54)
Hot water store If community h	•			ie z (KVV	n/iitre/ua	iy)					0		(51)
Volume factor	•		011 110								0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	77		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(56)
If cylinder 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	ix H	
(57)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by			ı —					<u> </u>		'			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

0 111		, ,	.14	(0.4)	(00)	05 (44)							
Combi loss o	1			-		- ` ` `		Т.	Ι.	Ι.		1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(61)
							`		` 	ì ´	`	· (59)m + (61)m	
(62)m= 168.3		156.51	140.96	138.62	124.54	120.26	131.07		146.14	153.69	164.51	J	(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition						 		 				1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter										-	
(64)m= 168.3	4 148.57	156.51	140.96	138.62	124.54	120.26	131.07	130.55	146.14	153.69	164.51		7
							Ou	tput from w	ater heate	r (annual) ₁	112	1723.76	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	<u>[</u>]	
(65)m= 77.96	69.26	74.03	68.15	68.08	62.69	61.98	65.57	64.69	70.58	72.38	76.69]	(65)
include (5	7)m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a)):									
Metabolic ga	ins (Table	5). Watt	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 84.55	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	L, equati	on L9 o	r L9a), a	lso see	Table 5				1	
(67)m= 13.52	2 12	9.76	7.39	5.52	4.66	5.04	6.55	8.79	11.16	13.03	13.89]	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			1	
(68)m= 147.3	<u> </u>	144.99	136.79	126.44	116.71	110.21	108.68		120.73	131.08	140.81	1	(68)
Cooking gair	ns (calcula	ıted in Ar	ppendix	L. eguat	ion L15	or L15a), also s	see Table	· 5	ļ	<u>I</u>	1	
(69)m= 31.45	_`	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45]	(69)
Pumps and	 fans dains	(Table 5	 ia)									1	
(70)m= 0	0		0	0	0	0	0	T 0	0	0	0	1	(70)
Losses e.g.		اـــــــا						1 -				1	` ,
(71)m= -67.6		-67.64	-67.64	-67.64	-67.64	-67.64	-67.64	-67.64	-67.64	-67.64	-67.64	1	(71)
` '			-07.04	-07.04	-07.04	-07.04	-07.04	-07.04	-07.04	-07.04	-07.04	J	(, ,)
Water heatin		99.5	94.65	91.5	87.07	83.3	88.13	89.84	94.86	100.53	103.07	1	(72)
` '	ļ	l l	94.00	91.5		l	<u> </u>		I	<u> </u>	I	J	(12)
Total intern			007.40	074.00				+ (69)m +	· · · · · ·			1	(72)
(73)m= 313.9		302.62	287.19	271.83	256.8	246.91	251.72	259.53	275.12	293.01	306.14	J	(73)
6. Solar gains ar		using solor	flux from	Toble 60	and accor	sioted equa	utiona to d	onvort to th	o applicat	alo orientos	tion		
Orientation:		Ü	Area	Table ba	Flu	•	1110115 10 (іе арріісаі	FF	uon.	Gains	
Onemation.	Table 6d		Mea m²			ble 6a		g_ Table 6b	Т	able 6c		(W)	
East 0.9						10.04	ı " 🗀	0.00			_	. ,	7(76)
		X	8.6			19.64	X	0.63		0.7	=	51.68	(76)
		X	8.6			38.42	X	0.63		0.7	=	101.1	[(76)
East 0.9		X	8.6			63.27		0.63	_ ×	0.7	=	166.49	 1 (76)
East 0.9:		X	8.6		-	92.28	X	0.63	x	0.7	=	242.82	(76)
East 0.9	0.77	X	8.6	51	x 1	13.09	X	0.63	X	0.7	=	297.58	(76)

East	0.9x	0.77	X	8.6	61	x	115.77	x		0.63	x	0.7	=	304.63	(76)
East	0.9x	0.77	х	8.6	51	x	110.22	x		0.63	x	0.7	=	290.02	(76)
East	0.9x	0.77	X	8.6	61	x	94.68	x		0.63	х	0.7	=	249.12	(76)
East	0.9x	0.77	X	8.6	51	x	73.59	x		0.63	х	0.7	=	193.64	(76)
East	0.9x	0.77	X	8.6	61	x	45.59	x		0.63	x	0.7	=	119.96	(76)
East	0.9x	0.77	х	8.6	51	x $\overline{\ }$	24.49	x		0.63	x	0.7	=	64.44	(76)
East	0.9x	0.77	х	8.6	51	x	16.15	x		0.63	x	0.7	=	42.5	(76)
	_					_									
Solar g	ains in	watts, ca	alculated	I for eacl	h month			(83)m	n = Si	um(74)m .	(82)m				
(83)m=	51.68	101.1	166.49	242.82	297.58	304	.63 290.02	249	.12	193.64	119.96	64.44	42.5		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m , watts								
(84)m=	365.66	413.37	469.11	530.01	569.41	561	.43 536.93	500	.85	453.17	395.08	357.45	348.64		(84)
7. Me	an inter	nal temp	erature	(heating	season)									
Temp	erature	during h	eating p	eriods ir	n the livi	ng ar	ea from Tal	ble 9,	, Th	1 (°C)				21	(85)
Utilisa	tion fac	ctor for g	ains for I	living are	ea, h1,m	(see	Table 9a)								
	Jan	Feb	Mar	Apr	May	Ju	ın Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.88	0.7	2 0.55	0.6	61	0.86	0.98	1	1		(86)
Mean	interna	l temner	ature in	living are	-a T1 (fo	ıllow	steps 3 to 7	7 in T	able	2 9c)		!	!		
(87)m=	21	21	21	21	21	2	i	2.		21	21	21	21		(87)
						ا مدده ا	La si fasas Ti	-1-1- (-0 (00)					
1 emp (88)m=	erature 19.72	19.73	19.73	19.75	19.76	19.	ling from Ta	19.		12 (°C) 19.77	19.76	19.75	19.74		(88)
` ′		<u> </u>						<u> </u>	70	19.77	13.70	19.73	19.74		(00)
ı							(see Table	T	1			1	1	1	(2.2)
(89)m=	1	0.99	0.98	0.94	0.83	0.6	0.41	0.4	16	0.77	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ng T	2 (follow ste	eps 3	to 7	7 in Tabl	e 9c)				
(90)m=	19.72	19.73	19.73	19.75	19.76	19.	78 19.78	19.	78	19.77	19.76	19.75	19.74		(90)
										f	LA = Livir	ng area ÷ (4) =	0.48	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling)	$= fLA \times T1$	+ (1	– fL	A) × T2					
(92)m=	20.33	20.34	20.34	20.35	20.35	20.	36 20.36	20.	36	20.36	20.35	20.35	20.34		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature	from Table	4e,	whe	re appro	priate			•	
(93)m=	20.33	20.34	20.34	20.35	20.35	20.	36 20.36	20.	36	20.36	20.35	20.35	20.34		(93)
8. Spa	ace hea	ıting requ	uirement												
						ned a	t step 11 of	Tabl	le 9k	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the ut		factor fo				<u> </u>	ابرا	Τ		Con	Oct	Nov	Doo		
 I Itiliea	Jan	tor for g	Mar	Apr	May	J	ın Jul	A	ug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.99	0.95	0.86	0.6	7 0.48	0.5	53	0.82	0.97	0.99	1		(94)
	l gains.	hmGm													, ,
(95)m=			462.68	505.35	488.87	374	.53 256.34	266	.93	369.88	383.79	355.54	347.94		(95)
		age exte	rnal tem	perature	from T	able i	_ 8	<u> </u>					<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.		16.	.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rat	e for mea	an intern	al tempe	erature,	Lm ,	W =[(39)m	x [(93	3)m-	– (96)m]				
(97)m=	1165.64	1117.32	997.39	808.56	608.63	398	.03 259.87	272	.89	435.35	686.01	939.21	1153.79		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh/m	nonth = 0.02	24 x [(97)	m – (95)m] x (4	1)m			
(98)m=	595.88	474.47	397.82	218.31	89.1	0	0	0)	0	224.85	420.24	599.55		

											— (00)
					Lota	ıl per year	(kWh/yeai	r) = Sum(9	08) _{15,912} =	3020.23	(98)
Space heating requirement	in kWh/m²	² /year								60.37	(99)
9a. Energy requirements – I	ndividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:		./									¬(004)
Fraction of space heat from			mentary	•		(204)				0	(201)
Fraction of space heat from	-	` ,			(202) = 1	, ,	(000)1			1	(202)
Fraction of total heating fro	-				(204) = (2	02) 🗙 [1 –	(203)] =			1	(204)
Efficiency of main space he										230.34	(206)
Efficiency of secondary/sup	plementar	y heating	g systen	า, % 	1		1	1	1	0	(208)
Jan Feb Ma		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement 595.88 474.47 397.8	`		1				224.85	420.24	F00 FF	1	
		89.1	0	0	0	0	224.65	420.24	599.55		(5.4.4)
$(211)m = \{[(98)m \times (204)] \}$ $258.69 205.98 172.7$		38.68	0	0	0	0	97.62	182.44	260.29		(211)
230.03 203.30 172.7	94.70	30.00					ar) =Sum(2			1311.18	(211)
Space heating fuel (second	arv) k\//h/	month					, ,	715,101.	2	1011.10	(=/
= $\{[(98)\text{m x }(201)]\}$ x $100 \div ($	• , .	monun									
(215)m= 0 0 0	0	0	0	0	0	0	0	0	0		
	•			•	Tota	l (kWh/yea	ar) =Sum(2	215),15,101	2=	0	(215)
Water heating									'		<u> </u>
Output from water heater (ca			404.54	1,00,00	1,04,07	1,00.55	T	1,50,00	1,04.54	İ	
168.34 148.57 156.5	1 140.96	138.62	124.54	120.26	131.07	130.55	146.14	153.69	164.51	470.40	(216)
Efficiency of water heater (217)m= 178.12 178.12 178.12	2 178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	(217)
Fuel for water heating, kWh/		170.12	170.12	170.12	170.12	170.12	170.12	170.12	170.12		(211)
(219) m = (64) m x $100 \div (2^{\circ})$				_	_		_				
(219)m= 94.5 83.41 87.8	7 79.14	77.82	69.92	67.52	73.58	73.29	82.04	86.28	92.36		
					Tota	ıl = Sum(2				967.73	(219)
Annual totals Space heating fuel used, ma	in evetom	1					k'	Wh/yea	ſ	kWh/yea	ı r
	iiii systeiii	1								1311.18	ᆗ
Water heating fuel used										967.73	
Electricity for pumps, fans a	nd electric	keep-ho	t								
Total electricity for the above	e, kWh/yea	r			sum	of (230a)	(230g) =			0	(231)
Electricity for lighting										238.68	(232)
Total delivered energy for al	uses (211)(221)	+ (231)	+ (232).	(237b)	=				2517.59	(338)
12a. CO2 emissions – Indiv	ridual he <u>at</u>	ing sys <u>te</u>	ems inclu	uding <u>mi</u>	cro-CHF						
				J			. .		4	F ! !	
				ergy /h/year			kg CO	ion fac 2/kWh	tor	Emission kg CO2/ye	
Space heating (main system	1)			1) x			0.5		=	680.5	(261)
	',			5) x							=
Space heating (secondary)			(213	<i>o,</i> ^			0.5	19	=	0	(263)

Water heating	(219) x	0.519	=	502.25	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1182.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	123.88	(268)
Total CO2, kg/year	sum	of (265)(271) =		1306.63	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		26.12	(273)
EI rating (section 14)				82	(274)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.51 Printed on 07 July 2022 at 08:39:32

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 GREEN

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: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 35.26 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

26.85 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

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)

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:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.42 kWh/day

Permitted by DBSCG: 2.03 kWh/day

OK

OK

OK

Primary pipework insulated:	Yes		ок
6 Controls			
Space heating controls	TTZC by plumbing and el	ectrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
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 valle	ey):	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/m ² K	
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),	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	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./	l	
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	n 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 (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>			Sum(40) ₁ .	. _{.12} /12=	1.42	(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)
				!		!	Į.		ļ	•			
4 Motor boot	ing one	ravi koani	romonti								Is\A/b/y	nor!	
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		67		(42)
Annual averag Reduce the annua	ıl average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.93		(43)
not more that 125	litres per	person per	day (all w	ater use, i	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(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		
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			ım(44) ₁₁₂ = ables 1b, 1		887.22	(44)
(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		
()				<u> </u>		<u> </u>	l			ım(45) ₁₁₂ =	l .	1163.28	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		· otal	(10)112	1	1.00.20	` ′
(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> </u>	l	l	1	l	l	<u> </u>		
Storage volum	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		170		(47)
If community h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	42		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	77		(50)
b) If manufact			-										
Hot water stora	-			le 2 (kW	h/litre/da	ay)					0		(51)
If community h	_		on 4.3								0		(50)
Temperature fa			2h							_	0		(52) (53)
•							(47) v (E4)) v (EQ) v (E2\				, ,
Energy lost fro Enter (50) or (_	, KVVII/y	ear			(47) X (51)) x (52) x (55) =	-	0 77		(54) (55)
` ' '		,	or ooob	month			((EC)m - ('EE) ~ (41)		0.	77		(33)
Water storage		culateu i		illolluli i			((56))11 = ((55) × (41)	···		ı		
(56)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(56)
If cylinder contains	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	ix H	
(57)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(57)
Primary circuit	•	•									0		(58)
Primary circuit					•	. ,	, ,						
(modified by					ı —			<u> </u>		- 			(=e)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss /	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m												
(61)m= 0	0 0	0	0	0	00) + 3	00 x (41)	0	0	T 0	0	0	1	(61)
] · (59)m + (61)m	(0.)
(62)m= 167.6	-i	155.88	140.41	138.09	124.09	119.84	130.5		145.57	153.07	163.83	(59)III + (61)III]	(62)
Solar DHW input												J	(02)
(add addition									ai continoc	ition to wate	er ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	water hea	ter						<u> </u>		Į		J	
(64)m= 167.6		155.88	140.41	138.09	124.09	119.84	130.5	9 130.07	145.57	153.07	163.83]	
` ′	Į	<u> </u>						Utput from w	ater heat	_ I er (annual)₁	112	1717.06	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	ı + (61)ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 77.73		73.82	67.97	67.9	62.54	61.84	65.4		70.39	72.18	76.46	اُ	(65)
include (5	7)m in cal	culation o	of (65)m	only if c	vlinder	is in the o	dwellii	na or hot w	vater is f	rom com	ımunitv h	ı neating	
5. Internal	<u> </u>				,			3			- 7	3	
Metabolic ga													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m= 83.69	5 83.65	83.65	83.65	83.65	83.65	83.65	83.6	5 83.65	83.65	83.65	83.65	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	ion L9 c	or L9a), a	lso se	e Table 5				•	
(67)m= 13.72	2 12.19	9.91	7.5	5.61	4.74	5.12	6.65	8.93	11.34	13.23	14.1]	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ble 5	•	•	•	
(68)m= 145.7	3 147.24	143.43	135.32	125.08	115.45	109.02	107.5	111.32	119.43	129.67	139.3]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	÷ 5	-	-	-	
(69)m= 31.3	7 31.37	31.37	31.37	31.37	31.37	31.37	31.3	7 31.37	31.37	31.37	31.37]	(69)
Pumps and	fans gains	(Table 5	ōa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)			•		•	•	•	
(71)m= -66.9	2 -66.92	-66.92	-66.92	-66.92	-66.92	-66.92	-66.9	2 -66.92	-66.92	-66.92	-66.92]	(71)
Water heatir	ng gains (T	able 5)					-					•	
(72)m= 104.4	7 102.77	99.22	94.4	91.27	86.86	83.11	87.9	1 89.62	94.61	100.24	102.77]	(72)
Total intern	al gains =				(66	5)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 312.0	2 310.29	300.66	285.31	270.05	255.14	245.35	250.1	7 257.96	273.47	291.24	304.27]	(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions to	convert to the	he applica	ble orienta	tion.		
Orientation:	Orientation: Access Factor Area Flux g_ FF Gains												
	Table 6d		m²			ble 6a	, -	Table 6b		Table 6c		(W)	_
East 0.9	× 0.77	Х	7.4	14	x	19.64	×	0.63	x [0.7	=	44.66	(76)
East 0.9		Х	7.4	14	х	38.42	X	0.63	x [0.7	=	87.36	(76)
East 0.9	× 0.77	X	7.4	14	x	63.27	X	0.63	x [0.7	=	143.87	(76)
East 0.9		Х	7.4	14	х	92.28	X	0.63	x [0.7	=	209.82	(76)
East 0.9	× 0.77	X	7.4	14	X	113.09	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	Х	7.4	4	x	9	94.68	x		0.63	x	0.7	=	215.27	(76)
East	0.9x	0.77	х	7.4	4	x	7	73.59	x		0.63	×	0.7	=	167.32	(76)
East	0.9x	0.77	х	7.4	4	x	4	15.59	x		0.63	×	0.7		103.66	(76)
East	0.9x	0.77	х	7.4	4	x	2	24.49	x		0.63	_ x [0.7	=	55.68	(76)
East	0.9x	0.77	Х	7.4	4	x	1	6.15	x		0.63	x [0.7		36.72	(76)
	_															
Solar g	ains in	watts, ca	alculated	for eacl	n month			_	(83)m	n = Si	um(74)m .	(82)m	_		_	
(83)m=	44.66	87.36	143.87	209.82	257.15		63.23	250.61	215	.27	167.32	103.66	55.68	36.72		(83)
Total ga	ains – i	nternal a	and solar		= (73)m	<u>`</u>		, watts						1	1	
(84)m=	356.68	397.65	444.52	495.14	527.19	5′	18.38	495.96	465	5.44	425.29	377.13	346.93	340.99		(84)
7. Mea	an inter	nal temp	perature	(heating	season)										
Tempe	erature	during h	neating p	eriods ir	the livi	ng	area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for I	iving are	ea, h1,m	(s	ee Ta	ble 9a)								_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.9	(0.76	0.59	0.6	64	0.87	0.98	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollo	w ste	ps 3 to 7	7 in T	Γable	e 9c)					
(87)m=	21	21	21	21	21		21	21	2	1	21	21	21	21		(87)
Tempe	erature	durina h	neating p	eriods ir	rest of	dw	ellina	from Ta	hle 9	—— 9 TI	າ2 (°C)		•	•	I	
(88)m=	19.71	19.72	19.72	19.75	19.75	_	9.77	19.77	19.		19.76	19.75	19.74	19.73		(88)
L	tion for	tor for a	cina for I	oot of d	volling	L h2	m (00	L Toblo	00) —					ļ	l .	
(89)m=	1	0.99	ains for i	0.95	0.85	Г	0.65	0.44	9a) 0.4	19	0.79	0.97	0.99	1	1	(89)
			ļ										1 0.00	<u>'</u>		(==)
Г		· ·	ature in			Ť	<u> </u>		Ė				T 40.74	10.70	1	(90)
(90)m=	19.71	19.72	19.72	19.75	19.75	'	9.77	19.77	19.	. / /	19.76	19.75	19.74	19.73	0.40	¬``
											'	LA - LIVI	ng area ÷ (4	-) –	0.48	(91)
Г			ature (fo			_		i	r `					1	Ī	
(92)m=	20.34	20.34	20.34	20.35	20.35	Ь_	0.36	20.36	20.		20.36	20.35	20.35	20.35		(92)
		1	he mean			_		i	T				T 00.05	00.05		(02)
(93)m=	20.34	20.34	20.34	20.35	20.35	2	0.36	20.36	20.	.37	20.36	20.35	20.35	20.35		(93)
			uirement		o obtoir		ot ot	on 11 of	Tob	ام ۸	th	t Tim	(76)m on	d ro oole	vulata	
			emarter or gains t			iea	ai Si	ерттог	rabi	ie si), so ma	t 11,111=	(76)m an	u re-caic	uiale	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:		!									J	
(94)m=	1	0.99	0.99	0.96	0.88		0.7	0.51	0.5	57	0.84	0.97	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m										•	
(95)m=	355.66	395.56	438.81	475.16	463.62	36	64.53	253.66	263	3.37	355.71	366.94	344.96	340.22		(95)
	ly aver		rnal tem		from T	abl	e 8						,	1	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	<u> </u>	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
			an intern			_		- · · ·			·		1 00=	44.5=	Ī	(07)
L		1113.39	993.9	805.78	606.58		96.75	259.1	272		433.94	683.68	935.95	1149.74		(97)
Space (98)m=	599.57	g require	ement fo 412.99	r each m 238.05	106.36	vn I	/mon1 0	$\frac{\text{th} = 0.02}{1}$	24 x	- `)m – (95 0)M] X (4 235.65	425.52	602.29	[
(90)111=	J33.51	402.30	412.99	230.05	100.30	<u> </u>	U		Щ	,	U	233.03	420.02	002.29		

								1		_
				Tota	l per year	(kWh/yeaı	r) = Sum(9	08)15,912 =	3102.8	(98)
Space heating requirement i	n kWh/m²/yea	r							62.78	(99)
9a. Energy requirements – In	dividual heatir	ng systems i	including	micro-C	CHP)					
Space heating: Fraction of space heat from	eecondary/eur	nlementar	, evetom					j	0	(201)
Fraction of space heat from			-	(202) = 1	- (201) -				0	(202)
Fraction of total heating from	• `	,		(204) = (2		(203)] =			1	(204)
Efficiency of main space hea	-	1		(204) - (2	02) * [1	(200)] =			229.73	(206)
Efficiency of secondary/supp	•	atina systen	n %						0	(208)
			1	Λα	Con	Oct	Nov	Doo		
Jan Feb Mar Space heating requirement		lay Jun ove)	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	J ai
599.57 482.38 412.99	' 	i	0	0	0	235.65	425.52	602.29		
$(211)m = \{[(98)m \times (204)] \} x$	100 ÷ (206)	I		•		•		•		(211)
260.98 209.98 179.77		.3 0	0	0	0	102.57	185.22	262.17		
		-	-	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1350.61	(211)
Space heating fuel (seconda										
$= \{[(98)\text{m x } (201)]\} \text{ x } 100 \div (201) \\ (215)\text{m} = 0 0 0$	1 1	<u> </u>	Ι ο	Ι ,	0	0	0			
(215)m= 0 0 0	0 0	0	0	0 Tota		ar) =Sum(2	_	0	0	(215)
Water heating					. (,	715,1012	2		(210)
Output from water heater (cal	culated above	e)								
167.64 147.97 155.88	140.41 138	.09 124.09	119.84	130.59	130.07	145.57	153.07	163.83		
Efficiency of water heater			_				_		178.12	(216)
(217)m= 178.12 178.12 178.12		.12 178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/n (219) m = (64) m x $100 \div (217)$										
(219)m= 94.11 83.07 87.51	78.83 77.	52 69.67	67.28	73.31	73.02	81.72	85.94	91.98		
		•		Tota	I = Sum(2	19a) ₁₁₂ =		!	963.96	(219)
Annual totals						k'	Wh/yeaı	r	kWh/yea	<u>r</u>
Space heating fuel used, mai	n system 1								1350.61	╛
Water heating fuel used									963.96	
Electricity for pumps, fans and	d electric keep	-hot								
Total electricity for the above,	kWh/year			sum	of (230a).	(230g) =			0	(231)
Electricity for lighting										(232)
Total delivered energy for all	uses (211)(2	221) + (231)	+ (232).	(237b)	=				2556.93	(338)
12a. CO2 emissions – Indivi	dual heating s	vstems incl	uding mi	cro-CHF)					
		•				. .		4	F	_
			nergy Vh/year			Emiss kg CO	ion fac 2/kWh	tor	Emission: kg CO2/ye	
Space heating (main system	1)		1) x					=		
	'/					0.5			700.97	(261)
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)

Water heating	(219) x	0.519	=	500.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1201.26	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	125.78	(268)
Total CO2, kg/year	sum	of (265)(271) =		1327.05	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =		26.85	(273)
El rating (section 14)				81	(274)

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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 GREENPlot 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: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.98 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 24.91 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)
61.2 kWh/m²
61.2 kWh/m²
61.4 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)	-	ОК
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:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.42 kWh/day

Permitted by DBSCG: 2.03 kWh/day

OK

Fail

Primary pipework insulated:	Yes		ок
6 Controls			
Space heating controls	TTZC by plumbing and ele	ectrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DHV	V	OK
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 valle	ey):	Not significant	ОК
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/m ² K	
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		19			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					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] á	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.	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	ameter (I	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>	!	<u>. </u>	!	!		Average =	Sum(40) ₁	12 /12=	1.79	(40)
Number of day	<u> </u>	1 ` ` 	· ·		· .								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	o(-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	al average	hot water	usage by	5% if the c	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 i													
(44)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		
							- /			m(44) ₁₁₂ =		1138.8	(44)
Energy content of													
(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		(45)
If instantaneous v	vater heati	ing at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		lotal = Su	m(45) ₁₁₂ =		1493.14	(45)
(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	loss:	<u> </u>		<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		170		(47)
If community h	_			_			, ,	a\ a.m.t.	a = (O) i = /	(A 7)			
Otherwise if no Water storage		not wate	er (uns ir	iciudes i	nstantar	ieous co	ווטט וטוווו	ers) ente	er o in ((47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	42		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	77		(50)
b) If manufactHot water stor			-										(54)
If community h	•			IC Z (KVV	ii/iiii c /uc	iy <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	77		(55)
Water storage	loss cal	culated	or each	month	r	ī	((56)m = ((55) × (41)	m •	•	ı		
(56)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m= 23.77	21.47	23.77	23	23.77	23	23.77	23.77	23	23.77	23	23.77		(57)
Primary circuit	•	,									0		(58)
Primary circuit				,	•	` '	, ,		v 4b a v	otot)			
(modified by			ı —					<u> </u>		'	22.26		(59)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

O a mala i I a	ombi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
				1	ì '	`	· ·	<u> </u>		Ι ,	Ι ,	Ι ,	1	(61)
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	<u> </u>	(61)
								`		ì	ì ´	`	(59)m + (61)m 1	(00)
` '	201.84	177.88	186.75	167.32	163.91	146.37	140.49	154.2		173.51	183.57	196.96	J	(62)
									'0' if no sola	ır contribu	tion to wate	er heating)		
(add add (63)m=	0 0	o Ines II	rGHKS 0		O O	applies	s, see Ap	penaix 0	(G)	0	0	0	1	(63)
				1 0									J	(00)
Output from (64) m= 2	om wa	177.88	ter 186.75	167.32	163.91	146.37	140.49	154.2	3 154.04	173.51	183.57	196.96	1	
(04)111= 2	.01.04	177.00	100.73	107.32	103.91	140.57	140.43	<u> </u>	utput from w			L	2046.92	(64)
Hoot goir	na frar	m water	hooting	k\N/b/m	anth 0.2	E ' [O 0E	(4E)m](0.7
_	89.1	79	84.08	76.91	76.49	69.95	68.7	73.29	m] + 0.8 2 72.5	79.68	82.32	87.48	']]	(65)
` '									_!	<u> </u>		ļ		(00)
	` '					yımder	s in the (aweiiir	g or hot w	ater is i	rom com	munity r	neating	
		Ì		5 and 5a):									
	Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
<u> </u>	Jan 27.79	127.79	127.79	127.79	127.79	Jun 127.79	127.79	127.7		127.79	127.79	127.79	ł	(66)
` ′						l	I .	L		127.79	127.79	127.79	J	(00)
Lighting	gains 21.24	18.86	15.34	11.61	L, equat	7.33	7.92	10.29	_	17.54	20.48	21.83	1	(67)
` ′	!			ļ	<u> </u>	<u> </u>	<u> </u>	ļ.	_!	<u> </u>	20.40	21.03	J	(07)
·· —				- 	 			- 	so see Ta	1	T 204.0	T 200 04	1	(68)
` '	30.16	232.55	226.53	213.72	197.54	182.34	172.19	169.8	Ļ	188.63	204.8	220.01	J	(00)
Ť				; 		35.78			see Table		05.70	05.70	1	(60)
` ′	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	J	(69)
Pumps a				1	Ι ,		Ι ,	Ι .		Ι ,	Ι ,	Ι ,	1	(70)
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(70)
Losses e	Ť		<u> </u>	1	, ``		1 400 00	1,00,0		1,00,00	1,00,00	1 400 00	1	(74)
` ′	!	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.2	3 -102.23	-102.23	-102.23	-102.23	J	(71)
Water he		<u> </u>		1 400 00	1,00,04	07.45	1 00 04	T 00 5	1,00,00	1 407 4	14400	147.57	1	(70)
` '	19.76	117.57	113.01	106.82	102.81	97.15	92.34	98.5	100.69	107.1	114.33	117.57		(72)
Total int				1					n + (69)m +		•		1	(70)
` '	32.49	430.32	416.22	393.49	370.37	348.16	333.78	339.9	3 351.66	374.61	400.95	420.75		(73)
6. Solar			usina sal:	ar flux from	Table 6a	and assoc	riated equa	ations to	convert to th	ne annlical	nla oriantai	tion		
Orientation			ŭ	Area		Flu	•	ations to	g_	іс арріісаі	FF	uon.	Gains	
Oneman		able 6d	aotoi	m ²			ble 6a		Table 6b	Т	able 6c		(W)	
North	0.9x	0.77	×	7.4	11	x ·	10.63	1 _x [0.63	x [0.7		24.08	(74)
North	0.9x	0.77	x			=	20.32] _x [0.63	x	0.7	= =	46.02](74)
North	0.9x	0.77	×				34.53	」^L 1 x	0.63		0.7	= =	78.2](74)
North	0.9x	0.77	x			-	55.46] ^ <u>L</u>] _× [0.63		0.7		125.6](74)
North	0.9x	0.77	×			_	74.72	」^L] x 「	0.63	^	0.7		169.2](74)
	U.UA	0.77	^	7.5	* '	^	14.12	J ^ L	0.05	^ L	0.7		109.2	

	_								_						
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	1 1	X	7	4.68	X	0.63	X	0.7	=	169.11	(74)
North	0.9x	0.77	X	7.4	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 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	X	6.8	31	X	7	6.57	x	0.63	X	0.7	=	159.35	(78)
South	0.9x	0.77	X	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)
Solar g	ains in	watts, ca	lculated	for eac	h montl	<u>1</u>			(83)m	n = Sum(74)m	ı(82)m	1		_	
(83)m=	121.38	205.37	281.19	355.03	408.27		11.21	393.91	352	.48 306.06	226.6	6 145.04	104.15		(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					•	_	
(84)m=	553.88	635.69	697.41	748.52	778.64	7	59.37	727.69	692	.41 657.73	601.2	7 545.99	524.9		(84)
7. Mea	an inter	nal temp	erature	(heating	seaso	n)									
Tempe	erature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for	iving are	ea, h1,r	n (s	ee Ta	ble 9a)						_	
Į	Jan	Feb	Mar	Apr	May	┖	Jun	Jul	Α	ug Sep	Oc	t Nov	Dec		
(86)m=	1	0.99	0.99	0.98	0.94		0.86	0.73	0.7	7 0.92	0.98	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (1	follo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	21	21	21	21	21		21	21	2	1 21	21	21	21		(87)
Tempe	erature	during h	eating p	eriods ir	n rest o	f dw	/elling	from Ta	able 9	9, Th2 (°C)				_	
(88)m=	19.39	19.41	19.42	19.48	19.49	_	19.55	19.55	19.	` 	19.4	9 19.47	19.44]	(88)
l Itilisa	tion fac	tor for a	ains for	rest of d	welling	h2	m (se	e Table	(9a)	<u> </u>	_ !	!			
(89)m=	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.96 0.91 0.76 0.55 0.6 0.86 0.97 0.99 1 (89)														
L	intorno	l tompor				الل	T2 /f	<u> </u>		<u> </u>				_	
(90)m=	19.39	19.41	19.42	19.48	19.49	Ť	12 (1)	19.55	19.	to 7 in Tab 56 19.52	19.4	9 19.47	19.44	1	(90)
(30)111=	10.00	13.41	10.42	10.40	10.40		10.00	10.00	10.	10.02		ving area ÷ (ļ	0.45	(91)
													,	0.45	(01)
г						_		i e		– fLA) × T2		_	<u> </u>	٦	(55)
(92)m=	20.12	20.13	20.14	20.17	20.18		20.21	20.21	20.		20.1		20.15	_	(92)
Apply	adjustr	nent to th	ne mear	ınterna	tempe	ratu	ire fro	m Table	4e,	where app	ropriate	9			

(00)	00.40	00.44	00.47	00.40	00.04	00.04		00.40	00.40	00.40	00.45		(93)
(93)m= 20.12	20.13	20.14	20.17	20.18	20.21	20.21	20.21	20.19	20.18	20.16	20.15		(93)
8. Space hea				ro obtoin	ad at at	on 11 of	Table 0	h aa tha	tTim /	76\m on	d ro oolo	uloto	
Set Ti to the i					eu ai sii	ep 11 01	Table 9	u, su ina	t 11,111=(, o) III aii	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		1					,						
(94)m= 1	0.99	0.99	0.97	0.93	0.81	0.64	0.69	0.89	0.98	0.99	1		(94)
Useful gains,		<u> </u>	<u> </u>							l			(05)
(95)m= 551.63	631.22	688.27	726.63	722.36	617.59	467.37	476.1	584.52	586.28	542.17	523.19		(95)
Monthly average (96)m= 4.3	age exte	ernai tem 6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
										7.1	4.2		(90)
Heat loss rate (97)m= 2576.9	2456.37	2178.01	<u> </u>	1279.12	809.71	520.8	545.93	895.45	J 1445.12	2008.08	2498.67		(97)
Space heatin	l .	l					l .	l		<u> </u>	2430.07		(01)
(98)m= 1506.8	1226.5	1108.37	712.61	414.23	0	0.02	0	0	638.98	r	1469.75		
(65)								l per year			<u> </u>	8132.7	(98)
On and bootin			1-10/15 / 3	16			1010	ii pei yeai	(ICVVIII) your) = Odin(o	0)15,912		╡``
Space heatin												95.34	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heatir	_			, .									¬
Fraction of sp					mentary	•						0	(201)
Fraction of sp	pace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of I	main spa	ace heat	ing syste	em 1								308.55	(206)
Efficiency of	seconda	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		alculate	d above)									
1506.8	1226.5	1108.37	712.61	414.23	0	0	0	0	638.98	1055.46	1469.75		
$(211)m = \{[(98)$)m x (20	(4)] } x 1	00 ÷ (20	06)									(211)
488.36	397.51	359.22	230.96	134.25	0	0	0	0	207.09	342.07	476.35		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	2635.82	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									_
$= \{[(98)m \times (20)]\}$	01)] } x 1	00 ÷ (20	8)										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating	9												
Output from w													
201.84	177.88	186.75	167.32	163.91	146.37	140.49	154.28	154.04	173.51	183.57	196.96		7,
Efficiency of w											Ī	188.96	(216)
(217)m= 188.96	188.96	188.96	188.96	188.96	188.96	188.96	188.96	188.96	188.96	188.96	188.96		(217)
Fuel for water $(219)m = (64)$	•												
(219)III = $(04)(219)$ m = 106.82	94.14	98.83	88.55	86.75	77.46	74.35	81.65	81.52	91.83	97.15	104.23		
. ,	I					L		I = Sum(2				1083.28	(219)
Annual totals								•		Wh/year		kWh/year	
Space heating		ed, main	system	1						-		2635.82	7
			-									<u> </u>	_

Water heating fuel used			1083.28	1
•			1063.26]
Electricity for pumps, fans and electric keep-hot				_
Total electricity for the above, kWh/year	sum of (23	30a)(230g) =	0	(231)
Electricity for lighting			375.08	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4094.19	(338)
12a. CO2 emissions – Individual heating systems including micro-CHP				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	1367.99	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	562.22	(264)
Space and water heating	(261) + (262) + (263) + (264)	=	1930.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	0	(267)
Electricity for lighting	(232) x	0.519 =	194.67	(268)
Total CO2, kg/year	sum of (265)(271) =		2124.88	(272)
Dwelling CO2 Emission Rate	(2	272) ÷ (4) =	24.91	(273)

El rating (section 14)

(274)

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