Project Information Building type Ground-floor flat

Plot number	1		
Reference			
Date	16 June 2016		
Client	Investland	Project	2
			- I

252 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

1. Overall dwelling dimensions	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

2. Venti		ale									m³ per	hou	r
							main + s heating	eonda	ry + othe	r			
Number Number Number	of pass		6				$ \begin{array}{c} 0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00)))	(6a) (6b) (7a) (7b) (7c)
Pressure test, result q504.00Air permeability0.20Number of sides on which sheltered2.00Shelter factor0.85Infiltration rate incorporating shelter factor0.17Infiltration rate modified for monthly wind speed0.17													s per hour (8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly	average	wind sp	eed fror	n Table	7	-		1	I				
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10		
Wind Fa	actor			_		-		_		-	54.10	C	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27		
Adjusted	d infiltrat	ion rate	allowing	g for shel	ter and	wind sp	eed)				13.50	3	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22		
efficie Ventilati	ncy in % on : bala		g for in-u tole hou	se factor se mech		ith heat	0.50 65.80 recovery				2.30	C	(22b) (23a) (23c)
0.40	0.39	0.39	0.36	0.35	0.34	0.33	0.33	0.35	0.36	0.38	0.39		(25)

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<i>3. Heat</i> Element		a nd hea Gross	Óp	aramete enings	Net are		-value	AxU		kappa-val		
argon fil soft coa	lled, low- t (South)		,		A, m² 5.29		//m²K .42 (1.50)	W/K 7.4		kJ/m²K	kJ/K	(27)
Window	lled, low- t (South	e-glazed ∙E, En=0			1.67	01	.42 (1.50)	2.3	36			(27)
Window argon fil soft coa	r - Doubl lled, low-	e-glazed ∙E, En=0 ∃ast)			0.51	01	.42 (1.50)	0.7	72			(27)
argon fil soft coa Slim V	led, low-	e-glazed ∙E, En=0 ∃ast)			0.51	01	.42 (1.50)	0.7	72			(27)
Walls Ground Party wa Party ce	all				41.2 24.9 42.4 24.9	0 0	0.22 0.20 0.00 0.00	9.0 4.9 0.0 0.0	98 00	17.00 110.00 180.00 30.00	700.74 2739.0 7632.0 747.00	00 (28) 00
Fabric h Heat ca Therma Effect of Total fal	leat loss pacity I mass p f therma bric heat	aramete I bridges	r, kJ/m²ł	<	m²						74. 25.3 11818.7 193. 11. 36.4	34 (33) 74 (34) 12 (35) 11 (36)
21.84	21.14	21.14	19.75	18.83	18.36	17.90	17.90	19.06	19.75	20.45	21.14	(38)
		efficient,		55.00	54.00	54.00	54.00		50.04	50.00	57.00	1
58.29	57.60	57.60	56.21	55.28	54.82	54.36	54.36	55.51	56.21	56.90	57.60 56.2	23 (39)
Heat los	s param	eter (HL	.P), W/m	²K							50.2	23 (39)
0.95	0.94	0.94	0.92	0.90	0.90	0.89	0.89	0.91	0.92	0.93	0.94	
HLP (av Number		in month	n (Table	1a)							0.9	92 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		ber day V	/d,avera	ge				kWh/year 2.02 82.06
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month	1	1	1		1	
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27
Energy	content c	of hot wa	ter used	1			l		1		
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96
Energy of Distribut	content (tion loss	annual)				•					1294.28
20.13	17.60 er storag	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor store (k ¹	,	/h/day)							0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stor	age loss			I	1	1	1	1	1	1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annu	ial)		•	1					0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi le	oss calcu	lated for	r each m	onth							
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00
Total he	at requir	ed for wa	ater heat	ing calcı	ulated fo	r each m	onth				
100 10	157.40						132.27	133.73	152.29	162.57	175.96
		ar hoator	for each	n month,	kWh/mo	onth					
	1			140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96
Output f 180.19		163.76	145.25			118.65	132.27	133.73	152.29	162.57	175.96 1786.54

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5. Internal gains

	- 3	-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•			•					
120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92
Lighting	gains	•				•	•				
41.43	36.80	29.93	22.66	16.94	14.30	15.45	20.08	26.95	34.22	39.94	42.58
Applianc	es gains	3	•						•		
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04
Cooking	gains										
49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11
Pumps a	and fans	gains	•		•			•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)				•	•		
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains	•								
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns	•							•	
478.90	474.53	456.29	428.47	400.25	374.80	360.19	368.00	384.20	412.21	443.22	466.57
							•				

6. Solar gains (calculation for January)

0. Solar gains (calculation for bandary)	Area 9 Elux	~ 0 ГГ	Chading	Caina	
Window - Double-glazed, argon filled,	Area & Flux 0.9 x 5.290 37.39	g & FF	Shading 1.00	Gains 78.4992	
low-E, En=0.1, soft coat (SouthWest)	0.9 x 5.290 57.39	0.03 x 0.70	1.00	70.4992	
Window and Door					
Window - Double-glazed, argon filled,	0.9 x 1.670 37.39	0.63 x 0.70	1.00	24.7814	
low-E, En=0.1, soft coat (SouthWest)				2	
Window					
Window - Double-glazed, argon filled,	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581	
low-E, En=0.1, soft coat (NorthEast)					
Slim Window					
Window - Double-glazed, argon filled,	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581	
low-E, En=0.1, soft coat (NorthEast)					
Slim Window					
Total solar gains, January				105.80	(83-1)
Solar gains					
105.80 181.21 241.63 300.70 332.71 3	39.12 331.90 307.	48 267.82 206.	.37 127.00	90.31	(83)
Total gains	I		I		
584.70 655.75 697.92 729.17 732.96 7	13.91 692.10 675.	49 652.03 618.	58 570.22	556.88	(84)
Lighting calculations					
	Area	g	FF x Shadi	ina	
Window - Double-glazed, argon filled,	0.9 x 5.29	9 0.80	0.70 x 0.83		
low-E, En=0.1, soft coat (SouthWest)					
Window and Door					
Window - Double-glazed, argon filled,	0.9 x 1.67	0.80	0.70 x 0.83	3 0.70	
low-E En=0.1 soft coat (SouthWest)					

low-E, En=0.1, soft coat (SouthWest) Window

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Lighting calculations				
	Area	g	FF x Shading	
Window - Double-glazed, argon filled,	0.9 x 0.51	0.80	0.70 x 0.67	0.17
low-E, En=0.1, soft coat (NorthEast)				
Slim Window				
Window - Double-glazed, argon filled,	0.9 x 0.51	0.80	0.70 x 0.67	0.17
low-E, En=0.1, soft coat (NorthEast)				
Slim Window				
GL = 3.85 / 61.20 = 0.063				
C1 = 0.500				
C2 = 1.014				

EI = 293

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

	-,										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
56.32	57.00	57.00	58.41	59.39	59.89	60.40	60.40	59.14	58.41	57.69	57.00
alpha											
4.75	4.80	4.80	4.89	4.96	4.99	5.03	5.03	4.94	4.89	4.85	4.80
Utilisatio	on factor	for gains	s for livin	g area							
0.96	0.93	0.89	0.81	0.66	0.48	0.32	0.33	0.55	0.80	0.93	0.96
Mean in	ternal te	mperatu	re in livin	ig area T	1						
20.36	20.49	20.65	20.79	20.90	20.94	20.95	20.95	20.93	20.83	20.55	20.37
Temper	ature du	ring heat	ting peric	ds in res	st of dwe	lling Th2	2	1	1	1	I
20.12	20.13	20.13	20.15	20.17	20.17	20.18	20.18	20.16	20.15	20.14	20.13
Utilisatio	on factor	for gains	s for rest	of dwell	ing	1	1	1	1	1	
0.95	0.92	0.86	0.77	0.61	0.42	0.26	0.26	0.49	0.76	0.92	0.96
Mean in	ternal te	mperatu	re in the	rest of d	welling 7	2	1	1	1	1	
19.55	19.68	19.84	19.98	20.08	20.11	20.12	20.12	20.10	20.01	19.76	19.57
0	rea fracti	· ·		,			1	1	1		0.41
Mean in	ternal te	mperatu	re (for th	e whole	dwelling)					
19.88	20.01	20.17	20.31	20.42	20.45	20.46	20.46	20.44	20.34	20.08	19.89
Apply ac	djustmen	it to the r	mean int	ernal ten	nperatur	e, where	appropr	iate			
19.88	20.01	20.17	20.31	20.42	20.45	20.46	20.46	20.44	20.34	20.08	19.89

21.00

0.75

(85)

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8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	n factor	for gains	5			•					
0.95	0.92	0.87	0.78	0.63	0.44	0.28	0.29	0.51	0.77	0.92	0.95
Useful g	ains		•			•					
555.54	603.16	604.08	569.68	459.34	317.38	193.20	193.17	334.00	474.00	523.79	530.76
Monthly	average	external	Itempera	ature			•				
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
896.40	864.67	769.92	652.67	481.79	320.66	193.43	193.42	340.72	536.43	744.43	863.68
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
253.59	175.73	123.39	59.76	16.71	-	-	-	-	46.45	158.86	247.69
Total spa						ar) (Octo	ober to N	lay)			1082.1
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						17.6

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	uremen	(S								kWh/year	
Fraction	of spac	eating sy e heat fro in heating	om main	system	(s)				1.0000 3.30%		,	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	quireme	ent			1	1	1 <u> </u>	1	1		
253.59	175.73	123.39	59.76	16.71	-	-	-	-	46.45	158.86	247.69	(98)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	I	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1		1	1		
271.81	188.35	132.25	64.05	17.91	-	-	-	-	49.78	170.27	265.48	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)	I	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	/stem)		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)	I								
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating			I				1				
Water h	eating re	equireme	nt									
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(64)
Efficienc	by of wat	er heate	r								80.20	(216)
85.81	85.23	84.25	82.90	81.16	80.20	80.20	80.20	80.20	82.35	84.89	85.81	(217)
Water h	eating fu	iel										
209.99	184.68	194.38	175.20	173.26	154.42	147.94	164.93	166.75	184.92	191.50	205.05	(219)
Space h Water h	eating fu eating fu eating fu	uel used, uel (seco uel mps, fan	ndary)		ep-hot						kWh/year 1159.89 0.00 2153.01	(211) (215) (219)
mecha central boiler v Total ele Electricit	nical ver heating with a far ectricity f ty for ligh	ntilation -	balance d flue oove, kW 0.00% fix	d, extrac /h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.57	740)	115.71 130.00 45.00 290.71 292.67	(230a) (230c) (230e) (231) (232)
PVs 0. PVs 0. PVs 0.	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	5							3073.67	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1159.892	3.100	35.96	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2153.01	3.100	66.74	(247)
Mech vent fans cost	115.714	11.460	13.26	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	292.667	11.460	33.54 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			181.28	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy cost factor (ECF)	0.80	(257)
SAP value	88.81	· · · ·
SAP rating	89	(258)
SAP band	В	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	1159.89	0.198	229.66	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2153.01	0.198	426.30	(264)
Space and water heating			655.96	(265)
Electricity for pumps and fans	290.71	0.517	150.30	(267)
Electricity for lighting	292.67	0.517	151.31	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			522.40	(272)
			kg/m²/yea	
CO2 emissions per m ²			8.54	(273)

CO2 emissions per m ²	
El value	
El rating	
El band	

8.54 (273) (273a) 93.41 93 (274) Α

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13a. Primary energy

	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year	·)
Space heating, main	1159.89	1.020	1183.09	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2153.01	1.020	2196.07	(264)
Space and water heating			3379.17	(265)
Electricity for pumps/fans	290.71	2.920	848.89	(267)
Electricity for lighting	292.67	2.920	854.59	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			2680.60	(272)
Primary energy kWh/m²/year			43.80	(273)

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Project Information Building type Ground-floor flat

Duliding type		ιαι	
Plot number Reference	1		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

main + seondary + other heatingNumber of chimneys $0 + 0 + 0$ $x 40$ 0.00 (6a)Number of open flues $0 + 0 + 0$ $x 20$ 0.00 (6b)Number of intermittent fans 2 $x 10$ 20.00 (7a)Number of passive vents 0 $x 10$ 0.00 (7b)Number of flueless gas fires 0 $x 40$ 0.00 (7c)Air changes per hourInfiltration due to chimneys, fans and flues 0.12 (8)Pressure test, result q50 10.00 (17)Air permeability 0.622 (18)Number of sides on which sheltered 2.00 (19)Shelter factor 0.85 (20)Infiltration rate incorporating shelter factor 0.53 (21)Infiltration rate modified for monthly wind speed 0.53 (21)JanFebMarAprMayJanFebMarAprMayJanFebMarApr(22)Wind Factor 1.33 1.27 1.13 1.02 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 Adjusted infiltration rate (allowing for shelter and wind speed) 7.14 (22b)Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	2. vem	Παιιοπτά	ale									m ³ per h	our
Number of chimneys $0 + 0 + 0$ x 40 0.00 (6a) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of intermittent fans 2 x 10 20.00 (7a) Number of passive vents 0 x 10 0.00 (7b) Number of flueless gas fires 0 x 40 0.00 (7c) Mumber of sides gas fires 0 x 40 0.00 (7c) Infiltration due to chimneys, fans and flues 0 x 40 0.00 (7c) Air permeability 0.62 10.00 (17) (17) Air permeability 0.62 (18) (17) Number of sides on which sheltered 2.00 (19) (19) Shelter factor 0.85 (20) (11) Infiltration rate incorporating shelter factor 0.53 (21) (21) Infiltration rate modified for monthly wind speed 0 3.70 3.70 4.20 4.50 4.80 5.10 S.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4									eondar	y + othe	er	•	
Number of flueless gas fires 0 x 40 0.00 (7c) Air changes per hour Air changes per hour 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed Sep Oct Nov Dec Monthly average wind speed from Table 7 54.0 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Vind Factor 13.53 (22a) Mind Factor 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) (27) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	Numbe Numbe	r of open r of inter	i flues mittent fa					0 + 0 + 0 2		x 20 x 10		0.00 20.00	(6b) (7a)
Infiltration due to chimneys, fans and flues 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.40 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Vind Factor 54.10 54.10 (22) 54.10 (22) 1.35 1.27 1.27 1.13 1.02 0.97 0.93 1.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.353 (22a) 13.53 (22a) 13.53 <td></td>													
Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 13.53 (22) Wind Factor 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	Infiltrati	on duo tr	o obimno	we fane	and fluo	c							
Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 51.0 5.10 4.50 4.10 3.90 3.70 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b) 7.14 (22b)					and nue	5				10.00		0.12	
Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 State 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 May 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.55 0.59 0.63 0.67 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59<													
Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 0.510 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Set 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 13.53 (22) Wind Factor 13.53 (22) Adjusted infiltration rate (allowing for shelter and wind speed) 7.14 (22) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 7.14 (22b) 7.14			s on whic	ch sheite	rea								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Sep 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 54.10 (22) Wind Factor 13.53 (22) Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) O.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	Infiltrati	on rate ir											
Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Stand Grad Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans				_	-				-1				
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 54.10 (22) Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans					-		Jul	Aug	Sep	Oct	Nov	Dec	
54.10 (22) Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.13 1.20 1.27 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans					-	-							
Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80		
Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 7.14 (22b) Ventilation : natural ventilation, intermittent extract fans	Wind Fa	actor										54.10	(22)
Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.49 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans	1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Ventilation : natural ventilation, intermittent extract fans	Adjuste	d infiltrat	ion rate	(allowing	for she	ter and	wind sp	eed)				13.53	(22a)
Ventilation : natural ventilation, intermittent extract fans	0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67	
					ntermitte	nt extrac	t fans				·	7.14	(22b)
0.75 0.73 0.68 0.65 0.63 0.62 0.65 0.68 0.70 0.73 (25)		-			0.65	0.63	0.62	0.62	0.65	0.68	0.70	0.73	(25)

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<i>3. Heat losses and heat lo</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	<i>ss paramete</i> Openings m²	r Net are A, m² 13.45 0	W	value ′m²K 35 (2.00)	A x U W/K 24.9	91			(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.85	D	2.00	3.7	70			(26)
Walls Ground floors Party wall Party ceiling		33.9 24.9 42.4 24.9	0 0	0.35 0.25 0.00 0.00	11.8 6.2 0.0 0.0	22)0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						74.10 46.70 11118.00 250.00 8.15 54.85	(31) (33) (34) (35) (36) (37)
	6.88 35.25	34.49	33.77	33.77	35.64	36.88	38.20	39.62	(38)
Heat transfer coefficient, W/	/K			·					
95.96 94.46 94.46 91	.73 90.10	89.34	88.61	88.61	90.49	91.73	93.05	94.46	
Heat loss parameter (HLP),	W/m²K							91.92	(39)
1.57 1.54 1.54 1.5	50 1.47	1.46	1.45	1.45	1.48	1.50	1.52	1.54	
HLP (average) Number of days in month (T	able 1a)		•					1.50	(40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	r heating d occupa	ancy, N	•			(1					kWh/year 2.02	(4
	average				· · · ·			-	-		86.38	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	er usage		-									
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02	(4
Energy	content c	of hot wa	ter used									
141.25	123.54	127.48	111.14	106.64	92.03	85.27	97.85	99.02	115.40	125.97	136.80	
	content (tion loss	annual)									1362.41	(4
21.19	18.53	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52	(4
lot wate olume emperationergy l	er storag er cylinde factor ature fac lost from prage los	er loss fa tor hot wate	ctor (kŴ	• •	day)						150.00 0.0191 0.9283 0.5400 1.44	(555) (555) (555)
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(5
let stor	age loss									•		
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(5
Primary Primary	circuit lo loss	ss (annu	al)		•	1					610.00	(5
51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(5
otal he	at require	ed for wa	ater heat	ing calcu	lated for	r each m	onth					
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth				•		
	210 55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(6
237.59	210.00											
	ins from			Nh/mont	h			•			2496.69	(6

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	gains	•	•								
26.68	23.70	19.27	14.59	10.91	9.21	9.95	12.93	17.36	22.04	25.72	27.42
Applianc	ces gains	5									
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains				•			•			
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains			•			•			
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)				•			
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72
Total int	ernal gai	ns									
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57
		-								-	

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 13.450 19.87	g & FF 0.72 x 0.70	Shading 0.77	Gains 93.3555
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
<i>Lighting calculations</i> Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area 0.9 x 13.45	g 0.80	FF x Shadir 0.70 x 0.83	•

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7. Mean internal temperature

Temper	ature du system	ring heat	ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 1.00	``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
44.29	44.99	44.99	46.33	47.17	47.57	47.96	47.96	46.97	46.33	45.67	44.99	
alpha												
3.95	4.00	4.00	4.09	4.14	4.17	4.20	4.20	4.13	4.09	4.04	4.00	
Utilisatio	on factor	for gains	s for livin	g area						•		
0.99	0.98	0.96	0.91	0.78	0.60	0.41	0.44	0.74	0.93	0.98	0.99	(86
Mean in	ternal te	mperatu	re in livin	ig area T	1					-		
19.49	19.70	20.05	20.45	20.80	20.95	20.99	20.99	20.88	20.46	19.87	19.53	(87
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2		•			
19.64	19.66	19.66	19.69	19.71	19.72	19.73	19.73	19.71	19.69	19.68	19.66	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing	•						
0.99	0.98	0.95	0.87	0.71	0.49	0.29	0.31	0.64	0.90	0.98	0.99	(89
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2	1	-	1	-	1]	
18.31	18.53	18.88	19.28	19.59	19.70	19.73	19.73	19.65	19.30	18.72	18.37	(90
	rea fracti ternal te				dwelling)	•	1		•	0.41	(91
18.79	19.01	19.36	19.76	20.08	20.21	20.24	20.24	20.15	19.78	19.19	18.84	(92
Apply ac	djustmen	it to the r	nean int	ernal ten	peratur	e, where	approp	riate	1	1	1]	
18.79	19.01	19.36	19.76	20.08	20.21	20.24	20.24	20.15	19.78	19.19	18.84	(93

8. Space heating requirement

Space heating requirement for each month, kWh/month634.33489.10386.32209.2373.68205.22448.66612.45Total space heating requirement per year (kWh/year) (October to May)3058.9			9.09	••••••								
0.99 0.98 0.95 0.88 0.73 0.53 0.34 0.36 0.67 0.90 0.98 0.99 Useful gains 518.53 595.16 666.79 723.56 656.03 481.06 294.15 293.41 478.01 547.50 510.75 494.05 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1371.1 (1322.98) 1186.04 1014.1 (1755.06) 501.13 296.23 296.12 529.49 823.33 1133.88 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.9 3058.9 3058.9	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 518.53 595.16 666.79 723.56 656.03 481.06 294.15 293.41 478.01 547.50 510.75 494.05 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1371.1 1322.9 1186.0 1014.1 755.06 501.13 296.23 296.12 529.49 823.33 1133.88 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.9	Utilisatio	n factor	for gains	5								
518.53 595.16 666.79 723.56 656.03 481.06 294.15 293.41 478.01 547.50 510.75 494.05 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1371.1 1322.98 1186.04 1014.16 755.06 501.13 296.23 296.12 529.49 823.33 1133.88 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	0.99	0.98	0.95	0.88	0.73	0.53	0.34	0.36	0.67	0.90	0.98	0.99
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1371.1 1322.9 1186.0 1014.1 755.0 501.13 296.23 296.12 529.49 823.33 1133.8 1317.2 4 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	Useful g	ains										
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1371.1 1322.9 1186.0 1014.1 755.0 501.13 296.23 296.12 529.49 823.33 1133.8 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	518.53	595.16	666.79	723.56	656.03	481.06	294.15	293.41	478.01	547.50	510.75	494.05
Heat loss rate for mean internal temperature 1371.1 1322.9 1186.04 1014.1 755.06 501.13 296.23 296.12 529.49 823.33 1133.8 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	Monthly	average	externa	tempera	ature							
1371.1 1322.9 1186.0 1014.1 755.06 501.13 296.23 296.12 529.49 823.33 1133.88 1317.24 Space heating requirement for each month, kWh/month 634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month634.33489.10386.32209.2373.68205.22448.66612.45Total space heating requirement per year (kWh/year) (October to May)3058.99	Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
634.33 489.10 386.32 209.23 73.68 - - - 205.22 448.66 612.45 Total space heating requirement per year (kWh/year) (October to May) 3058.99	1371.13	1322.98	1186.04	1014.16	755.06	501.13	296.23	296.12	529.49	823.33	1133.88	1317.24
Total space heating requirement per year (kWh/year) (October to May) 3058.99	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
	634.33	489.10	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45
Space heating requirement per m ² (kWh/m ² /year) 49.9a							ar) (Octo	ober to N	lay)			
	Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						49.9

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9a. Energy requirements

Fraction	of heat	from sec	ondary s						0.1000		kWh/year	(201)
Efficiend	cy of mai	e heat fro in heating ondary h	g system	1	(S)			78	0.9000 8.90% 00.00%			(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(200)
		equireme		iviay	Jouri	Juli	Aug	OCP	001		Dee	
		386.32		73.68	_	-	-	-	205.22	448.66	612.45	(98)
		onthly en			1 heating	l svstem	1)		200.22	110.00	012.10	(00)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
	neating fu	uel (main			1)							()
723.57	557.90	440.67	238.67	84.04	-	-	-	-	234.09	511.78	698.61	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (maii	heating	system	2)					. ,
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)		1	•	•				11	
63.43	48.91	38.63	20.92	7.37	-	-	-	-	20.52	44.87	61.24	(215)
Water h							•					
		equireme			1	1	1				11	(- 1)
		223.82		202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(64)
	·	er heate									68.80	(216)
75.64	75.32	74.61	73.30	71.04	68.80	68.80	68.80	68.80	73.16	75.02	75.60	(217)
	eating fu	-	070.00	005 70		000 07	000.05	070.44	000.40	000 17	000.07	(010)
314.12	279.54	299.98	278.82	285.73	269.26	263.97	282.25	279.44	289.40	292.17	308.37	(219)
Space h Water h	neating fu neating fu leating fu	uel used, uel (seco uel mps, fan	ndary)		en-hot						kWh/year 3489.34 305.90 3443.05	(211) (215) (219)
central boiler v Total ele Electrici	l heating with a far ectricity f ty for ligh saving/g		d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 471.15	(230c) (230e) (231) (232)
Energ		or gener):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	3							7884.43	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

Target Carbon Dioxide Emission Rate (TER)

= [(25.2912 x 1.0000 x 1.0206) + (3.2488 x 1.2251)] x 0.6000

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	3489.34	0.194	676.93	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	305.90	0.422	129.09	(263)
Water heating	3443.05	0.194	667.95	(264)
Space and water heating			1473.97	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	471.15	0.422	198.82	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1746.65	(272)
			kg/m²/yea	
Emissions per m ² for space and water heating			25.29	(272a)
Emissions per m ² for lighting			3.25	(272b)
Emissions per m ² for pumps and fans			1.21	(272c)

17.88

(273)

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Project Information Building type Ground-floor flat

Duliding type		ιαι	
Plot number Reference	1		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	6 1.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

2. Venti											m ³ per	hour
							main + s heating	eonda	ry + othe	r		
Number Number Number	of pass		6				$ \begin{array}{c} 0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00) (6b)) (7a)) (7b)
Pressur Air perm Number Shelter	e test, re neability of sides factor on rate ir	esult q50 s on whic ncorpora	ch shelte ting she	and flue red Iter facto hly wind	r				4.00		Air cha 0.00 0.20 2.00 0.85 0.17	(17) 0 (18) 0 (19) 5 (20)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed from	n Table	7		I					
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor	1	1	-	-	1		-			54.10) (22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
	d infiltrat	ion rate		g for she	Iter and	_	eed)				13.53	8 (22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
efficie Ventilati	ncy in % on : bala		g for in-u nole hou	se facto		ith heat	0.50 65.80 recovery	1			2.30) (22b) (23a) (23c)
0.40	0.39	0.39	0.36	0.35	0.34	0.33	0.33	0.35	0.36	0.38	0.39	(25)

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Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Silm Window Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Silm Window Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) 1.670 1.42 (1.50) 7.49 (27) Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) 5.290 1.42 (1.50) 7.49 (27) Window and Door Window and Door 24.90 0.20 4.98 110.00 2739.00 Party wall 42.40 0.00 0.00 780.00 7832.00 741.00 (28) Party wall 42.40 0.00 0.00 780.00 743.00 (28) Fabric heat loss, W/K 25.34 (33) 11818.74 (34) Fabric heat loss, W/K 118.18 (36) 11.11 (36) Ventilation heat loss calculated mon	Element	t	and hea Gross area, m	Óp 2 m²	a <i>ramete</i> enings	Net are A, m ²	V	J-value V/m²K	A x U W/K		kappa-va kJ/m²K	lue A x K kJ/K	
argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window 1.670 1.42 (1.50) 2.36 (27) argon filled, low-E, En=0.1, soft coat (SouthWest) Window (27) (27) window Window 5.290 1.42 (1.50) 7.49 (27) argon filled, low-E, En=0.1, soft coat (SouthWest) (27) (27) (27) (27) window argon filled, low-E, En=0.1, soft coat (SouthWest) (27) (27) (27) Window and Door (28) (28) (28) (28) Party wall 42.40 0.00 0.00 180.00 7632.00 Party ceiling 24.90 0.00 0.00 30.00 747.00 Total area of external elements Sigma A, m ² 74.10 (31) (31) Fabric heat loss, W/K 25.34 (33) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m ² K 193.12 (35) Effect of thermal bridges 11.11 (36) Total fabric heat loss 36.46 (37) Ventilation heat loss calculated monthly 11.8.26 54.36 55.51 56.21 <td>argon fil soft coa</td> <td>lled, Iow t (North</td> <td>-E, En=0</td> <td></td> <td></td> <td>0.51</td> <td>01</td> <td>.42 (1.50)</td> <td>0.7</td> <td>72</td> <td></td> <td></td> <td>(27)</td>	argon fil soft coa	lled, Iow t (North	-E, En=0			0.51	01	.42 (1.50)	0.7	72			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window 1.670 1.42 (1.50) 2.36 (27) Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door 5.290 1.42 (1.50) 7.49 (27) Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door 5.290 1.42 (1.50) 7.49 (27) Window and Door 41.22 0.22 9.07 17.00 700.74 (29) Ground floors 24.90 0.00 0.00 180.00 7632.00 741.00 (31) Party wall 42.40 0.00 0.00 30.00 747.00 (28) Total area of external elements Sigma A, m ² 74.10 (31) 25.34 (33) Heat capacity 11818.74 (34) 193.12 (35) Effect of thermal bridges 11.11 (36) 11.11 (36) Total fabric heat loss 36.46 (37) 11.11 (36) Ventilation heat loss calculated monthly 121.44 21.14 19.75 18.83 18.36 17.90 19.06 19.75 20.45 21.14	argon fil soft coa	lled, Iow t (North	-E, En=0			0.51	01	.42 (1.50)	0.7	72			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door 5.290 1.42 (1.50) 7.49 (27) soft coat (SouthWest) Window and Door 41.22 0.22 9.07 17.00 700.74 (29) Ground floors 24.90 0.20 4.98 110.00 2739.00 (28) Party wall 42.40 0.00 0.00 180.00 7632.00 Party ceiling 24.90 0.00 0.00 30.00 747.00 Total area of external elements Sigma A, m ² 74.10 (31) Fabric heat loss, W/K 25.34 (33) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m ² K 193.12 (35) Effect of thermal bridges 11.11 (36) Total fabric heat loss 36.46 (37) Ventilation heat loss calculated monthly 21.84 21.14 19.75 18.83 18.36 17.90 19.06 19.75 20.45 21.14 (38) Heat transfer coefficient, W/K 58.29 57.60 57.60 56.21 56.23 54.36 55.51 56.21	Window argon fil soft coat	r - Doubl lled, low t (South	-E, En=0			1.67	01	.42 (1.50)	2.3	36			(27)
Walls 41.22 0.22 9.07 17.00 700.74 (29) Ground floors 24.90 0.20 4.98 110.00 2739.00 (28) Party wall 42.40 0.00 0.00 180.00 7632.00 747.00 Party ceiling 24.90 0.00 0.00 30.00 747.00 (31) Fabric heat loss, W/K 25.34 (33) 1881.74 (34) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m²K 193.12 (35) Effect of thermal bridges 11.11 (36) Total fabric heat loss 36.46 (37) Ventilation heat loss calculated monthly 36.46 (37) Ventilation heat loss calculated monthly 36.46 (37) L1.84 21.14 21.74 19.75 18.83 18.36 17.90 19.06 19.75 20.45 21.14 (38) Heat transfer coefficient, W/K 58.29 57.60 57.60 56.21 55.28 54.36 55.51 56.21 56.23 (39) Heat loss paramete	Window argon fil soft coa	r - Doubl lled, low t (South	-E, En=0 West)			5.29	01	.42 (1.50)	7.4	49			(27)
Party wall Party ceiling 42.40 24.90 0.00 0.00 0.00 0.00 180.00 30.00 7632.00 747.00 Total area of external elements Sigma A, m ² 74.10 (31) Fabric heat loss, W/K 25.34 (33) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m ² K 193.12 (35) Effect of thermal bridges 111.11 (36) Total fabric heat loss calculated monthly 36.46 (37) Ventilation heat loss calculated monthly 36.46 (37) Ventilation heat loss calculated monthly 58.29 57.60 57.60 56.21 55.28 54.36 54.36 55.51 56.21 56.23 (39) Heat loss parameter (HLP), W/m ² K 56.23 56.23 (39) 11.14 (30) 10.92 0.93 0.94 Heat loss parameter (HLP), W/m ² K 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.92 0.90 0.89 0.89 0.91 0.92 0.92 (40) Number of days in month (Table 1a) Jan Feb Mar<	Walls												(-)
Partý ceiling 24.90 0.00 0.00 30.00 747.00 Total area of external elements Sigma A, m² 74.10 (31) Fabric heat loss, W/K 25.34 (33) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m²K 193.12 (35) Effect of thermal bridges 11.11 (36) Total fabric heat loss 36.46 (37) Ventilation heat loss calculated monthly 36.46 (37) Ventilation heat loss calculated monthly 17.90 19.06 19.75 20.45 21.14 (38) Heat transfer coefficient, W/K 58.29 57.60 56.21 55.28 54.32 54.36 55.51 56.21 56.23 (39) Heat loss parameter (HLP), W/m²K 56.23 0.94 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 Mumber of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
Fabric heat loss, W/K 25.34 (33) Heat capacity 11818.74 (34) Thermal mass parameter, kJ/m²K 193.12 (35) Effect of thermal bridges 11.11 (36) Total fabric heat loss 36.46 (37) Ventilation heat loss calculated monthly 58.29 57.60 56.21 55.28 54.36 54.36 55.51 56.21 56.20 57.60 58.29 57.60 57.60 56.21 55.28 54.32 54.36 55.51 56.21 56.23 (39) Heat loss parameter (HLP), W/m²K 56.23 0.90 0.90 0.89 0.91 0.92 0.94 0.92 0.90 0.90 0.89 0.91 0.92 0.92 (40) Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
Heat transfer coefficient, W/K 58.29 57.60 56.21 55.28 54.82 54.36 55.51 56.21 56.90 57.60 S6.23 53.29 57.60 56.21 55.28 54.36 54.36 55.51 56.21 56.90 57.60 Heat loss parameter (HLP), W/m²K 0.95 0.94 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 Number of days in month (Table 1a) Oct Nov Dec	Fabric h Heat cap Thermal Effect of Total fat	leat loss pacity I mass p f therma bric hea	, W/K paramete I bridges t loss	r, kJ/m²l	<	m²						25.3 11818.1 193.1 11.1	34 (33) 74 (34) 12 (35) 11 (36)
58.29 57.60 57.60 56.21 55.28 54.82 54.36 55.51 56.21 56.90 57.60 Heat loss parameter (HLP), W/m²K 0.95 0.94 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	21.84	21.14	21.14	19.75	18.83	18.36	17.90	17.90	19.06	19.75	5 20.45	21.14	(38)
56.23 (39) Heat loss parameter (HLP), W/m²K 0.95 0.94 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 Number of days in month (Table 1a) Oct Nov Dec	Heat tra		efficient,	W/K		·			- -				-
Heat loss parameter (HLP), W/m²K 0.95 0.94 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.92 0.90 0.89 0.89 0.91 0.92 0.93 0.94 Number of days in month (Table 1a) 0.92 0.90 0.91 0.92 0.93 0.94	58.29	57.60	57.60	56.21	55.28	54.82	54.36	54.36	55.51	56.21	56.90		
0.95 0.94 0.92 0.90 0.90 0.89 0.91 0.92 0.93 0.94 HLP (average) 0.91 0.92 0.93 0.94 0.92 0.92 0.93 0.94	Heat los	s paran	neter (HL	.P), W/m	²K							56.2	23 (39)
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec					-	0.90	0.89	0.89	0.91	0.92	0.93	0.94]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			in mont	n (Table	1a)	,			,			0.9	92 (40)
				· ·	,	Jun	Jul	Aua	Sep	Oct	Nov	Dec]
					-			-	-				

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Assume	d occupa	ancy, N	/ require r usage i		oer day V	/d,avera	ge				kWh/year 2.02 82.06	(42 (43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot wate	er usage	in litres	per day f	or each	month		•					
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27	(4
Energy of	content o	of hot wa	ter used									
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96	
	content (ion loss	annual)									1294.28	(4
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(4
lot wate /olume empera nergy l		er loss fa tor store (k'	ctor (kW	'h/day)							0.00 0.0000 0.0000 0.0000 0.000	(5 (5 (5 (5 (5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Vet stora	age loss			I					1		1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Primary Primary	circuit lo loss	ss (annu	ial)			•				•	0.00	(5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Combi lo	oss calcu	lated for	r each m	onth								
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(6
otal he	at require	ed for wa	ater heat	ing calcu	lated fo	r each m	ionth					
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth						
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
leat gai	ns from	water he	ating, kV	Vh/mont	h						1786.54	(6
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(6

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	gains		•	•	•		•	•		•	
17.19	15.27	12.42	9.40	7.03	5.93	6.41	8.33	11.18	14.20	16.57	17.67
Applianc	ces gains	;									
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains				•		•		•		
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains		•	•		•	•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•				
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns								•	
331.81	329.25	317.29	298.55	279.77	261.59	250.13	256.13	266.04	284.97	306.54	322.63

6. Solar gains (calculation for January)

o. Solar gains (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51		0.54	1.2581
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 1.670 37.39	0.63 x 0.70	0.77	19.0817
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	0.9 x 5.290 37.39	0.63 x 0.70	0.77	60.4444
Lighting calculations				
	Area	g	FF x Shadi	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.51	0.80	0.70 x 0.67	0.17
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.51	0.80	0.70 x 0.67	0.17
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 1.67	0.80	0.70 x 1.00	0.84
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	0.9 x 5.29	0.80	0.70 x 1.00	2.67

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(85)

(86)

(87)

(88)

(89)

(90)

(91)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec tau 56.32 57.00 57.00 58.41 59.39 59.89 60.40 60.40 59.14 58.41 57.69 57.0 alpha 4.75 4.80 4.89 4.96 4.99 5.03 5.03 4.94 4.89 4.85 4.80 Utilisation factor for gains for living area 0.99 0.98 0.92 0.81 0.63 0.43 0.44 0.72 0.92 0.98 0.99	21.00 0.75
56.32 57.00 57.00 58.41 59.39 59.89 60.40 60.40 59.14 58.41 57.69 57.0 alpha 4.75 4.80 4.80 4.89 4.96 4.99 5.03 5.03 4.94 4.89 4.85 4.80 Utilisation factor for gains for living area 5.03 5.03 5.03 5.03 5.03 4.94 5.03 <	C
alpha 4.75 4.80 4.89 4.96 4.99 5.03 5.03 4.94 4.89 4.85 4.80 Utilisation factor for gains for living area 4.80 4.85 4.80 4.85 4.80	
4.75 4.80 4.89 4.96 4.99 5.03 5.03 4.94 4.89 4.85 4.80 Utilisation factor for gains for living area	00
Utilisation factor for gains for living area	
	0
0.99 0.98 0.96 0.92 0.81 0.63 0.43 0.44 0.72 0.92 0.98 0.99	
	9
Mean internal temperature in living area T1	
20.13 20.27 20.45 20.65 20.83 20.92 20.94 20.94 20.90 20.70 20.35 20.1	15
Temperature during heating periods in rest of dwelling Th2	
20.12 20.13 20.13 20.15 20.17 20.17 20.18 20.18 20.16 20.15 20.14 20.1	13
Utilisation factor for gains for rest of dwelling	
0.99 0.98 0.95 0.90 0.77 0.56 0.35 0.36 0.65 0.89 0.98 0.99	9
Mean internal temperature in the rest of dwelling T2	
19.33 19.47 19.65 19.85 20.03 20.11 20.12 20.12 20.08 19.91 19.57 19.3	36
Living area fraction (24.90 / 61.20) Mean internal temperature (for the whole dwelling)	0.41

	Mean Internal temperature (for the whole dwelling)													
	19.66	19.79	19.98	20.18	20.36	20.44	20.46	20.46	20.41	20.23	19.89	19.68	(92)	
Apply adjustment to the mean internal temperature, where appropriate														
19.66 19.79 19.98 20.18 20.36 20.44 20.46 20.46 20.41 20.23 19.89 19.68											(93)			

8. Space heating requirement

407.80 457.45 478.94 479.41 420.44 309.06 192.44 192.31 318.10 398.05 394.52 387.42 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	er epae	0	9.094	••••••									
0.99 0.97 0.95 0.90 0.78 0.59 0.38 0.39 0.67 0.89 0.97 0.99 Useful gains 407.80 457.45 478.94 479.41 420.44 309.06 192.44 192.31 318.10 398.05 394.52 387.42 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 833.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains 407.80 457.45 478.94 479.41 420.44 309.06 192.44 192.31 318.10 398.05 394.52 387.42 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	Utilisatio	n factor	for gains	5					1			ı	
407.80 457.45 478.94 479.41 420.44 309.06 192.44 192.31 318.10 398.05 394.52 387.42 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	0.99	0.97	0.95	0.90	0.78	0.59	0.38	0.39	0.67	0.89	0.97	0.99	
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	Useful gains												
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.50	407.80	457.45	478.94	479.41	420.44	309.06	192.44	192.31	318.10	398.05	394.52	387.42	
Heat loss rate for mean internal temperature 883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	Monthly average external temperature												
883.55 852.09 759.11 645.08 478.62 319.97 193.36 193.35 339.41 530.04 733.37 851.34 Space heating requirement for each month, kWh/month 353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.5	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	
Space heating requirement for each month, kWh/month353.96265.19208.45119.2843.2998.21243.97345.15Total space heating requirement per year (kWh/year) (October to May)1677.5	Heat los	s rate fo	r mean ii	nternal te	emperati	ire							
353.96 265.19 208.45 119.28 43.29 - - - 98.21 243.97 345.15 Total space heating requirement per year (kWh/year) (October to May) 1677.50	883.55	852.09	759.11	645.08	478.62	319.97	193.36	193.35	339.41	530.04	733.37	851.34	
Total space heating requirement per year (kWh/year) (October to May) 1677.5	Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth						
	353.96	265.19	208.45	119.28	43.29	-	-	-	-	98.21	243.97	345.15	
Space heating requirement per m ² (kWh/m ² /year) 27.4	Total space heating requirement per year (kWh/year) (October to May) 16												
	Space h	pace heating requirement per m ² (kWh/m ² /year) 27											

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	ergy requ	uirement	(S								kWh/yea	r	
Fraction	of spac	eating sys e heat fro in heating	om main	system((s)				1.0000 3.30%		-	(202) (206)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space h	heating re	equireme	ent	-	1				1				
353.96	265.19	208.45	119.28	43.29	-	-	-	-	98.21	243.97	345.15	(98)	
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)	
Space h	heating fu	uel (main	heating	system	1)								
379.38	284.24	223.42	127.85	46.39	-	-	-	-	105.26	261.49	369.94	(211)	
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)						
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)	
Space h	heating fu	uel (main	heating	system	2)				1				
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)	
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	/stem)	l	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)	
Space h	heating fu	uel (seco	ndary)							I			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)	
Water h													
Water heating requirement													
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(64)	
Efficiend	cy of wat	er heater	r								80.20	(216)	
86.62	86.25	85.56	84.46	82.37	80.20	80.20	80.20	80.20	83.88	85.97	86.62	(217)	
Water h	eating fu	lel											
208.02	182.49	191.40	171.97	170.72	154.42	147.94	164.93	166.75	181.56	189.10	203.14	(219)	
Space h Water h	neating fu neating fu leating fu	uel used, uel (seco uel mps, fan:	ndary)		ep-hot						kWh/yeai 1797.96 0.00 2132.45	(211) (215) (219)	
mecha central boiler v Total ele Electrici	inical ver l heating with a far ectricity f ty for ligh	ntilation - pump n-assiste for the ab nting (100	balance d flue oove, kW 0.00% fix	d, extrac h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.57	740)	115.71 130.00 45.00 290.71 303.57	(230a) (230c) (230e) (231) (232)	
Energy saving/generation technologies 822.616 PVs 0.80 x 1.070 x 961.000 x 1.000 0.000 PVs 0.80 x 0.000 x 0.000 x 0.500 0.000 PVs 0.80 x 0.000 x 0.000 x 0.500 0.000 PVs 0.80 x 0.000 x 0.500 0.000 PVs 0.80 x 0.000 x 0.500 0.000											(233)		
		or genera):	ated ():								0.000 0.000	(236a) (237a)	
Total de	livered e	energy fo	r all uses	6							3702.08	(238)	

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	1797.96	0.198	356.00	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2132.45	0.198	422.22	(264)
Space and water heating			778.22	(265)
Electricity for pumps and fans	290.71	0.517	150.30	(267)
Electricity for lighting	303.57	0.517	156.95	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				, ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			650.30	(272)

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 10.63 (273)

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Project Information Building type Ground-floor flat

Plot number	2		
Reference			
Date	17 June 2016		
Client	Investland	Project	252 L or

2 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat losses and</i> Element Gro		aramete enings	r Net are	a U-	value	AxU	ka	appa-valu	le A x K	
Window - Double-gla air-filled (SouthEast)	ι, m² m²	-	A, m ² 1.28	W	/m²K i2 (1.50)	W/K 1.8	ku	I∕m²K	kJ/K	(27)
Window Window - Double-gla air-filled (NorthEast) Window	zed,		0.51	0 1.4	ł2 (1.50)	0.7	2			(27)
Window - Double-gla air-filled (NorthEast) Window	zed,		0.51	0 1.4	1 2 (1.50)	0.7	2			(27)
Window - Double-gla air-filled (SouthEast) Window	zed,		2.480	0 1.4	12 (1.50)	3.5	1			(27)
Window - Double-gla air-filled (SouthEast) Window	zed,		0.68	0 1.4	1 2 (1.50)	0.9	6			(27)
Window - Double-gla air-filled (NorthEast) Window adjacent d			3.38	0 1.4	12 (1.50)	4.7	8			(27)
Window - Double-gla air-filled (NorthEast) Window	zed,		2.48	0 1.4	12 (1.50)	3.5	1			(27)
Full glazed door - Double-glazed, air-fil (NorthEast) Door	ed		2.020	D	1.50	3.0	3			(26)
Walls			77.90		0.22	17.3		17.00	1324.3	()
Ground floors Party wall			66.70 23.80		0.20 0.00	13.3 0.0		10.00 180.00	7337.0 4284.0	
Party ceiling			66.70		0.00	0.0		30.00	2001.0	
Total area of externa Fabric heat loss, W/H Heat capacity Thermal mass paran Effect of thermal brid Total fabric heat loss Ventilation heat loss	K neter, kJ/m² ges	K	m²						157.9 49.7 14946.3 224.0 23.6 73.4	6 (33) 0 (34) 8 (35) 9 (36)
29.71 29.71 29.		29.71	29.71	29.71	29.71	29.71	29.71	29.71	29.71	(38)
Heat transfer coeffici		20.71	20.71	20.71	20.71	20.71	20.71	20.71	20.71	(00)
103.17 103.17 103	.17 103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	
Heat loss parameter	(HLP), W/m	1²K							103.1	7 (39)
1.55 1.55 1.5	5 1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (average) Number of days in m	onth (Table	1a)							1.5	5 (40)
Jan Feb Ma	· Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		or day \	/d avera	ne				kWh/yea ı 2.16 85.58	r (*	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(
	er usage	in litres					-3			_			
94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14	(
Energy	content c	of hot wa	ter used			1				1			
139.94	122.39	126.30	110.11	105.65	91.17	84.48	96.95	98.10	114.33	124.80	135.52		
Energy content (annual) 1349.75 Distribution loss													
20.99	18.36	18.94	16.52	15.85	13.68	12.67	14.54	14.72	17.15	18.72	20.33	(
Hot water storage volume (litres)0.00Hot water cylinder loss factor (kWh/day)0.0000Volume factor0.0000Temperature factor0.0000Energy lost from store (kWh/day)0.00Total storage loss0.00													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Net stor	age loss	1	1	1	1	1	1	1	1	1			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Primary Primary	circuit lo loss	ss (annu	ial)								0.00		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Combi l	oss calcı	lated fo	r each m	onth	-								
47.97	41.75	44.48	41.36	40.99	37.98	39.25	40.99	41.36	44.48	44.74	47.97	(
	at requir								1				
	164.15						137.94	139.46	158.81	169.54	183.50		
	rom wate												
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54			
Heat da	ins from	water he	eating, k\	Nh/mont	h						1863.10		
58.52	51.13	53.11	46.95	45.38	39.81	37.90	42.48	42.96	49.14	52.68	57.05		
	1	I	1	I	I	I	1	1	I	1			

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5. Internal gains

		_										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabol	ic gains,	Watts	•									
129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	
Lighting gains												
43.57	38.70	31.47	23.82	17.81	15.04	16.25	21.12	28.34	35.99	42.00	44.78	
Appliances gains												
282.80	285.73	278.34	262.60	242.72	224.05	211.57	208.63	216.03	231.77	251.64	270.32	
Cooking gains												
50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	
Pumps	and fans	gains										
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
Losses	e.g. evap	oration	negative	values)						•		
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	
Water h	eating ga	ains										
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69	
Total internal gains												
508.44	503.94	484.61	455.04	424.94	397.79	382.17	390.26	407.45	437.22	470.23	495.20	
L							•					

6. Solar gains (calculation for January)

e. Colar gains (carculation for carlady)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.280 37.39		0.77	17.6434
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.480 37.39	0.76 x 0.70	0.77	34.1842
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (NorthEast) Window adjacent door	0.9 x 3.380 11.51	0.76 x 0.70	0.77	14.3426
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 2.480 11.51	0.76 x 0.70	0.77	10.5236
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations	Area	g	FF x Shadii	na
		-		-

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7. Mean internal temperature

Temperature during he	ating perio	ods in the	e living ar	rea, Th1	(°C)						
Heating system respon	Heating system responsiveness										

Apply adjustment to the mean internal temperature, where appropriate

20.02

20.16

19.75

Heating	system	respons	iveness		•						0.75	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau		•	•	•	•	•			•	•		
40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	
alpha	-	•	•	1	•	•		•	•	•		
3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	
Utilisati	on factor	for gain	s for livin	ig area	•		_	•				
0.99	0.98	0.96	0.91	0.81	0.65	0.47	0.50	0.77	0.93	0.98	0.99	
Mean ir	nternal te	mperatu	re in livir	ng area T	1		-			-		
19.75	19.88	20.14	20.40	20.68	20.85	20.91	20.91	20.78	20.45	20.00	19.76	
Temper	rature du	ring hea	ting perio	ds in re	st of dwe	lling Th	2			•		
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	
Utilisati	on factor	for gain	s for rest	of dwell	ing	•				•		
0.98	0.97	0.94	0.88	0.75	0.54	0.32	0.35	0.67	0.90	0.97	0.98	
Mean ir	nternal te	mperatu	re in the	rest of d	welling 7	2	_	-	-			
18.55	18.68	18.93	19.18	19.43	19.55	19.58	19.58	19.51	19.23	18.80	18.57	
0	rea fract	(,	1	1		-			0.47	
Mean ir	nternal te	mperatu	re (for th	e whole	dwelling)	_		_			
19.12	19.24	19.50	19.75	20.02	20.16	20.21	20.20	20.11	19.81	19.37	19.13	
	12 1								•	•		

21.00

(85)

(93)

8. Space heating requirement

19.50

19.24

19.12

er epae	e neathig	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5					1			
0.98	0.97	0.94	0.89	0.77	0.58	0.38	0.41	0.70	0.90	0.97	0.98
Useful g	ains										
594.48	662.86	711.39	749.92	692.46	529.44	334.44	332.55	512.75	587.34	572.07	566.73
Monthly	average	external	l tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
1507.82	1469.60	1309.94	1140.04	858.30	573.78	341.07	340.84	599.48	929.06	1275.9 ⁻	1468.02
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55
	ace heat					ar) (Octo	ober to N	/lay)			3502.8
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						52.5

20.21

20.20

20.11

19.81

19.37

19.13

8c. Space cooling requirement - not applicable

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Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

9a. Energy requirements

9a. Ene	rgy req	uirement	IS								kWh/year	
Fraction	of spac	eating sy e heat fro in heating	om main	system(s)				1.0000 4.80%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating r	equireme	ent					•	•			
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	(98)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)			•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	iel (main	heating	system	1)					•		
716.80	571.87	469.75	296.29	130.15	-	-	-	-	268.19	534.56	707.34	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)			•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	iel (main	heating	system	2)					•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	stem)	•	•	•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)			•		•		•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h Water h	eating eating re	equireme	nt									
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(64)
Efficience	by of wat	er heate	r					1			80.20	(216)
87.90	87.73	87.25	86.48	84.52	80.20	80.20	80.20	80.20	86.13	87.54	87.92	(217)
Water h	eating fu	lel				1	1		1	1		
213.78	187.10	195.73	175.14	173.51	161.04	154.28	171.99	173.89	184.39	193.68	208.71	(219)
Space h Water h	eating fu eating fu eating fu		ndary)		ep-hot						kWh/year 3694.95 0.00 2193.23	(211) (215) (219)
mecha central boiler v Total ele Electrici	central heating pump13boiler with a fan-assisted flue22Total electricity for the above, kWh/year22						49.21 130.00 45.00 224.21 307.77	(230a) (230c) (230e) (231) (232)				
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	075 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							826.460 0.000 0.000 826.460	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							5593.70	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	3694.946	3.100	114.54	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2193.23	3.100	67.99	(247)
Mech vent fans cost	49.215	11.460	5.64	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	307.767	11.460	35.27 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	826.460	11.460	-94.71	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			254.79	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)
Energy cost denator			0.47	(250)

	0.17	(_00)
Energy cost factor (ECF)	1.07	(257)
SAP value	85.04	
SAP rating	85	(258)
SAP band	В	
		(200)

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	3694.95	0.198	731.60	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2193.23	0.198	434.26	(264)
Space and water heating			1165.86	(265)
Electricity for pumps and fans	224.21	0.517	115.92	(267)
Electricity for lighting	307.77	0.517	159.12	(268)
Electricity generated - PVs	-826.46	0.529	-437.20	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				. ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1003.70	(272)
			kg/m²/yea	
\mathbf{coo} aminalized and \mathbf{max} m ²			16 06	(070)

CO2 emissions pe	er m²
El value	
El rating	
El band	

(273) 15.05 (273a) 87.96 88 (274) В

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13a. Primary energy

	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year)	
Space heating, main	3694.95	1.020	3768.85	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2193.23	1.020	2237.10	(264)
Space and water heating			6005.94	(265)
Electricity for pumps/fans	224.21	2.920	654.71	(267)
Electricity for lighting	307.77	2.920	898.68	(268)
Electricity generated - PV	-826.46	2.920	-2413.26	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			5146.07	(272)
Primary energy kWh/m²/year			77.15	(273)

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Project Information Building type Ground-floor flat

Ballanig type		iai	
Plot number Reference	2		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

Z. Vem	Παιιοπτά	ale									m ³ per h	our
							main + s heating	eondar	y + othe	er		
Numbe Numbe Numbe	r of chim r of open r of inter r of pass	i flues mittent fa ive vents	S				0 + 0 + 0 0 + 0 + 0 2 0		x 40 x 20 x 10 x 10		0.00 0.00 20.00 0.00	(6a) (6b) (7a) (7b)
Numbe	r of fluele	ess gas f	fires				0		x 40		0.00	(7c)
Pressur Air perr Numbe Shelter Infiltrati	on due to re test, re neability r of sides factor on rate in on rate n	esult q50 s on whic ncorpora) ch shelte ting she	red Iter facto	r				10.00		Air chan 0.11 0.61 2.00 0.85 0.52	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	/ average			n Table	7			_				
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind F	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)		-		13.53	(22a)
0.70	0.66	0.66	0.58	0.53	0.51	0.48	0.48	0.55	0.58	0.62	0.66	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.02	(22b)
0.75	0.72	0.72	0.67	0.64	0.63	0.62	0.62	0.65	0.67	0.69	0.72	(25)

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<i>3. Heat losses and heat I</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	loss paramete Openings m²	r Net are A, m² 14.82	W/	/alue m²K 5 (2.00)	A x U W/K 27.4	5			(27)
Solid door - Double-glazed air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	1,	1.850)	2.00	3.7	0			(26)
Walls Ground floors Party wall Party ceiling		74.57 66.70 23.80 66.70))	0.35 0.25 0.00 0.00	26.1 16.6 0.0 0.0	8 0			(29) (28)
Total area of external elem Fabric heat loss, W/K Heat capacity Thermal mass parameter, Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcul	kJ/m²K	m²						157.9 73.9 13622.0 250.0 17.3 91.3	3 (33) 0 (34) 0 (35) 7 (36)
44.32 42.75 42.75 3	39.86 38.14	37.34	36.57	36.57	38.55	39.86	41.26	42.75	(38)
Heat transfer coefficient, V	V/K								
135.62 134.05 134.05 1	131.16 129.44	128.64	127.87	127.87	129.85	131.16	132.56	134.05	_ /
Heat loss parameter (HLP)), W/m²K							131.3	6 (39)
2.03 2.01 2.01 1	1.97 1.94	1.93	1.92	1.92	1.95	1.97	1.99	2.01	
HLP (average) Number of days in month ((Table 1a)							1.9	7 (40)
Jan Feb Mar A	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 3	30 31	30	31	31	30	31	30	31	

SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	e r heating ed occupa average	ancy, N	•		oer dav V	/d avera	ne				kWh/yea 2.16 90.09
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	er usage		•	,		••••	1.0.9	COP	•••		200
99.09	95.49	91.89	88.28	84.68	81.08	81.08	84.68	88.28	91.89	95.49	99.09
Energy	content c	of hot wa	ter used	I	1	I				1	
147.31	128.83	132.95	115.90	111.21	95.97	88.93	102.05	103.27	120.35	131.37	142.66
	content (tion loss	annual)								1	1420.79
22.10	19.33 er storag	19.94	17.39	16.68	14.40	13.34	15.31	15.49	18.05	19.71	21.40 150.00
Volume	er cylinde factor	51 1055 14		n/uay)							0.0191 0.9283
Energy I	ature fac lost from orage los	hot wate	er cylinde	er (kWh/	day)						0.5400 1.44
Energy		hot wate	er cylinde	er (kWh/	day) 43.09	44.53	44.53	43.09	44.53	43.09	
Energy Total sto 44.53	lost from orage los	hot wate s 44.53				44.53	44.53	43.09	44.53	43.09	1.44
Energy Total sto 44.53	lost from orage los 40.22	hot wate s 44.53				44.53 44.53	44.53 44.53	43.09	44.53 44.53	43.09	1.44
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09 43.09	44.53	43.09						1.44 44.53
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09 43.09	44.53	43.09						1.44 44.53 44.53
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81	lost from prage los 40.22 age loss 40.22 circuit lo loss	hot wate s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28	43.09 43.09 aal) 50.14 ater heat 209.13	44.53 44.53 51.81 ing calcu 207.55	43.09 43.09 50.14 Jated for 189.20	44.53 51.81 each m 185.27	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28	43.09 43.09 aal) 50.14 ater heat 209.13	44.53 44.53 51.81 ing calcu 207.55	43.09 43.09 50.14 Jated for 189.20	44.53 51.81 each m 185.27	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64 Output f	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85	hot wate s 44.53 44.53 ss (annu 51.81 ed for wa 229.28 er heater	43.09 43.09 (al) 50.14 ater heat 209.13 for each	44.53 44.53 51.81 ing calcu 207.55 n month,	43.09 43.09 50.14 Jated for 189.20 kWh/mc	44.53 51.81 each m 185.27	44.53 51.81 onth	43.09 50.14 196.50	44.53 51.81 216.68	43.09 50.14	1.44 44.53 610.00 51.81 238.99 238.99
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64 Output f 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85 from wate	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28 er heater 229.28	43.09 43.09 al) 50.14 ater heat 209.13 for each 209.13	44.53 51.81 ing calcu 207.55 month, 207.55	43.09 43.09 50.14 Jlated for 189.20 kWh/mo 189.20	44.53 51.81 r each m 185.27 onth	44.53 51.81 onth 198.38	43.09 50.14 196.50	44.53 51.81 216.68	43.09 50.14 224.60	1.44 44.53 610.00 51.81 238.99

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5. Internal gains

	u gun										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts								•	
108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17
Lighting	gains			•							
28.72	25.51	20.74	15.70	11.74	9.91	10.71	13.92	18.68	23.72	27.69	29.52
Appliand	ces gains	3									
189.48		186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12
Cooking	gains										
33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82
Pumps	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54
Water h	eating ga	ains									
169.42	167.33	163.00	157.11	153.29	147.91	143.33	149.19	151.28	157.37	164.25	167.34
Total int	ernal gai	ns									
453.06	449.73	435.68	414.21	393.11	373.38	361.24	368.35	380.15	401.83	425.99	443.43

6. Solar gains (calculation for January)

e. Colar gams (calculation for bandary)	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)		9.87 0.72 x 0.70	0	102.8993	
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	0.9 x 1.850 0.0	00 0.72 x 0.70	0.77	0.0000	
Reference Door Total solar gains, January				102.90	(83-1)
Solar gains					
102.90 199.45 318.78 473.32 575.89 60	0.91 583.25 5	507.62 381.12 2	42.89 127.93	84.88	(83)
Total gains	i i		ı		
555.96 649.18 754.47 887.52 969.00 97	4.29 944.50 8	375.97 761.27 6	644.72 553.93	528.31	(84)
Lighting calculations					
	Area	g	FF x Shac	ling	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 14.83	0.80	0.70 x 0.8	3 6.20	
GL = 6.20 / 66.70 = 0.093					
C1 = 0.850 C2 = 0.960					
El = 507					

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7. Mean internal temperature

Temper	ature du system		ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau			•			•		•				
34.15	34.55	34.55	35.32	35.79	36.01	36.22	36.22	35.67	35.32	34.94	34.55	
alpha			•			•		•	•		<u> </u>	
3.28	3.30	3.30	3.35	3.39	3.40	3.41	3.41	3.38	3.35	3.33	3.30	
Utilisatio	on factor	for gains	s for livin	g area				•		•		
0.99	0.99	0.97	0.93	0.85	0.70	0.52	0.55	0.82	0.95	0.99	0.99	(86)
Mean in	ternal te	mperatu	re in livin	g area T	1			•				
18.95	19.17	19.57	20.04	20.53	20.83	20.96	20.95	20.70	20.11	19.40	19.01	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2	•				
19.32	19.33	19.33	19.36	19.38	19.39	19.40	19.40	19.38	19.36	19.35	19.33	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing			•		•		
0.99	0.98	0.96	0.91	0.78	0.58	0.33	0.36	0.71	0.93	0.98	0.99	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2		•				
17.55	17.77	18.17	18.64	19.09	19.32	19.39	19.39	19.23	18.72	18.01	17.61	(90)
	rea fracti ternal te				dwelling)					0.47	7 (91)
18.21	18.43	18.83	19.30	19.77	20.03	20.13	20.12	19.92	19.38	18.67	18.27	(92)
Apply ad	djustmen	t to the r	nean int	ernal ten	peratur	e, where	appropr	iate		•		
18.21	18.43	18.83	19.30	19.77	20.03	20.13	20.12	19.92	19.38	18.67	18.27	(93)

8. Space heating requirement

JanFebMarAprMayJunJulAugSepOctNovUtilisation factor for gains	Dec
Utilisation factor for gains	
0.99 0.98 0.96 0.91 0.80 0.63 0.42 0.45 0.76 0.93 0.9	0.99
Useful gains	
548.46 634.72 720.54 804.49 775.11 615.63 398.61 394.87 574.90 598.03 542	14 521.69
Monthly average external temperature	
4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.0	4.90
Heat loss rate for mean internal temperature	
1859.42 1800.04 1612.72 1389.82 1044.13 698.62 412.73 412.11 730.08 1124.73 154	6.48 1792.50
Space heating requirement for each month, kWh/month	·
975.35 783.10 663.78 421.44 200.15 391.86 723	13 945.48
Total space heating requirement per year (kWh/year) (October to May)	5104.2
Space heating requirement per m ² (kWh/m ² /year)	76.5

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9a. Energy requirements

Fractior	n of heat of spac		ondary s		(s)				0.1000 0.9000		kWh/year	(201) (202)
Efficien	cy of mai	in heating	g system		(0)			7	8.90% 00.00%			(206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	heating re	equireme	ent								11	
975.35	783.10	663.78	421.44	200.15	-	-	-	-	391.86	723.13	945.48	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)				11	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1]	
1112.57	893.27	757.17	480.73	228.31	-	-	-	-	446.99	824.86	1078.49	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ondary he	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)			•		1				
97.54	78.31	66.38	42.14	20.01	-	-	-	-	39.19	72.31	94.55	(215)
Water h												
	eating re			1	1	1		1				
	215.85			207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(64)
	cy of wat										68.80	(216)
76.46	76.27	75.81	74.99	73.15	68.80	68.80	68.80	68.80	74.73	76.04	76.44	(217)
	eating fu	-		1	1	1		1				
318.65	282.99	302.43	278.89	283.73	275.00	269.28	288.35	285.60	289.97	295.38	312.66	(219)
Space h Water h	neating fu neating fu neating fu	uel (seco iel	ndary)		on hot						kWh/year 5822.38 510.43 3482.93	(211) (215) (219)
centra boiler Total ele Electrici	ity for pur I heating with a far ectricity f ity for ligh saving/g	pump n-assiste or the ab nting (30	d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 507.17	(230c) (230e) (231) (232)
Energ	ly saved ly used ()		ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							10497.91	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission: kg CO2/ye	-
Space heating, main system 1	5822.38	0.194	1129.54	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	510.43	0.422	215.40	(263)
Water heating	3482.93	0.194	675.69	(264)
Space and water heating			2020.63	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	507.17	0.422	214.03	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2308.51	(272)
			kg/m²/yea	r
Emissions per m ² for space and water heating			31.40	(272a)
Emissions per m ² for lighting			3.21	(272b)
Emissions per m ² for pumps and fans			1.11	(272c)
Target Carbon Dioxide Emission Rate (TER)			21.59	(273)

= [(31.4015 x 1.0000 x 1.0206) + (3.2088 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Building type		iui	
Plot number Reference	2		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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	<i>3. Heat los</i> Element		n d heat Gross		r ameter enings	Net are	a II-	value	AxU	k	anna-valı	ιο Α x K	
air-filed (NorthEast) Window - Double-glazed, air-filed (NorthEast) Window - Double-glazed, air-filed (SouthEast) Window - Double-glazed, air-filed (NorthEast) Door Valis 77.90 Air filed (NorthEast) Door Total area of external elements Sigma A, m ² 57.94 157.94 163.07	Liement			•	Jiiiigo								
Window - Double-glazed, air-filled (NorthEast) 3.380 1.42 (1.50) 4.78 (27) Window - Double-glazed, window - Double-glazed, 0.680 1.42 (1.50) 0.96 (27) air-filled (SouthEast) Window - Double-glazed, 0.680 1.42 (1.50) 0.96 (27) window - Double-glazed, 0.510 1.42 (1.50) 0.511 (27) window - Double-glazed, 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, 1.280 1.42 (1.50) 1.81 (27) window GouthEast) Window (26) Double-glazed, air-filled (NorthEast) Window Southe-glazed, air-filled (NorthEast) (28) Party ceiling 66.70 0.00				,		2.480	0 1.4	42 (1.50)	3.5	1			(27)
Window - Double-glazed, air-filled (NorthEast) 3.380 1.42 (1.50) 4.78 (27) Window - Double-glazed, air-filled (SouthEast) 0.680 1.42 (1.50) 0.96 (27) Window - Double-glazed, air-filled (SouthEast) 2.480 1.42 (1.50) 3.51 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Vindow - Double-glazed, air-filled 0.510 1.42 (1.50) 0.72 (27) Vindow - Double-glazed, air-filled 0.510 1.50 3.03 (26) Door <t< td=""><td></td><td>orthEa</td><td>ast)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		orthEa	ast)										
bir-filled (NorthEast) Window - Double-glazed, 0.680 1.42 (1.50) 0.96 (27) air-filled (SouthEast) Window - Double-glazed, 2.480 1.42 (1.50) 3.51 (27) air-filled (NorthEast) Window - Double-glazed, 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window - Double-glazed, 0.510 1.42 (1.50) 1.81 (27) air-filled (SouthEast) Window - Double-glazed, 1.280 1.42 (1.50) 1.81 (27) air-filled (SouthEast) Door Full glazed door - 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) Door Total area of external elements Sigma A, m ² 15.7.94 (31) Fabric heat loss /// 49.76 (33) Heat capacity 14946.30 (34) Heat capacity 14946.30 (34) Heat capacity 14946.30 (34) Heat ranser coefficient N/K 103.17)ouble	-alazed			3 38(ר ר ר	12 (1 50)	47	8			(27)
Window - Double-glazed, air-filled (SouthEast) 0.680 1.42 (1.50) 0.96 (27) Window - Double-glazed, window - Double-glazed, air-filled (SouthEast) 2.480 1.42 (1.50) 3.51 (27) Window - Double-glazed, air-filled (SouthEast) 2.480 1.42 (1.50) 3.51 (27) Window - Double-glazed, air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) Window Window 0.510 1.42 (1.50) 0.72 (27) Window Double-glazed, air-filled (NorthEast) Window (27) (27) Window Double-glazed, air-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) Window Vindow Using a construction of the state of external elements Sigma A, m ² 1.50 3.03 (26) Door Vindow 128.0 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.00 13.34 110.00 7337.00 (28) Party weiling 66.70 0.00				,		5.500	5 1	+2 (1.50)	7.7	0			(27)
air-filled (SouthEast) Window - Double-glazed, 2.480 1.42 (1.50) 3.51 (27) air-filled (SouthEast) Window - Double-glazed, 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window - Double-glazed, 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window - Double-glazed, 1.280 1.42 (1.50) 1.81 (27) air-filled (SouthEast) Window - Double-glazed, air-filled (NorthEast) Door Walls 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 Party ceiling 66.70 0.00 180.00 4284.03 Party ceiling 66.70 0.00 1.00 180.00 4284.03 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Fabric heat loss, W/K 49.76 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Total fabric heat loss calculated monthly Ventilation heat loss calculated monthly 28.71 28.71 28.71 28.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 (39) Heat transfer coefficient, W/K 103.17 103													
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air-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window Window (27) Window - Double-glazed, air-filled (SouthEast) 1.280 1.42 (1.50) 1.81 (27) Window - Double-glazed, air-filled (SouthEast) 1.280 1.42 (1.50) 1.81 (27) Window Vindow 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) 0.02 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 (28) Party ceiling 66.70 0.00 0.00 30.00 2001.00 (31) Total area of external elements Sigma A, m ² 157.94 (31) 49.76 (33) Heat capacity 14946.30 (34) 14946.30 (34) Thermal mass parameter, KJ/m ² K 224.08 (35) Effect of thermal bridges 73.45 (37) Ventilation heat loss calculated monthly 103.17 103			,										
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Walls 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 (28) Party ceiling 66.70 0.00 0.00 180.00 4284.00 (28) Total area of external elements Sigma A, m2 157.94 (31) (31) (33) Heat capacity 49.76 (33) Heat capacity 14946.30 (34) 14946.30 (34) Thermal mass parameter, kJ/m2K 224.08 (35) (36) (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 29.71 (37) Ventilation heat loss calculated monthly 103.17													
Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 2011.00 157.94 (31) Fabric heat loss, W/K 49.76 (33) 49.76 (33) 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) 23.69 (36) 73.45 (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 31.7 103.1													
Party wall 23.80 0.00 0.00 180.00 4284.00 Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 23.71 29.71 38) Heat transfer coefficient, W/K 103.17 <													
Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 (38) Heat transfer coefficient, W/K 103.17		ors											
Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 39) Heat loss parameter (HLP), W/m ² K 1.55		a											
Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 29.71 38) Heat transfer coefficient, W/K 103.17 <td></td> <td>5</td> <td></td>		5											
Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17				ments S	igma A,	m²							
Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17			W/K										· · ·
Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 29.71 103.17 103.17 103.17 103.17 103.17 103.17			aramete	r. kJ/m²k	(· · ·
Ventilation heat loss calculated monthly 29.71<				.,									()
29.71 29.71 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>73.4</td><td>5 (37)</td></td<>												73.4	5 (37)
Heat transfer coefficient, W/K 103.17													()
103.17 103.17					29.71	29.71	29.71	29.71	29.71	29.71	29.71	29.71	(38)
103.17 (39) Heat loss parameter (HLP), W/m²K 1.55 1.5			-		1								
Heat loss parameter (HLP), W/m²K 1.55 <td>103.17 10</td> <td>3.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td></td> <td></td>	103.17 10	3.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17		
1.55 1.55	Heat loss p	aram	eter (HL	P), W/m²	²K							103.1	7 (39)
Number of days in month (Table 1a)JanFebMarAprMayJunJulAugSepOctNovDec	1.55 1.5	55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
Number of days in month (Table 1a)JanFebMarAprMayJunJulAugSepOctNovDec	HLP (avera	ge)			I	1	1	1	1	1	1		5 (40)
			in month	n (Table ⁻	1a)								. ,
31 28 31 30 31 30 31 31 30 31 30 31 30 31	Jan Fe	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	31 28	5	31	30	31	30	31	31	30	31	30	31	

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Assume	d occupa	ancy, N	/ <i>require</i> r usage i		oer day V	/d,averag	ge				kWh/year 2.16 85.58	(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres	per day f	or each	month	1	1	1		1		
94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14	(44
Energy of	content o	f hot wa	ter used	1	1				1		<u>. </u>	
139.94	122.39	126.30	110.11	105.65	91.17	84.48	96.95	98.10	114.33	124.80	135.52	
Energy o Distribut		annual)									1349.75	(45
20.99	18.36	18.94	16.52	15.85	13.68	12.67	14.54	14.72	17.15	18.72	20.33	(46
Hot wate Volume Tempera Energy le	factor ature fac	er loss fa tor store (k'	e (litres) actor (kW Wh/day)	(h/day)							0.00 0.0000 0.0000 0.0000 0.000	(50 (51 (52 (53 (55
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56
Net stora	age loss							•				
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57
Primary Primary	circuit lo loss	ss (annı	ial)								0.00	(58
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59
Combi lo	oss calcu	lated for	r each m	onth			•					
47.97	41.75	44.48	41.36	40.99	37.98	39.25	40.99	41.36	44.48	44.74	47.97	(61
Total he	at requir	ed for wa	ater heat	ing calcu	lated fo	r each m	onth					
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(62
Output fi	rom wate	er heater	for each	n month,	kWh/mo	onth						
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(64
			eating, k\								1863.10	(64
58.52	51.13	53.11	46.95	45.38	39.81	37.90	42.48	42.96	49.14	52.68	57.05	(65

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5. Internal gains

	5										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17
Lighting	gains		•								
17.43	15.48	12.59	9.53	7.12	6.01	6.50	8.45	11.34	14.40	16.80	17.91
Applianc	ces gains	5									
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12
Cooking	gains										
33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54
Water h	eating ga	ains									
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69
Total int	ernal gai	ns				•				•	
351.01	348.46	335.92	316.13	296.19	276.87	264.65	270.78	281.19	301.18	324.02	341.17

6. Solar gains (calculation for January)

or colar game (carcalation for canaary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 2.480 11.51	0.76 x 0.70	0.77	10.5236
Window - Double-glazed, air-filled (NorthEast) Window adjacent door	0.9 x 3.380 11.51	0.76 x 0.70	0.77	14.3426
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.480 37.39	0.76 x 0.70	0.77	34.1842
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.280 37.39	0.76 x 0.70	0.77	17.6434
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations	Area	g	FF x Shadi	ng

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Temper	n interna ature du system	ring hea	ting perio	ods in th	e living a	irea, Th1	(°C)				21.00 0.75	(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	•					•	•	•	•			
40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	
alpha	•					•	•	•	•			
3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	
Utilisatio	on factor	for gain	s for livin	g area								
0.99	0.99	0.98	0.94	0.86	0.71	0.53	0.57	0.84	0.96	0.99	1.00	(
Mean ir	iternal te	mperatu	re in livir	ig area 1	Γ1			-		-1		
19.59	19.73	20.00	20.29	20.62	20.82	20.90	20.89	20.73	20.33	19.86	19.61	(
Temper	ature du	ring hea	ting perio	ds in re	st of dwe	lling Th	2			1		
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(
Utilisatio	on factor	for gain	s for rest	of dwel	ling			1		1	11	
0.99	0.99	0.97	0.92	0.81	0.61	0.37	0.40	0.75	0.94	0.99	0.99	(
Mean ir	iternal te	mperatu	re in the	rest of c	welling ⁻	Г2	1		1	1		
18.39	18.53	18.80	19.08	19.38	19.53	19.58	19.58	19.48	19.13	18.66	18.41	(
	rea fract nternal te				dwelling)	1	-			0.47	(
18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(
Apply a	djustmer	t to the	mean int	ernal ter	nperatur	e, where	approp	riate	1	1		
18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(

8. Space heating requirement

	••	9.09	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	3								
0.99	0.98	0.97	0.92	0.82	0.65	0.44	0.47	0.78	0.94	0.99	0.99
Useful gains											
446.16	521.81	588.16	654.69	637.72	509.13	330.32	326.95	470.33	487.54	438.79	420.94
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
1491.32	1453.83	1296.06	1129.27	852.18	571.53	340.56	340.14	594.75	917.78	1261.02	1451.80
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
777.60 626.32 526.68 341.70 159.56 320.10 592.00 766.96											
	ace heat					ar) (Octo	ober to N	lay)			4110.9
Space h	leating re	equireme	ent per m	² (kWh/r	n²/year)						61.6

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	urement	[S								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system(s)				1.0000 4.80%		Ĩ	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	equireme	ent	1	1	1	1	1	1	1	<u> </u>	
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	(98)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1	<u> </u>	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1	1	1	1	ļ	
820.25	660.67	555.57	360.44	168.31	-	-	-	-	337.66	624.47	809.03	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)		1	1	· · · · · ·	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)	1	1	1	1		I	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	vstem)	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)		1	1	1		1	1	I	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h		1	1	1	1	1	1	1	1	1	ļ	
	-	equireme										
		170.78		146.65	129.15	123.73	137.94	139.46	158.81	169.54		(64)
Efficience	cy of wat	er heatei	r								80.20	(216)
88.14	88.00	87.60	86.94	85.16	80.20	80.20	80.20	80.20	86.68	87.84	88.16	(217)
Water h	eating fu	ıel										
213.20	186.53	194.96	174.23	172.20	161.04	154.28	171.99	173.89	183.22	193.01	208.15	(219)
Space h Water h	neating fu neating fu neating fu		ndary)		en-hot						kWh/year 4336.41 0.00 2186.70	(211) (215) (219)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)49.21 49.21 (23) 130.00 (23) boiler with a fan-assisted flue430.00 45.00 45.00 (23) 224.21 (23) 224.21 (23) 307.77 (23)										(230a) (230c) (230e) (231) (232)		
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	eneratior 175 x 961 100 x 0.01 100 x 0.01	.000 x 1 00 x 0.50	.000 00							826.460 0.000 0.000 826.460	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	5							6228.64	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy	Emission factor	Emission	
	kWh/year	kg CO2/kWh	kg CO2/ye	
Space heating, main system 1	4336.41	0.198	858.61	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2186.70	0.198	432.97	(264)
Space and water heating			1291.58	(265)
Electricity for pumps and fans	224.21	0.517	115.92	(267)
Electricity for lighting	307.77	0.517	159.12	(268)
Electricity generated - PVs	-826.46	0.529	-437.20	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				. ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1129.41	(272)
				. ,

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 16.93 (273)

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Project Information Building type Ground-floor flat

Plot number	3		
Reference			
Date	17 June 2016		
Client	Investland	Project	252 L on

2 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

1. Overall dwelling dimensions	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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3. Heat losses and heat lo	oss paramete	r					
Element Gross	Ópenings	Net area	U-value	AxU	kappa-value		
Area, m ²	m²	A, m ²	W/m²K	W/K 1.70	kJ/m²K	kJ/K	(07)
Window - Double-glazed, air-filled (NorthWest)		1.200	1.42 (1.50)	1.70			(27)
Window							
Window - Double-glazed,		0.680	1.42 (1.50)	0.96			(27)
air-filled (NorthWest)							
Window Window - Double-glazed,		1.370	1.42 (1.50)	1.94			(27)
air-filled (NorthWest)		1.370	1.42 (1.50)	1.94			(27)
Window							
Window - Double-glazed,		3.780	1.42 (1.50)	5.35			(27)
air-filled (NorthWest) Window							
Window - Double-glazed,		3.190	1.42 (1.50)	4.51			(27)
air-filled (NorthEast)							()
Window							(--)
Window - Double-glazed, air-filled (NorthEast)		3.090	1.42 (1.50)	4.37			(27)
Window							
Window - Double-glazed,		1.200	1.42 (1.50)	1.70			(27)
air-filled (SouthEast)							
Window Window Double glazed		1.080	1 40 (1 50)	1 50			(07)
Window - Double-glazed, air-filled (SouthEast)		1.000	1.42 (1.50)	1.53			(27)
Window							
Window - Double-glazed,		1.680	1.42 (1.50)	2.38			(27)
air-filled (SouthEast) Window							
Window - Double-glazed,		1.320	1.42 (1.50)	1.87			(27)
air-filled (SouthEast)							()
Window							(07)
Window - Double-glazed, air-filled (SouthEast)		0.680	1.42 (1.50)	0.96			(27)
Window							
Window - Double-glazed,		2.310	1.42 (1.50)	3.27			(27)
air-filled (SouthEast)							
Window Window - Double-glazed,		2.310	1.42 (1.50)	3.27			(27)
air-filled (SouthEast)		2.010	1.42 (1.50)	0.27			(27)
Window							
Full glazed door -		2.020	1.50	3.03			(26)
Double-glazed, air-filled (NorthEast)							
Door							
Walls		80.12	0.22	17.87		15222.80	(29)
Ground floors		83.30 7.30	0.20	16.66		9163.00	(28)
Party wall Party ceiling		7.30 83.30	0.00 0.00	0.00 0.00		511.00 2499.00	
				2.00			

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3. Heat losses and heat loss parameter												
Element		Gross	Ope	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W	′m²K	W/K	kJ	/m²K	kJ/K	
Fabric heat loss, W/K71.36Heat capacity27395.80Thermal mass parameter, kJ/m²K328.88Effect of thermal bridges28.40Total fabric heat loss99.76Ventilation heat loss calculated monthly												6 (33) 60 (34) 68 (35) 60 (36)
37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	(38)
Heat tra	nsfer co	efficient,	W/K									
136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	
Heat los	s param	eter (HL	P), W/m [;]	²K	•					•	136.8	37 (39)
1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	
HLP (average) 1.64 (40										64 (40)		
Number of days in month (Table 1a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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	<i>r heatin</i>		y require	ements							kWh/yea 2.52
	average		r usage	in litres p	oer day V	/d,avera	ge				94.11
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day t	for each	month						
103.52	99.76	95.99	92.23	88.46	84.70	84.70	88.46	92.23	95.99	99.76	103.52
Energy	content c	of hot wa	ter used								
153.88	134.59	138.88	121.08	116.18	100.26	92.90	106.61	107.88	125.72	137.24	149.03
Energy of Distribut	content (tion loss	annual)									1484.25
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35
Volume Tempera Energy I	er cylinde factor ature fac lost from prage los	tor store (k	·								0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stor	age loss							•			·
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annu	ial)			•				•	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi lo	oss calcı	lated for	r each m	onth							
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96
Total he	at requir	ed for wa	ater heat	ing calcı	ulated fo	r each m	ionth				
	180.50						151.69	153.36	174.64	186.43	199.99
Output f	rom wate										
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99
Heat ga	ins from	water he	eating, k	Nh/mont	h						2045.16
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29
L	1		1	1	1	1	1	1		1	

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5. Internal gains

	5										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35
Lighting	gains	•	•								
50.41	44.78	36.42	27.57	20.61	17.40	18.80	24.44	32.80	41.64	48.61	51.82
Applianc	es gains	5									
337.61	341.11	332.29	313.49	289.77	267.47	252.57	249.07	257.90	276.69	300.42	322.71
Cooking	gains										
52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66
Pumps a	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water heating gains											
85.90	83.67	78.51	71.71	67.07	60.80	56.02	62.79	65.61	72.62	80.46	83.73
Total int	ernal gai	ns									
587.03	582.67	560.31	525.88	490.55	458.78	440.50	449.40	469.41	504.07	542.59	571.36

6. Solar gains (calculation for January)

e. Colar game (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.200 11.51		0.54	3.5710
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 0.680 11.51	0.76 x 0.70	0.54	2.0236
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.370 11.51	0.76 x 0.70	0.54	4.0769
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 3.780 11.51	0.76 x 0.70	0.77	16.0399
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.190 11.51	0.76 x 0.70	0.77	13.5364
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.090 11.51	0.76 x 0.70	0.77	13.1120
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.200 37.39	0.76 x 0.70	0.77	16.5407
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.080 37.39	0.76 x 0.70	0.77	14.8867
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.680 37.39	0.76 x 0.70	0.77	23.1570

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6. Solar gains (calculation for January)			<u>.</u>	. .	
Window Davible algored air filled	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.320 37.39	0.76 x 0.70	0.77	18.1948	
Window					
Window - Double-glazed, air-filled	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731	
(SouthEast) Window					
Window - Double-glazed, air-filled	0.9 x 2.310 37.39	0.76 x 0.70	0.77	31.8409	
(SouthEast) Window					
Window Window - Double-glazed, air-filled	0.9 x 2.310 37.39	0 76 x 0 70	0.77	31.8409	
(SouthEast)	0.9 X 2.310 37.39	0.70 x 0.70	0.77	51.0409	
Window	0.0.4.0.000.11.51	0.70 × 0.70	0.77	0 5710	
Full glazed door - Double-glazed, air-filled (NorthEast)	0.9 x 2.020 11.51	0.76 X 0.70	0.77	8.5716	
Door					
Total solar gains, January				206.77	(83-1)
Solar gains					()
	64.90 932.17 810.	14 633.64 438	.95 251.74	174.18	(83)
Total gains	932.17 010.	14 000.04 400.	.95 251.74	174.10	(00)
793.79 955.97 1106.53 1288.46 1407.84 14	100 60 1070 60 1050		.02 794.33	745.54	(84)
793.79 933.97 1100.33 1288.40 1407.84 12	+23.00 1372.00 1238	.50 1105.00 945.	.02 794.33	745.54	(04)
Lighting calculations	Area	0	FF x Shadi	ina	
Window - Double-glazed, air-filled	0.9 x 1.20	g 0.80	0.70 x 0.67		
(NorthWest)	0.0 X 1.20	0.00	0.70 × 0.07	0.41	
Window					
Window - Double-glazed, air-filled	0.9 x 0.68	0.80	0.70 x 0.67	0.23	
(NorthWest)					
Window					
Window - Double-glazed, air-filled	0.9 x 1.37	0.80	0.70 x 0.67	0.46	
(NorthWest) Window					
Window Window - Double-glazed, air-filled	0.9 x 3.78	0.80	0.70 x 0.83	3 1.58	
(NorthWest)	0.0 × 0.70	0.00	0.70 × 0.00	, 1.00	
Window					
Window - Double-glazed, air-filled	0.9 x 3.19	0.80	0.70 x 0.83	3 1.33	
(NorthEast)					

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Window - Double-glazed, air-filled

Window - Double-glazed, air-filled

Window - Double-glazed, air-filled

Window - Double-glazed, air-filled

Window

(NorthEast) Window

(SouthEast) Window

(SouthEast) Window

(SouthEast) Window

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0.9 x 3.09

0.9 x 1.20

0.9 x 1.08

0.9 x 1.68

0.80

0.80

0.80

0.80

0.70 x 0.83

0.70 x 0.83

0.70 x 0.83

0.70 x 0.83

1.29

0.50

0.45

0.70

Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

Lighting calculations				
Window - Double-glazed, air-filled (SouthEast) Window	Area 0.9 x 1.32	g 0.80	FF x Shading 0.70 x 0.83	0.55
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.68	0.80	0.70 x 0.83	0.28
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31	0.80	0.70 x 0.83	0.97
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31	0.80	0.70 x 0.83	0.97
GL = 9.73 / 83.30 = 0.117 C1 = 0.500 C2 = 0.960 El = 356				

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) onoive ro

21.00 (85)

Heating	system	responsi	veness								0.7	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau			•	•				•				
55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	
alpha							•		•			
4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	
Utilisatio	on factor	for gains	s for livin	g area		•		•	•			
1.00	0.99	0.97	0.91	0.78	0.59	0.41	0.44	0.74	0.94	0.99	1.00	(86)
Mean in	ternal te	mperatu	re in livin	g area T	1			•			<u> </u>	
20.02	20.16	20.39	20.62	20.83	20.92	20.94	20.94	20.88	20.62	20.23	20.02	(87)
Temperature during heating periods in rest of dwelling Th2												
19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing			•		•		
0.99	0.98	0.95	0.88	0.70	0.47	0.27	0.29	0.62	0.91	0.99	0.99	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2		•				
18.72	18.86	19.09	19.30	19.47	19.52	19.53	19.53	19.51	19.31	18.94	18.73	(90)
	rea fracti ternal te				dwelling)					0.3	3 (91)
19.15	19.29	19.52	19.74	19.92	19.98	19.99	19.99	19.96	19.74	19.36	19.15	(92)
Apply ac	djustmen	t to the r	nean inte	ernal ten	peratur	e, where	appropr	iate	1	1	<u> </u>	
19.15	19.29	19.52	19.74	19.92	19.98	19.99	19.99	19.96	19.74	19.36	19.15	(93)

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8. Space heating requirement

		0 1									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	n factor	for gains	5								
0.99	0.98	0.95	0.88	0.72	0.51	0.31	0.33	0.66	0.91	0.98	0.99
Useful gains											
787.64	938.86	1054.87	1138.31	1016.12	720.40	422.35	421.77	724.16	861.10	782.17	740.54
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
2005.1	1955.80	1741.02	1510.94	1125.12	736.79	423.51	423.44	774.53	1224.11	1692.10	1951.01
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59
	ace heat					ar) (Octo	ober to N	lay)			4274.8
Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						51.3

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	uirement	[S								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system((s)				1.0000 3.30%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	equireme	ent		1	1			1	1		
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1		1	1		
970.85	732.46	547.16	287.56	86.91	-	-	-	-	289.47	702.20	965.26	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)		1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating			1	1	1	1			1		
Water h	eating re	equireme	nt									
			166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiend	cy of wat	er heater	r								80.20	(216)
88.25	87.98	87.34	86.14	83.32	80.20	80.20	80.20	80.20	86.04	87.85	88.28	(217)
Water h	eating fu	lel										
232.12	205.15	215.02	193.35	193.55	177.09	169.65	189.13	191.22	202.96	212.22	226.54	(219)
Space h Water h	neating fu neating fu neating fu	uel used, uel (seco uel mps, fan:	ndary)		ep-hot						kWh/year 4581.86 0.00 2408.01	(211) (215) (219)
mecha central boiler v Total ele Electrici	nical ver heating with a far ectricity f ty for ligh	ntilation -	balance d flue oove, kW 0.00% fix	d, extrac /h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.22	240)	61.46 130.00 45.00 236.46 356.13	(230a) (230c) (230e) (231) (232)
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							6759.85	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4581.859	3.100	142.04	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)́
Water heating cost	2408.01	3.100	74.65	(247)
Mech vent fans cost	61.463	11.460	7.04	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	356.134	11.460	40.81 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			296.33	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy cost factor (ECF)	1.09	(257)
SAP value	84.86	. ,
SAP rating	85	(258)
SAP band	В	

12a. Carbon dioxide emissions

El rating

El band

	Energy	Emission factor	Emission	-
.	kWh/year	kg CO2/kWh	kg CO2/ye	
Space heating, main system 1	4581.86	0.198	907.21	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2408.01	0.198	476.79	(264)
Space and water heating			1383.99	(265)
Electricity for pumps and fans	236.46	0.517	122.25	(267)
Electricity for lighting	356.13	0.517	184.12	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1255.20	(272)
			kg/m²/yea	
CO2 emissions per m ²			15.07	(273)
El value			86.89	(273a)

87

В

(274)

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13a. Primary energy

isa. Primary energy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year)
Space heating, main	4581.86	1.020	4673.50	<i>(</i> 261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2408.01	1.020	2456.17	(264)
Space and water heating			7129.66	(265)
Electricity for pumps/fans	236.46	2.920	690.47	(267)
Electricity for lighting	356.13	2.920	1039.91	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - μ CHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			6458.01	(272)
Primary energy kWh/m²/year			77.53	(273)

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Project Information Building type Ground-floor flat

Duliding type		ιαι	
Plot number Reference	3		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

2. vem	Παιιοπτά	ale									m ³ per l	nour
							main + s heating	eondar	y + othe	er		
Numbe Numbe	r of chim r of open r of inten r of pass	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 3 0		x 40 x 20 x 10 x 10		0.00 0.00 30.00 0.00	(6b) (7a)
	r of fluele						0		x 40		0.00	(7c)
Pressur Air perr Numbe Shelter Infiltration	on due to re test, re neability r of sides factor on rate in on rate n	esult q50 s on whic ncorpora) ch shelte ting shel	red Iter facto	r				10.00		Air char 0.13 0.63 2.00 0.85 0.54	(17) (18) (19) (20)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	v average	e wind sp	peed fror	n Table	7							
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	tion rate	(allowing	g for she	Iter and	wind sp	eed)				13.53	(22a)
0.73	0.69	0.69	0.61	0.55	0.52	0.50	0.50	0.57	0.61	0.65	0.69	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.28	(22b)
0.76	0.74	0.74	0.68	0.65	0.64	0.62	0.62	0.66	0.68	0.71	0.74	(25)

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<i>3. Heat losses and heat los</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	ss parameter Openings m²	Net are A, m² 18.97	W/	/alue m²K 5 (2.00)	A x U W/K 35.1	4			(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.850)	2.00	3.7	0			(26)
Walls Ground floors Party wall Party ceiling		85.20 83.30 7.30 83.30)	0.35 0.25 0.00 0.00	29.8 20.8 0.0 0.0	2 0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						189.3 89.4 12173.0 250.0 20.8 110.3	9 (33) 0 (34) 0 (35) 3 (36)
56.71 54.60 54.60 50).72 48.41	47.34	46.31	46.31	48.97	50.72	52.60	54.60	(38)
Heat transfer coefficient, W/	· · · · · · · · · · · · · · · · · · ·								
167.03 164.91 164.91 16	61.04 158.72	157.65	156.63	156.63	159.28	161.04	162.91	164.91	
Heat loss parameter (HLP),	W/m²K							161.3	0 (39)
2.01 1.98 1.98 1.9	93 1.91	1.89	1.88	1.88	1.91	1.93	1.96	1.98	
HLP (average) Number of days in month (T	able 1a)							1.9	4 (40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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	<i>r heating</i> d occupa		/ require	ements							kWh/year 2.52
Annual a	average	hot wate	r usage i	in litres p	oer day V	d,avera	ge				99.06
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month		•	•			
108.97	105.01	101.04	97.08	93.12	89.16	89.16	93.12	97.08	101.04	105.01	108.97
Energy	content c	of hot wa	ter used								
161.98	141.67	146.19	127.45	122.30	105.53	97.79	112.22	113.56	132.34	144.46	156.87
	content (tion loss	annual)	-						-		1562.37
24.30	21.25 er storag	21.93	19.12	18.34	15.83	14.67	16.83	17.03	19.85	21.67	23.53 150.00
Hot wate Volume	er cylinde factor ature fac	er loss fa tor	ctor (kŴ	•	dev ()						0.0191 0.9283 0.5400
	brage los				uay)						1.44
			43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	1.44
Total sto 44.53	orage los	s 44.53				44.53	44.53	43.09	44.53	43.09	
Total sto 44.53	orage los 40.22	s 44.53				44.53 44.53	44.53	43.09	44.53 44.53	43.09	
Total sto 44.53 Net stor 44.53 Primary	40.22 age loss 40.22 circuit lo	s 44.53 44.53	43.09	44.53	43.09			I			44.53
Total sto 44.53 Net stor 44.53 Primary Primary 51.81	age los 40.22 age loss 40.22 circuit lo loss 46.79	s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	I			44.53 44.53
Total sto 44.53 Net stor 44.53 Primary Primary 51.81	age loss 40.22 age loss 40.22 circuit lo loss	s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	44.53 44.53 610.00
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he	age los 40.22 age loss 40.22 circuit lo loss 46.79	s 44.53 44.53 ss (annu 51.81 ed for wa	43.09 43.09 (al) 50.14 ater heat	44.53 44.53 51.81 ing calcu	43.09 43.09 50.14 ulated fo	44.53 51.81 r each m	44.53 51.81	43.09	44.53	43.09	44.53 44.53 610.00
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32	age los 40.22 age loss 40.22 circuit lo loss 46.79 at requir	s 44.53 44.53 ss (annu 51.81 ed for wa 242.53	43.09 43.09 aal) 50.14 ater heat 220.68	44.53 44.53 51.81 ing calcu 218.63	43.09 43.09 50.14 Jated for 198.76	44.53 51.81 r each m 194.13	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	44.53 44.53 610.00 51.81
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32 Output f	age loss 40.22 40.22 circuit lo loss 46.79 at requir 228.69	s 44.53 44.53 ss (annu 51.81 ed for wa 242.53 er heater	43.09 43.09 (al) 50.14 ater heat 220.68 c for each	44.53 44.53 51.81 ing calcu 218.63 n month,	43.09 43.09 50.14 Jated for 198.76 kWh/mo	44.53 51.81 r each m 194.13 onth	44.53 51.81 onth	43.09 50.14 206.79	44.53 51.81 228.68	43.09 50.14	44.53 610.00 51.81 253.21
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32 Output f 258.32	40.22 age loss 40.22 circuit lo loss 46.79 at requir 228.69 rom wate	44.53 44.53 ss (annu 51.81 ed for wa 242.53 er heater 242.53	43.09 43.09 al) 50.14 ater heat 220.68 for each 220.68	44.53 51.81 ing calcu 218.63 month, 218.63	43.09 43.09 50.14 Jlated for 198.76 kWh/mc 198.76	44.53 51.81 r each m 194.13 onth	44.53 51.81 onth 208.55	43.09 50.14 206.79	44.53 51.81 228.68	43.09 50.14 237.69	44.53 610.00 51.81 253.21

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13
Lighting	gains	•	•			•				•	
34.28	30.45	24.76	18.75	14.01	11.83	12.78	16.62	22.30	28.32	33.05	35.23
Applianc	ces gains	5									
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22
Cooking	gains										
35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration ((negative	e values)							
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water h	eating ga	ains									
175.98	173.69	168.92	162.45	158.24	152.32	147.29	153.74	156.03	162.73	170.30	173.70
Total int	ernal gai	ns									
507.30	503.52	487.15	462.07	437.24	414.20	400.14	408.07	421.96	447.27	475.47	495.99
	•	•	•	•	•	•	•	•	•	•	

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 18.975 19.87	g & FF 7 0.72 x 0.70	Shading 0.77	Gains 131.7042
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
<i>Lighting calculations</i> Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area 0.9 x 18.97	g 0.80	FF x Shadir 0.70 x 0.83	ng 7.94

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7. Mean internal temperature

Temper	ature dui system	ring heat	ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau					1	1			1			
34.63	35.08	35.08	35.92	36.45	36.69	36.93	36.93	36.32	35.92	35.51	35.08	
alpha								4	•			
3.31	3.34	3.34	3.39	3.43	3.45	3.46	3.46	3.42	3.39	3.37	3.34	
Utilisatio	on factor	for gains	for livin	g area			•					
0.99	0.99	0.97	0.94	0.85	0.71	0.52	0.56	0.83	0.96	0.99	0.99	(86)
Mean in	ternal ter	mperatu	re in livin	g area T	1							
18.93	19.15	19.56	20.04	20.53	20.83	20.96	20.95	20.69	20.10	19.38	18.99	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2					
19.34	19.35	19.35	19.38	19.40	19.41	19.42	19.42	19.40	19.38	19.37	19.35	(88)
Utilisatio	on factor	for gains	for rest	of dwell	ing							
0.99	0.98	0.96	0.91	0.79	0.58	0.34	0.37	0.73	0.94	0.99	0.99	(89)
Mean in	ternal tei	mperatu	re in the	rest of d	welling T	2						
17.54	17.77	18.17	18.65	19.11	19.34	19.41	19.41	19.25	18.72	18.01	17.61	(90)
	rea fracti ternal tei				dwelling))					0.33	(91)
18.00	18.22	18.63	19.11	19.58	19.84	19.92	19.92	19.73	19.18	18.46	18.06	(92)
Apply ac	djustmen	t to the r	nean inte	ernal ten	perature	e, where	appropr	iate	•			
18.00	18.22	18.63	19.11	19.58	19.84	19.92	19.92	19.73	19.18	18.46	18.06	(93)

8. Space heating requirement

	e. epae	0	9.094	••••••								
0.99 0.98 0.96 0.91 0.80 0.62 0.40 0.43 0.75 0.93 0.98 0.99 Useful gains 631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	Utilisatio	Jtilisation factor for gains										
631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	0.99	0.98	0.96	0.91	0.80	0.62	0.40	0.43	0.75	0.93	0.98	0.99
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	Useful g	ains										
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	631.91	744.07	857.96	970.57	937.08	735.00	460.35	456.40	685.59	707.12	627.72	598.49
Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	Monthly	average	externa	tempera	ature							
2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month1207.15 965.42 813.15 507.90 233.27477.37 892.33 1169.69Total space heating requirement per year (kWh/year) (October to May)6266.2	Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•				
1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.21 6266.21 6266.21	2254.4	2180.7	1950.90	1675.98	1250.61	825.34	473.63	472.97	864.31	1348.75	1867.07	2170.7
Total space heating requirement per year (kWh/year) (October to May) 6266.2	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
	1207.15	965.42	813.15	507.90	233.27	-	-	-	-	477.37	892.33	1169.69
Space heating requirement per m ² (kWh/m ² /year) 75.23							ear) (Octo	ober to N	lay)	•	•	
	Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						75.23

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9a. Energy requirements

9a. Energy requirements Fraction of heat from secondary system0.1000Fraction of space heat from main system(s)0.9000Efficiency of main heating system78.90%Efficiency of secondary heating system100.00%							kWh/year	(201) (202) (206) (208)				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	-	equireme										
		813.15		233.27		-	-	-	477.37	892.33	1169.69	(98)
	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)				·,	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1376.98	8 1101.24	927.55	579.35	266.08	-	-	-	-	544.52	1017.86	1334.25	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)						I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	stem)				I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
120.72	96.54	81.32	50.79	23.33	-	-	-	-	47.74	89.23	116.97	(215)
Water h	eating											
Water h	eating re	equireme	ent									
258.32	228.69	242.53	220.68	218.63	198.76	194.13	208.55	206.79	228.68	237.69	253.21	(64)
Efficiend	cy of wat	er heate	r	1				l	1		68.80	(216)
76.74	76.56	76.12	75.30	73.40	68.80	68.80	68.80	68.80	75.07	76.34	76.72	(217)
Water h	eating fu	lel		1				1	1		11	
336.64	298.71	318.62	293.07	297.85	288.90	282.16	303.13	300.56	304.61	311.35	330.06	(219)
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel							kWh/year 7147.83 626.63 3665.65	(211) (215) (219)				
Electricity for pumps, fans and electric keep-hot central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (30.00% fixed LEL) Energy saving/generation technologies Appendix Q -						130.00 45.00 175.00 605.43	(230c) (230e) (231) (232)					
Energy saved or generated (): Energy used ():							0.000 0.000	(236a) (237a)				
Total de	elivered e	energy fo	r all uses	6							12220.54	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/ye	
Space heating, main system 1	7147.83	0.194	1386.68	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	626.63	0.422	264.44	(263)
Water heating	3665.65	0.194	711.14	(264)
Space and water heating			2362.25	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	605.43	0.422	255.49	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2691.59	(272)
			kg/m²/year	
Emissions per m ² for space and water heating			29.24	(272a)
Emissions per m ² for lighting			3.07	(272b)
Emissions per m ² for pumps and fans			0.89	(272c)

20.16

(273)

Target Carbon Dioxide Emission Rate (TER) = [(29.2449 x 1.0000 x 1.0206) + (3.0671 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Building type		iui	
Plot number Reference	3		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat losses and heat le</i> Element Gross	o ss paramete Openings	r Net area	U-value	AxU	kappa-value.	AxK	
area, m ² Window - Double-glazed, air-filled (SouthEast)	m²	A, m ² 2.310	W/m²K 1.42 (1.50)	W/K 3.27		kJ/K	(27)
Window Window - Double-glazed,		2.310	1.42 (1.50)	3.27			(27)
air-filled (SouthEast) Window Window - Double-glazed,		0.680	1.42 (1.50)	0.96			(27)
air-filled (SouthEast) Window		0.000	1.42 (1.50)	0.90			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.320	1.42 (1.50)	1.87			(27)
Window - Double-glazed, air-filled (SouthEast)		1.680	1.42 (1.50)	2.38			(27)
Window Window - Double-glazed, air-filled (SouthEast)		1.080	1.42 (1.50)	1.53			(27)
Window Window - Double-glazed, air-filled (SouthEast)		1.200	1.42 (1.50)	1.70			(27)
Window Window - Double-glazed, air-filled (NorthEast)		3.090	1.42 (1.50)	4.37			(27)
Window Window - Double-glazed, air-filled (NorthEast)		3.190	1.42 (1.50)	4.51			(27)
Window Window - Double-glazed,		3.780	1.42 (1.50)	5.35			(27)
air-filled (NorthWest) Window Window - Double-glazed,		1.370	1.42 (1.50)	1.94			(27)
air-filled (NorthWest) Window				0.00			
Window - Double-glazed, air-filled (NorthWest) Window		0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled (NorthWest) Window		1.200	1.42 (1.50)	1.70			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door		2.020	1.50	3.03			(26)
Walls Ground floors		80.12 83.30	0.22 0.20	17.87 16.66	110.00	15222.80 9163.00	(29) (28)
Party wall Party ceiling		7.30 83.30	0.00 0.00	0.00 0.00		511.00 2499.00	

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3. Heat losses and heat loss parameter												
Element	Ī	Gross	Öpe	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W/	′m²K	W/K	kJ	/m²K	kJ/K	
Fabric h Heat cap Thermal Effect of Total fat	eat loss, pacity I mass p f thermal pric heat	aramete bridges	r, kJ/m²k	ζ	m²						189.3 71.3 27395.8 328.8 28.4 99.7	36 (33) 30 (34) 38 (35) 40 (36)
37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	(38)
Heat tra	nsfer co	efficient,	W/K									
136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	
Heat los	s param	eter (HL	P), W/m [;]	²K							136.8	37 (39)
1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	
HLP (av							1				1.6	64 (40)
Number		in month	(Table	1a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	d occupa	ancy, N	y require r usage i		oer day V	/d,avera	ge				kWh/year 2.52 94.11	(4) (4)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot wate	er usage	in litres	per day f	or each	month		1	1		1		
103.52	99.76	95.99	92.23	88.46	84.70	84.70	88.46	92.23	95.99	99.76	103.52	(4-
Energy o	content o	f hot wa	ter used	1	1			l	1	I	·]	
153.88	134.59	138.88	121.08	116.18	100.26	92.90	106.61	107.88	125.72	137.24	149.03	
	content (ion loss	annual)									1484.25	(4
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(4
	er storag		e (litres) ctor (kW	(h/dov)						•	0.00	(5 (5
olume		1055 18		n/uay)							0.0000	(5
	ature fac	tor									0.0000	(5
	ost from orage los		Wh/day)								0.00	Ì5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
let stora	age loss		1						•	•		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Primary Primary	circuit lo loss	ss (annu	ial)								0.00	(5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Combi lo	oss calcu	lated for	r each m	onth								
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(6
Fotal he	at requir	ed for wa	ater heat	ing calcı	lated fo	r each m	onth					
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth						
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(6
											2045.16	(6
			ating, kV					L		I		
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(6

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts								•	
126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13
Lighting	gains	•	•			•				•	
20.17	17.91	14.57	11.03	8.24	6.96	7.52	9.77	13.12	16.66	19.44	20.73
Appliance	ces gains	3									
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22
Cooking	gains										
35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water h	eating ga	ains									
85.90	83.67	78.51	71.71	67.07	60.80	56.02	62.79	65.61	72.62	80.46	83.73
Total internal gains											
403.10	400.97	386.54	363.61	340.29	317.80	303.60	310.28	322.36	345.50	372.02	391.51
			•							•	

6. Solar gains (calculation for January)

e. Colar gams (calculation for calculary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.310 37.39		0.77	31.8409
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.310 37.39	0.76 x 0.70	0.77	31.8409
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.320 37.39	0.76 x 0.70	0.77	18.1948
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.680 37.39	0.76 x 0.70	0.77	23.1570
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.080 37.39	0.76 x 0.70	0.77	14.8867
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.200 37.39	0.76 x 0.70	0.77	16.5407
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.090 11.51	0.76 x 0.70	0.77	13.1120
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.190 11.51	0.76 x 0.70	0.77	13.5364

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6. Solar gains (calculation for January)				
Window - Double-glazed, air-filled	Area & Flux 0.9 x 3.780 11.51	g & FF 0.76 x 0.70	Shading 0.77	Gains 16.0399
(NorthWest) Window				
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.370 11.51	0.76 x 0.70	0.54	4.0769
Window - Double-glazed, air-filled (NorthWest)	0.9 x 0.680 11.51	0.76 x 0.70	0.54	2.0236
Window Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.200 11.51	0.76 x 0.70	0.54	3.5710
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations				
Window Double glazed air filled	Area	g	FF x Shadi	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31	0.80	0.70 x 0.83	8 0.97
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31	0.80	0.70 x 0.83	8 0.97
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.68	0.80	0.70 x 0.83	8 0.28
Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.32	0.80	0.70 x 0.83	8 0.55
Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.68	0.80	0.70 x 0.83	3 0.70
Window Window - Double-glazed, air-filled	0.9 x 1.08	0.80	0.70 x 0.83	0.45
(SouthEast) Window	0.5 × 1.00	0.00	0.70 × 0.00	, 0.40
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.20	0.80	0.70 x 0.83	8 0.50
Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.09	0.80	0.70 x 0.83	3 1.29
Window Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.19	0.80	0.70 x 0.83	3 1.33
Window Window - Double-glazed, air-filled (NorthWest)	0.9 x 3.78	0.80	0.70 x 0.83	3 1.58
Window Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.37	0.80	0.70 x 0.67	0.46

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Lighting calculations				
Window - Double-glazed, air-filled	Area 0.9 x 0.68	g 0.80	FF x Shading 0.70 x 0.67	0.23
(NorthWest) Window				
Window - Double-glazed, air-filled (NorthWest)	0.9 x 1.20	0.80	0.70 x 0.67	0.41
Window				

21.00

0.75

(85)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)

Heating system responsiveness

rieating	System	responsi	1033								0.75
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60
alpha											
4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71
Utilisatio	on factor	for gains	s for livin	g area				•			
1.00	1.00	0.98	0.94	0.83	0.64	0.45	0.49	0.81	0.97	1.00	1.00
Mean in	iternal te	mperatu	re in livin	g area T	1			•			
19.90	20.05	20.29	20.55	20.80	20.91	20.94	20.94	20.85	20.54	20.12	19.91
Temper	ature du	ring heat	ting peric	ds in res	st of dwe	illing Th2	2				
19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59
Utilisatio	on factor	for gains	s for rest	of dwell	ing						
1.00	0.99	0.98	0.92	0.76	0.52	0.30	0.33	0.69	0.95	0.99	1.00
Mean in	iternal te	mperatu	re in the	rest of d	welling T	2					
18.61	18.75	19.00	19.24	19.45	19.52	19.53	19.53	19.49	19.24	18.83	18.62
	rea fracti										0.33
Mean in	iternal te	mperatu	re (for th	e whole	dwelling)				.	
19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04
Apply a	djustmen	it to the r	mean int	ernal ten	nperatur	e, where	appropr	iate			
19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	5		•						
1.00	0.99	0.97	0.92	0.77	0.56	0.34	0.38	0.73	0.95	0.99	1.00
Useful g	ains	•	•								
608.24	768.08	908.47	1036.10	973.94	712.05	421.61	420.58	694.88	745.70	620.02	564.46
Monthly	average	externa	Itempera	ature			•				
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
1989.54	1940.90	1728.16	1501.95	1121.46	736.03	423.42	423.29	771.96	1213.96	1677.98	1935.73
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
1027.68	788.14	609.85	335.41	109.76	-	-	-	-	348.38	761.73	1020.22
Total space heating requirement per year (kWh/year) (October to May)5001.16Space heating requirement per m² (kWh/m²/year)60.04											
Space h	leating re	equireme	ent per m	² (kWh/r	n²/year)						60.04

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8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Energy requirements ki	Wh/year
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.30%	(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	C
Space heating requirement	
1027.68 788.14 609.85 335.41 109.76 348.38 761.73 102	20.22 (98)
Appendix Q - monthly energy saved (main heating system 1)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (210)
Space heating fuel (main heating system 1)	
1101.48 844.73 653.64 359.49 117.64 373.40 816.43 109	93.49 (211)
Appendix Q - monthly energy saved (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (212)
Space heating fuel (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (213)
Appendix Q - monthly energy saved (secondary heating system)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (214)
Space heating fuel (secondary)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (215)
Water heating	
Water heating requirement	
	9.99 (64)
Efficiency of water heater	80.20 (216)
88.45 88.23 87.70 86.68 84.01 80.20 80.20 80.20 86.66 88.12 88.	.47 (217)
Water heating fuel	
231.60 204.58 214.14 192.16 191.97 177.09 169.65 189.13 191.22 201.53 211.57 226	6.04 (219)
Space heating fuel used, main system 1 53 Space heating fuel (secondary)	Wh/year 360.30 (211) 0.00 (215) 400.69 (219)
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year	61.46(230a)130.00(230c)45.00(230e)236.46(231)356.13(232)
PVs 0.80 x 1.070 x 961.000 x 1.000 82 PVs 0.80 x 0.000 x 0.000 x 0.500 82 PVs 0.80 x 0.000 x 0.000 x 0.500 82 82 82 82 82 83 82 84 82 85 82 86 82 86 82 86 82 86 82 82 82 82 82 82 82 83 82 84 82 85 82 86 82 86 82 82 82 83 82 84 82 85 82 85 82 86 82 86 82 86 82 87 82 88 82 88 82 82 82 83 82 84 82 84 84 <t< td=""><td>22.616 0.000 0.000 22.616 (233)</td></t<>	22.616 0.000 0.000 22.616 (233)
Appendix Q - Energy saved or generated (): Energy used ():	0.000 (236a) 0.000 (237a)
Total delivered energy for all uses75	530.97 (238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

Energy	Emission factor	Emission	s
kWh/year	kg CO2/kWh		
5360.30	0.198	1061.34	(261)
0.00	0.000	0.00	(262)
0.00	0.517	0.00	(263)
2400.69	0.198	475.34	(264)
		1536.68	(265)
236.46	0.517	122.25	(267)
356.13	0.517	184.12	(268)
-822.62	0.529	-435.16	(269)
0.00	0.000	0.00	(269)
			· · ·
0.00	0.000	0.00	(270)
0.00	0.000	0.00	(271)
		1407.89	(272)
			. ,
	5360.30 0.00 2400.69 236.46 356.13 -822.62 0.00 0.00	kWh/year kg CO2/kWh 5360.30 0.198 0.00 0.000 0.00 0.517 2400.69 0.198 236.46 0.517 356.13 0.517 -822.62 0.529 0.00 0.000 0.00 0.000	kWh/year kg CO2/kWh kg CO2/ye 5360.30 0.198 1061.34 0.00 0.000 0.00 0.00 0.517 0.00 2400.69 0.198 475.34 1536.68 236.46 0.517 122.25 356.13 0.517 184.12 -822.62 0.529 -435.16 0.00 0.000 0.00 0.00 0.000 0.00

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 16.90 (273)

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Project Information Building type Ground-floor flat

Plot number	4		
Reference			
Date	17 June 2016		
Client	Investland	Project	25: L o

52 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

Z. Vent		ale									m ³ pe	r ho ı	ır
							main + s heating	eondar	y + othe	r			
Number Number Number	r of chim r of open r of intern r of pass r of fluele	flues nittent fa ive vents	5				$ \begin{array}{c} 0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} $	> > >	 40 20 10 10 40 		0.0 0.0 0.0 0.0 0.0)0)0)0	(6a) (6b) (7a) (7b) (7c)
Pressur Air pern Number Shelter Infiltratio	on due to re test, re neability r of sides factor on rate ir on rate n	esult q50 s on whic ncorpora	h shelte	red ter facto	r				4.00		Air ch 0.0 2.0 0.8 0.1	20 20 00 35	es per hour (8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly	vaverage	wind sp	eed fron	n Table 7	7	1							
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10		
Wind Fa	actor		1						-		54.1	0	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	1	
Adjuste	d infiltrat	ion rate	(allowing	for she	ter and v	vind spe	eed)				13.5	53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22		
efficie Ventilat	ange rate ency in % ion : bala e air cha	allowing	for in-u			ith heat	0.50 64.40 recovery				2.3	30	(22b) (23a) (23c)
0.41	0.39	0.39	0.37	0.35	0.34	0.34	0.34	0.36	0.37	0.38	0.39		(25)

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<i>3. Heat</i> Element		and hea Gross	Ópe	a ramete i enings	Net are		-value	AxU		appa-val		
	(SouthE	area, m ^a e-glazed East)			A, m² 0.34		//m²K .42 (1.50)	W/K 0.4		J/m²K	kJ/K	(27)
Window	· - Doubl (SouthE	e-glazed East)	,		0.61	01	.42 (1.50)	0.8	86			(27)
Window	· - Doubl (SouthE	e-glazed East)	,		0.61	01	.42 (1.50)	0.8	86			(27)
	(SouthV	e-glazed Vest)	,		2.14	01	.42 (1.50)	3.0)3			(27)
	(SouthV	e-glazed Vest)	,		2.46	01	.42 (1.50)	3.4	8			(27)
	zed door glazed, a Vest)				2.020	D	1.50	3.0)3			(26)
Walls Ground Party wa Party ce	all				36.60 41.74 30.50 41.74	4 0	0.22 0.20 0.00 0.00	8.1 8.3 0.0 0.0	85 00	190.00 110.00 70.00 100.00	6954.0 4591.4 2135.0 4174.0	0 (28) 0
Fabric h Heat ca Therma Effect of Total fal	leat loss pacity I mass p f therma bric heat	aramete I bridges	r, kJ/m²ł	<	m²						86.5 28.2 17854.4 427.7 12.9 41.2	6 (33) 0 (34) 5 (35) 8 (36)
15.16	14.68	14.68	13.73	13.10	12.78	12.47	12.47	13.26	13.73	14.21	14.68	(38)
		efficient,			1				1			
56.39	55.92	55.92	54.97	54.34	54.02	53.70	53.70	54.49	54.97	55.44	55.92	0 (00)
Heat los	s param	eter (HL	P), W/m	²K							54.9	8 (39)
1.35	1.34	1.34	1.32	1.30	1.29	1.29	1.29	1.31	1.32	1.33	1.34	
HLP (av Number		in month	n (Table	1a)							1.3	2 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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4. Wate Assume Annual a	d occupa	ancy, N	-		oer dav ∖	/d.avera	ae				kWh/year 1.45 68.72
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month						1
75.59	72.84	70.09	67.34	64.59	61.84	61.84	64.59	67.34	70.09	72.84	75.59
Energy of	content o	of hot wa	ter used	1	1	1	1		1	1	11
112.36	98.27	101.41	88.41	84.83	73.20	67.83	77.84	78.77	91.80	100.21	108.82
Energy of Distribut		annual)									1083.76
16.85 Hot wate	14.74	15.21	13.26	12.72	10.98	10.18	11.68	11.82	13.77	15.03	16.32
Hot wate Volume Tempera Energy I Total sto	factor ature fac ost from	tor store (k	·	/h/day)							0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stora	age loss	1	1	1			1		1		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annı	ial)								0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	oss calcu		r each m		-						
38.52	33.53	35.72	33.21	32.92	30.50	31.52	32.92	33.21	35.72	35.92	38.52
			ater heat					-			1
			121.62		103.70		110.76	111.98	127.52	136.13	147.34
Output f			for each								
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	
Heat gai	ins from	water he	ating, k\	Nh/mont	h						1495.94
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20
Lighting	gains										
29.77	26.44	21.51	16.28	12.17	10.27	11.10	14.43	19.37	24.59	28.70	30.60
Appliand	ces gains	5									
187.96	189.91	185.00	174.53	161.32	148.91	140.62	138.67	143.58	154.04	167.25	179.67
Cooking	gains										
45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•				
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains									
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57
Total int	ernal gai	ns								•	
365.13	361.69	348.06	327.41	306.71	287.82	276.86	283.18	295.10	315.90	338.94	356.08

6. Solar gains (calculation for January)

o. Solar gains (calculation for bandary)	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.340 37.39	0.76 x 0.70	0.77	4.6865	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082	
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.140 37.39	0.76 x 0.70	0.77	29.4976	
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.460 37.39	0.76 x 0.70	0.77	33.9085	
Full glazed door - Double-glazed, air-filled (SouthWest) Door	0.9 x 2.020 37.39	0.76 x 0.70	0.77	27.8436	
Total solar gains, January				112.75 (8	33-1)
Solar gains					
112.75 192.21 253.98 312.10 341.80 3	46.95 340.15 317.	68 280.16 218	.23 135.18	96.35 (8	33)
Total gains					
477.88 553.90 602.04 639.51 648.50 6	34.77 617.01 600.	87 575.25 534	.13 474.13	452.43 (8	34)

Lighting calculations

Area

g

FF x Shading

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)	
Heating system responsiveness	

21.00 (85)

lon											0.75	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau			•	•								
87.95	88.70	88.70	90.23	91.28	91.81	92.35	92.35	91.01	90.23	89.46	88.70	
alpha												
6.86	6.91	6.91	7.02	7.09	7.12	7.16	7.16	7.07	7.02	6.96	6.91	
Utilisation	n factor	for gains	for livin	g area								
0.99	0.99	0.96	0.90	0.75	0.54	0.36	0.37	0.63	0.90	0.99	1.00	(86)
Mean inte	ernal ter	nperatui	re in livin	g area T	1							
20.48	20.59	20.73	20.85	20.94	20.96	20.96	20.96	20.96	20.87	20.63	20.49	(87)
Tempera	ature dur	ing heat	ing perio	ds in res	st of dwe	lling Th2	2					
19.80	19.81	19.81	19.83	19.84	19.85	19.85	19.85	19.84	19.83	19.82	19.81	(88)
Utilisation	n factor	for gains	for rest	of dwelli	ing							
0.99	0.98	0.94	0.86	0.67	0.45	0.26	0.26	0.52	0.84	0.98	0.99	(89)
Mean inte	ernal ter	nperatui	re in the	rest of d	welling T	2						
19.35	19.47	19.60	19.72	19.79	19.81	19.82	19.82	19.80	19.74	19.52	19.37	(90)
Living are		· ·		,							0.46	(91)
Mean inte		•	· · · · · · · · · · · · · · · · · · ·	1								
	19.99	20.12	20.24	20.32	20.34	20.34	20.34	20.33	20.26	20.03	19.88	(92)
Apply adj	•	t to the r	nean inte		peratur			1	1			
19.87	19.99	20.12	20.24	20.32	20.34	20.34	20.34	20.33	20.26	20.03	19.88	(93)

8. Space heating requirement

e. epac	••a	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	on factor	for gains	5								
0.99	0.98	0.95	0.87	0.70	0.49	0.30	0.31	0.57	0.86	0.98	0.99
Useful g	jains										
474.25	542.75	569.51	557.50	454.39	309.02	184.88	184.88	325.93	461.12	465.15	449.47
Monthly	average	externa	l tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	Jre						
866.82	837.99	744.92	634.48	468.37	309.98	184.90	184.90	328.66	520.13	722.61	837.70
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
292.08	198.40	130.50	55.43	10.40	-	-	-	-	43.90	185.37	288.84
	ace heat					ar) (Oct	ober to N	lay)			1204.9
Space h	leating re	equireme	ent per m	² (kWh/r	n²/year)						28.8

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Energy requirements	kWh/year	
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.30%		(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec	
Space heating requirement		
292.08 198.40 130.50 55.43 10.40 43.90 185.3	37 288.84	(98)
Appendix Q - monthly energy saved (main heating system 1)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(210)
Space heating fuel (main heating system 1)		
313.05 212.65 139.87 59.41 11.15 47.05 198.6	8 309.59	(211)
Appendix Q - monthly energy saved (main heating system 2)		
0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00	(212)
Space heating fuel (main heating system 2)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)	I	
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(214)
Space heating fuel (secondary)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(215)
Water heating		
Water heating requirement		
150.88 131.80 137.13 121.62 117.75 103.70 99.35 110.76 111.98 127.52 136.1		(64)
Efficiency of water heater	80.20	(216)
86.59 85.98 84.83 83.11 80.93 80.20 80.20 80.20 80.20 82.57 85.73	8 86.62	(217)
Water heating fuel		
174.26 153.29 161.66 146.34 145.49 129.30 123.88 138.10 139.63 154.44 158.7	79 170.10	(219)
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel Electricity for pumps, fans and electric keep-hot	kWh/year 1291.45 0.00 1795.27	(211) (215) (219)
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL) Energy saving/generation technologies	107.79 130.00 45.00 282.79 210.31	(230a) (230c) (230e) (231) (232)
PVs 0.80 x 1.075 x 961.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500	826.460 0.000 0.000 826.460	(233)
Appendix Q - Energy saved or generated (): Energy used ():	0.000 0.000	(236a) (237a)
Total delivered energy for all uses	2753.37	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1291.452	3.100	40.04	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	1795.27	3.100	55.65	(247)
Mech vent fans cost	107.793	11.460	12.35	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	210.313	11.460	24.10 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	826.460	11.460	-94.71	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			163.49	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy cost factor (ECF)	0.89	(257)
SAP value	87.64	. ,
SAP rating	88	(258)
SAP band	В	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	1291.45	0.198	255.71	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	1795.27	0.198	355.46	(264)
Space and water heating			611.17	(265)
Electricity for pumps and fans	282.79	0.517	146.20	(267)
Electricity for lighting	210.31	0.517	108.73	(268)
Electricity generated - PVs	-826.46	0.529	-437.20	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				, ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			428.91	(272)
			kg/m²/yea	r

CO2 emissions	per	m²
El value	-	
El rating		
El band		

(273) (273a) 10.28 93.37 (274) 93 Α

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13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year	
Space heating, main	1291.45	1.020	1317.28	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	1795.27	1.020	1831.18	(264)
Space and water heating			3148.46	(265)
Electricity for pumps/fans	282.79	2.920	825.76	(267)
Electricity for lighting	210.31	2.920	614.11	(268)
Electricity generated - PV	-826.46	2.920	-2413.26	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			2175.07	(272)
Primary energy kWh/m ² /year			52.11	(273)

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Project Information Building type Ground-floor flat

Ballanig type		iai	
Plot number Reference	4		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	¥1.74	2.70	`11́2.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

2. VCIII	Πατιστητά	ale									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe	r of chim r of open r of inter	flues	ans				0 + 0 + 0 0 + 0 + 0 2		x 40 x 20 x 10		0.00 0.00 20.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
Infiltratio	on due to	o chimne	eys, fans	and flue	S						Air chan 0.18	ges per hour (8)
Air pern Number Shelter Infiltratio	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					10.00		0.68 2.00 0.85 0.58	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7		I	1		1		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	Iter and	wind sp	eed)				13.53	(22a)
0.78	0.73	0.73	0.65	0.59	0.56	0.53	0.53	0.60	0.65	0.69	0.73	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.79	(22b)
0.80	0.77	0.77	0.71	0.67	0.66	0.64	0.64	0.68	0.71	0.74	0.77	(25)

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<i>3. Heat losses and heat los</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	<i>ss paramete</i> Openings m²	r Net are A, m² 8.58	W	value ⁄m²K 35 (2.00)	A x U W/K 15.9	90			(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.85	D	2.00	3.7	70			(26)
Walls Ground floors Party wall Party ceiling		34.34 41.74 30.50 41.74	4 0	0.35 0.25 0.00 0.00	12.0 10.4 0.0 0.0	14)0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						86.52 42.05 10900.40 250.00 9.52 51.57	(31) (33) (34) (35) (36) (37)
	6.40 25.07	24.46	23.87	23.87	25.39	26.40	27.47	28.62	(38)
Heat transfer coefficient, W/	/K			•			-		
81.40 80.19 80.19 77	7.97 76.64	76.03	75.44	75.44	76.96	77.97	79.05	80.19	
Heat loss parameter (HLP),	W/m²K							78.12	(39)
1.95 1.92 1.92 1.8	87 1.84	1.82	1.81	1.81	1.84	1.87	1.89	1.92	
HLP (average) Number of days in month (T	able 1a)			1				1.87	(40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	r heating d occupa average	ancy, N	•		oer dav V	/d.avera	ae				kWh/year 1.45 72.33
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day	for each	month						
79.57	76.67	73.78	70.89	67.99	65.10	65.10	67.99	70.89	73.78	76.67	79.57
Energy of	content c	of hot wa	ter used	1	1			1	1		I
118.28	103.45	106.75	93.06	89.30	77.06	71.40	81.94	82.92	96.63	105.48	114.54
Energy of Distribut	content (tion loss	annual)									1140.80
17.74	15.52 er storag	16.01	13.96	13.39	11.56	10.71	12.29	12.44	14.49	15.82	17.18 150.00
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor hot wate		• /	day)						0.0191 0.9283 0.5400 1.44
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.50
44.00	40.22	44.53	1-0.00				11.00			40.00	44.53
	age loss	44.53	+0.00				11.00			40.00	44.53
	-	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53
Net stor 44.53 Primary	age loss 40.22 circuit lo	44.53	43.09			44.53			I		
Net stor 44.53 Primary Primary 51.81	age loss 40.22 circuit lo loss 46.79	44.53 ss (annu 51.81	43.09 Jal) 50.14	44.53 51.81	43.09 50.14	51.81	44.53 51.81		I		44.53
Net stor 44.53 Primary Primary 51.81	age loss 40.22 circuit lo loss	44.53 ss (annu 51.81	43.09 Jal) 50.14	44.53 51.81	43.09 50.14	51.81	44.53 51.81	43.09	44.53	43.09	44.53 610.00
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46	44.53 ss (annu 51.81 ed for wa 203.08	43.09 ial) 50.14 ater heat 186.29	44.53 51.81 ing calcu 185.63	43.09 50.14 Jated for 170.29	51.81 r each m 167.74	44.53 51.81	43.09	44.53	43.09	44.53 610.00
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08 er heater	43.09 Jal) 50.14 ater heat 186.29 r for each	44.53 51.81 ing calcu 185.63 n month,	43.09 50.14 Jlated for 170.29 kWh/mo	51.81 r each m 167.74 onth	44.53 51.81 onth 178.27	43.09 50.14 176.14	44.53 51.81 192.97	43.09 50.14 198.71	44.53 610.00 51.81 210.88
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08	43.09 Jal) 50.14 ater heat 186.29 r for each	44.53 51.81 ing calcu 185.63	43.09 50.14 Jlated for 170.29 kWh/mo	51.81 r each m 167.74 onth	44.53 51.81 onth	43.09 50.14 176.14	44.53 51.81	43.09 50.14	44.53 610.00 51.81 210.88 210.88
Net stor 44.53 Primary 51.81 Total he 214.61 Output f 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08 er heater 203.08	43.09 ial) 50.14 ater heat 186.29 for eacl 186.29	44.53 51.81 ing calcu 185.63 month, 185.63	43.09 50.14 Jated for 170.29 kWh/mo 170.29	51.81 r each m 167.74 onth	44.53 51.81 onth 178.27	43.09 50.14 176.14	44.53 51.81 192.97	43.09 50.14 198.71	44.53 610.00 51.81 210.88

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5. Internal gains

•••••••		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67
Lighting	gains		•								
19.17	17.03	13.85	10.48	7.84	6.62	7.15	9.29	12.47	15.83	18.48	19.70
Applianc	es gains	3					•				
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38
Cooking	gains										
30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27
Pumps a	and fans	gains		•	•		•	•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	(negative	values)			•	•	•		
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains					•				
156.45	154.77	151.29	146.57	143.50	139.17	135.50	140.21	141.88	146.77	152.30	154.78
Total int	ernal gai	ns									
356.35	353.84	343.89	328.78	314.22	300.36	291.66	297.20	305.35	320.62	337.64	349.66

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 8.585 19.87	g & FF 0.72 x 0.70	Shading 0.77	Gains 59.5879
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
Lighting calculations Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing GL = 3.59 / 41.74 = 0.086 C1 = 0.850 C2 = 0.964 El = 339	Area 0.9 x 8.59	g 0.80	FF x Shadi 0.70 x 0.83	•

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)21.00Heating system responsiveness1.00											()	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	1	1		1			1	1	1	•	1]	
35.61	36.15	36.15	37.18	37.82	38.13	38.42	38.42	37.66	37.18	36.67	36.15	
alpha	•		•							•		
3.37	3.41	3.41	3.48	3.52	3.54	3.56	3.56	3.51	3.48	3.44	3.41	
Utilisatio	on factor	for gains	s for livin	g area								
0.99	0.98	0.96	0.92	0.81	0.66	0.47	0.50	0.77	0.93	0.98	0.99	(86)
Mean in	ternal te	mperatu	re in livin	ig area T	1							
19.17	19.38	19.75	20.19	20.63	20.88	20.97	20.97	20.78	20.27	19.61	19.23	(87)
Temper	ature du	ring heat	ing peric	ods in res	st of dwe	lling Th2	2					
19.37	19.39	19.39	19.43	19.45	19.46	19.47	19.47	19.45	19.43	19.41	19.39	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing							
0.98	0.97	0.94	0.88	0.74	0.53	0.30	0.32	0.66	0.90	0.97	0.98	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2						
17.80	18.02	18.38	18.82	19.23	19.41	19.47	19.47	19.35	18.91	18.26	17.87	(90)
	rea fracti ternal te				dwelling)					0.46	(91)
18.43	18.64	19.01	19.45	19.87	20.09	20.16	20.16	20.00	19.54	18.88	18.50	(92)
Apply adjustment to the mean internal temperature, where appropriate												
18.43	18.64	19.01	19.45	19.87	20.09	20.16	20.16	20.00	19.54	18.88	18.50	(93)

8. Space heating requirement

Space heating requirement for each month, kWh/month540.82429.99359.19219.7497.06198.27389.57520.67Total space heating requirement per year (kWh/year) (October to May)2755.3	er epae	o noutini	groqui	••••••								
0.98 0.97 0.94 0.88 0.77 0.59 0.38 0.40 0.70 0.90 0.97 0.98 Useful gains 406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.37 275.37 275.37	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	Utilisatio	n factor	for gains	5					1			ı
406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	0.98	0.97	0.94	0.88	0.77	0.59	0.38	0.40	0.70	0.90	0.97	0.98
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3												
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	406.89	454.00	496.72	533.18	495.86	381.12	240.57	239.29	370.03	414.80	397.86	390.52
Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	Monthly	average	externa	tempera	ature							
1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month540.82429.99359.19219.7497.06198.27389.57520.67Total space heating requirement per year (kWh/year) (October to May)2755.3	Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•				
540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 - Total space heating requirement per year (kWh/year) (October to May) 2755.3 2755.3 2755.3	1133.80	1093.87	979.50	838.38	626.31	417.21	245.92	245.71	439.08	681.29	938.93	1090.35
Total space heating requirement per year (kWh/year) (October to May) 2755.3	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
	540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67
Space heating requirement per m ² (kWh/m ² /year) 66.0							ar) (Octo	ober to N	/lay)			
	Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						66.0

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9a. Energy requirements

9a. Energy requirements k Fraction of heat from secondary system 0.1000												(201)
Efficiend	cy of ma	e heat fro in heating ondary h	g system	1	(S)			7	0.9000 8.90% 00.00%			(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	()
	heating re	equireme		,			0					
540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67	(98)
Append	lix Q - mo	onthly en	ergy sav	ed (maii	heating	system	1)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)							
616.91	490.48	409.72	250.66	110.71	-	-	-	-	226.16	444.38	593.93	(211)
Append	lix Q - mo	onthly en	ergy sav	ed (maii	heating	system	2)			1	I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fi	uel (main	heating	system	2)	1	1		1	1	I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	lix Q - mo	onthly en	ergy sav	ed (seco	ondary he	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)	1		1						
54.08	43.00	35.92	21.97	9.71	-	-	-	-	19.83	38.96	52.07	(215)
Water h												
	-	equireme	-									
		203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(64)
	· · · · · · · · · · · · · · · · · · ·	er heate									68.80	(216)
75.51	75.26	74.67	73.66	71.74	68.80	68.80	68.80	68.80	73.31	74.92	75.46	(217)
	neating fu	-										
284.23	253.08	271.97	252.93	258.76	247.51	243.81	259.12	256.02	263.23	265.22	279.45	(219)
Space h Water h	neating fu neating fu neating fu	uel used, uel (seco uel mps, fan	ndary)		en-hot						kWh/year 3142.94 275.53 3135.33	(211) (215) (219)
central boiler Total ele Electrici	I heating with a far ectricity f ity for lig saving/g		d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 338.54	(230c) (230e) (231) (232)
Energ		or gener):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							7067.34	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	3142.94	0.194	609.73	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	275.53	0.422	116.27	(263)
Water heating	3135.33	0.194	608.25	(264)
Space and water heating			1334.26	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	338.54	0.422	142.86	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1550.97	(272)
			kg/m²/yea	ır
Emissions per m ² for space and water heating			33.74	(272a)
Emissions per m ² for lighting			3.42	(272b)
Emissions per m ² for pumps and fans			1.77	(272c)

(273)

23.17

Emissions per m² for pumps and fans Target Carbon Dioxide Emission Rate (TER)

= [(33.7353 x 1.0000 x 1.0206) + (3.4227 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Ballanig type		iai	
Plot number Reference	4		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

2. Venti		ale							m ³ per hour				
							main + s heating	eonda	ry + othe	r			
Number Number Number	of pass	flues nittent fa ive vents	6				$ \begin{array}{c} 0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array} $	x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00)))	(6a) (6b) (7a) (7b) (7c)	
Air changes pInfiltration due to chimneys, fans and flues0.00(8Pressure test, result q504.00(1Air permeability0.20(1Number of sides on which sheltered2.00(1Shelter factor0.85(2Infiltration rate incorporating shelter factor0.17(2Infiltration rate modified for monthly wind speed0.17(2												s per hour (8) (17) (18) (19) (20) (21)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly	average	wind sp	beed from	n Table	7								
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10		
Wind Fa	actor			-	-	- I		-		L	54.10	C	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27		
Adjusted	d infiltrat	ion rate	(allowing	g for she	Iter and	wind sp	eed)				13.50	3	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22		
air change rate through system 0.50 (23											(22b) (23a) (23c)		
0.41	0.39	0.39	0.37	0.35	0.34	0.34	0.34	0.36	0.37	0.38	0.39		(25)

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<i>3. Heat</i> Element		and hea Gross	Ópe	a <i>rametei</i> enings	Net are		-value	A x U W/K		appa-val J/m²K	ue A x K kJ/K	
Window air-filled Windo	(SouthV	area, m ^a e-glazed Vest)			A, m ² 2.46		//m²K .42 (1.50)			J/111-K	KJ/K	(27)
	· - Doubl (SouthV	e-glazed Vest)	,		2.14	01	.42 (1.50)	3.0)3			(27)
	· - Double (SouthE	e-glazed East)	,		0.61	01	.42 (1.50)	8.0	36			(27)
	(SouthE	e-glazed East)	,		0.61	01	.42 (1.50)	0.8	36			(27)
Window air-filled Windo	(SouthE	e-glazed East)	,		0.34	01	.42 (1.50)	0.4	18			(27)
Full glaz Double- (SouthW Door	glazed, a				2.020	0	1.50	3.0)3			(26)
Walls Ground Party wa Party ce	all				36.60 41.74 30.50 41.74	4 0	0.22 0.20 0.00 0.00	8.1 8.3 0.0 0.0	35)0	190.00 110.00 70.00 100.00	6954.0 4591.4 2135.0 4174.0	0 (28) 0
Fabric h Heat ca Therma Effect of Total fal	eat loss pacity l mass p f therma oric heat	aramete I bridges	r, kJ/m²ł	<	m²						86.5 28.2 17854.4 427.7 12.9 41.2	6 (33) 0 (34) 5 (35) 8 (36)
15.16	14.68	14.68	13.73	13.10	12.78	12.47	12.47	13.26	13.73	14.21	14.68	(38)
	-	efficient,	-								_	
56.39	55.92	55.92	54.97	54.34	54.02	53.70	53.70	54.49	54.97	55.44	55.92	- ()
Heat los	s param	eter (HL	P), W/m	²K							54.9	8 (39)
1.35	1.34	1.34	1.32	1.30	1.29	1.29	1.29	1.31	1.32	1.33	1.34	
HLP (av Number		in month	n (Table	1a)		•			·		1.3	2 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		ber day V	/d,avera	ge				kWh/year 1.45 68.72	(42 (43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	. ,
Hot wate	er usage	in litres	per day t	or each	month	1	1	1	1	1		
75.59	72.84	70.09	67.34	64.59	61.84	61.84	64.59	67.34	70.09	72.84	75.59	(44
Energy	content o	of hot wa	ter used	I	1	1	1	1	1	1		
112.36	98.27	101.41	88.41	84.83	73.20	67.83	77.84	78.77	91.80	100.21	108.82	
Energy Distribut	content (tion loss	annual)				•					1083.76	(45
16.85	14.74	15.21	13.26	12.72	10.98	10.18	11.68	11.82	13.77	15.03	16.32	(46
Hot wate Volume Temper Energy I	er storag er cylinde factor ature fac lost from orage los	er loss fa tor store (k'	ictor (kW	• •							0.00 0.0000 0.0000 0.0000 0.000	(50 (51 (52 (53 (55
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56
Net stor	age loss						•			•		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57
Primary Primary	circuit lo loss	ss (annu	ial)					- -			0.00	(58
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59
Combi le	oss calcu	lated for	r each m	onth								
38.52	33.53	35.72	33.21	32.92	30.50	31.52	32.92	33.21	35.72	35.92	38.52	(61
Total he	at requir	ed for wa	ater heat	ing calcı	lated fo	r each m	onth					
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	147.34	(62
Output f	rom wate	er heater	for eacl	n month,	kWh/mo	onth						
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	147.34	(64
Heat ga 46.99	ins from 41.06	water he 42.65	ating, k\ 37.70	Wh/mont 36.44	h 31.96	30.43	34.11	34.49	39.45	42.30	1495.94	(64 (65
40.99	+1.00	42.00	57.70	50.44	51.90	50.43	54.11	54.49	59.45	42.30	43.01	(0,

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•								
72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67
Lighting	gains										
11.91	10.58	8.60	6.51	4.87	4.11	4.44	5.77	7.75	9.84	11.48	12.24
Appliance	ces gains	3	•						•		
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38
Cooking	gains										
30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains	•								
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57
Total int	ernal gai	ns	•			•				•	
255.80	253.71	244.67	230.61	216.73	203.07	194.36	199.33	206.65	220.87	237.09	248.99

6. Solar gains (calculation for January)

er oorar game (ourouration for ouroury)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.460 37.39		0.77	33.9085
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.140 37.39	0.76 x 0.70	0.77	29.4976
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.340 37.39	0.76 x 0.70	0.77	4.6865
Full glazed door - Double-glazed, air-filled (SouthWest) Door	0.9 x 2.020 37.39	0.76 x 0.70	0.77	27.8436
Lighting calculations				
Window - Double-glazed, air-filled (SouthWest) Window	Area 0.9 x 2.46	g 0.80	FF x Shadi 0.70 x 0.83	•
Window - Double-glazed, air-filled (SouthWest)	0.9 x 2.14	0.80	0.70 x 0.83	0.90

Window

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Lighting calculations Area q										FF x Shad	dina	
Window - [(SouthEast Window		glazed,	, air-filleo	k		a x 0.61		g 0.80		0.70 x 0.83		26
Window - E	Double-	glazed,	, air-filleo	ł	0.9	x 0.61		0.80		0.70 x 0.8	3 0.2	26
(SouthEast Window	st)											
Window - E (SouthEast Window		glazed,	, air-fillec	ł	0.9	x 0.34		0.80	().70 x 0.8	3 0.1	14
<i>7. Mean in</i> Temperatu Heating sys	ure durii	ng heat	ing peric	ods in the	e living a	ırea, Th1	(°C)				21.0 0.1	()
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]
tau								•]
87.95 88	8.70 8	88.70	90.23	91.28	91.81	92.35	92.35	91.01	90.23	89.46	88.70]
alpha					1	1						1
6.86 6.	.91 (6.91	7.02	7.09	7.12	7.16	7.16	7.07	7.02	6.96	6.91]
Utilisation f	factor fo	or gains	for livin	g area								,
		0.98	0.95	0.83	0.62	0.41	0.43	0.72	0.95	1.00	1.00	(86)
Mean inter	rnal tem	peratur	re in livin	g area T	1							
		20.64	20.79	20.92	20.96	20.96	20.96	20.95	20.81	20.53	20.37	(87)
Temperatu	ure durin	ng heat	ing peric	ds in res	st of dwe	elling Th2	2					_
		19.81	19.83	19.84	19.85	19.85	19.85	19.84	19.83	19.82	19.81	(88)
Utilisation f		•		of dwell	ing							_
		0.98	0.92	0.75	0.51	0.30	0.31	0.61	0.92	0.99	1.00	(89)
Mean inter		•			. <u> </u>	Т2	_					-
		19.52	19.67	19.78	19.81	19.82	19.82	19.80	19.69	19.42	19.26	(90)
Living area Mean inter					dwelling)					0.4	46 (91)
19.76 19	9.88 2	20.03	20.19	20.30	20.34	20.34	20.34	20.33	20.21	19.93	19.77	(92)
Apply adjust	stment	to the r	nean inte	ernal ten	nperatur	e, where	approp	oriate				_

19.76

19.88

20.03

20.19

20.30

20.34

20.34

20.34

20.33

20.21

19.93

19.77

(93)

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8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	Jtilisation factor for gains										
1.00	0.99	0.98	0.93	0.79	0.56	0.35	0.36	0.66	0.93	0.99	1.00
Useful g	ains										
367.93	443.13	487.54	505.20	439.16	307.59	184.84	184.82	321.47	410.31	370.40	344.88
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat loss rate for mean internal temperature											
860.47	832.06	740.02	631.41	467.48	309.89	184.90	184.90	328.37	517.15	717.01	831.50
Space heating requirement for each month, kWh/month											
366.45	261.36	187.85	90.87	21.07	-	-	-	-	79.48	249.56	362.04
Total space heating requirement per year (kWh/year) (October to May)									1618.7		
Space heating requirement per m ² (kWh/m ² /year)								38.7			

8c. Space cooling requirement - not applicable

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9a. Energy requirements

		uirement									kWh/year	
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.30%										(202) (206)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	· · · ·
Space h	eating re	equireme	ent				0					
366.45	261.36	187.85	90.87	21.07	-	-	-	-	79.48	249.56	362.04	(98)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
392.77	280.13	201.34	97.40	22.58	-	-	-	-	85.19	267.48	388.04	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)	1	1		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h				1								
Water heating requirement												
		137.13		117.75	103.70	99.35	110.76	111.98	127.52	136.13		(64)
Efficience	cy of wat	er heatei	ſ								80.20	(216)
87.10	86.64	85.74	84.23	81.58	80.20	80.20	80.20	80.20	83.80	86.46	87.13	(217)
Water h	eating fu	lel										
173.23	152.12	159.93	144.39	144.33	129.30	123.88	138.10	139.63	152.17	157.45	169.11	(219)
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel Electricity for pumps, fans and electric keep-hot									kWh/year 1734.94 0.00 1783.62	(211) (215) (219)		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL)									107.79 130.00 45.00 282.79 210.31	(230a) (230c) (230e) (231) (232)		
Energy saving/generation technologies PVs 0.80 x 1.075 x 961.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500									826.460 0.000 0.000 826.460	(233)		
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							3185.21	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year		
Space heating, main system 1	1734.94	0.198	343.52	(261)	
Space heating, main system 2	0.00	0.000	0.00	(262)	
Space heating, secondary	0.00	0.517	0.00	(263)	
Water heating	1783.62	0.198	353.16	(264)	
Space and water heating			696.68	(265)	
Electricity for pumps and fans	282.79	0.517	146.20	(267)	
Electricity for lighting	210.31	0.517	108.73	(268)	
Electricity generated - PVs	-826.46	0.529	-437.20	(269)	
Electricity generated - µCHP	0.00	0.000	0.00	(269)	
Appendix Q -				. ,	
Energy saved ():	0.00	0.000	0.00	(270)	
Energy used ():	0.00	0.000	0.00	(271)	
Total CO2, kg/year			514.41	(272)	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 12.32 (273)

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Project Information Building type Ground-floor flat

Plot number	5		
Reference			
Date	16 June 2016		
Client	Investland	Project	252
			1 ()(

2 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

2. Venti											m ³ per h	nour
							main + s heating	eondar	y + othe	r		
Number Number Number Number Number	of open of interr of pass	flues nittent fa ive vents	3				$0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
- turnoor		loo guo i					Ũ		X 10			
Infiltratio Pressure Air perm Number Shelter f Infiltratio Infiltratio	e test, re leability of sides actor on rate ir	esult q50 s on whic ncorpora	ch shelte	red Iter facto	r				4.00		Air char 0.00 2.00 0.85 0.17	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed fror	n Table	7	•	•			·		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	ictor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjusted	d infiltrat	ion rate	(allowing	g for shel	ter and	wind spe	eed)	-			13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
Ventilation Effective				ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat</i> Element		and hea Gross	Óp	aramete enings	r Net are	ea U	-value	AxU		kappa-val		
	led, low-	area, m e-glazed E, En=0 ∃ast)	,		A, m² 0.51		//m²K . 42 (1.50)	W/K 0.7		⟨J/m²K	kJ/K	(27)
Window argon fil soft coa	lled, low- t (Northl	e-glazed ∙E, En=0 ∃ast)			0.51	0 1.	.42 (1.50)	0.7	72			(27)
Window	lled, low- t (South	e-glazed ∙E, En=0 West)			1.67	0 1.	.42 (1.50)	2.3	36			(27)
Window argon fil soft coa	r - Doubl lled, low-				5.29	01	.42 (1.50)	7.4	19			(27)
Walls Ground Party wa Party ce	floors all				41.2 24.9 42.4 24.9	0 0	0.22 0.20 0.00 0.00	9.0 4.9 0.0 0.0	98 00	17.00 110.00 180.00 30.00	700.74 2739.0 7632.0 747.00	00 (28) 00
Fabric h Heat ca Therma Effect of Total fal	leat loss pacity I mass p f therma bric heat	aramete I bridges	r, kJ/m²l	<	m²						74.1 25.3 11818.7 193.1 11.1 36.4	34 (33) 74 (34) 12 (35) 11 (36)
27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	(38)
		efficient,							1			1
63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72 63.7	70 (20)
Heat los	s param	eter (HL	.P), W/m	²K							03.7	72 (39)
1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	
HLP (av Number		in month	n (Table	1a)							1.(04 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		ber day V	/d,avera	ge				kWh/year 2.02 82.06
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month	1	1	1		1	
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27
Energy	content c	of hot wa	ter used	1			I.		1		
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96
Energy of Distribut	content (tion loss	annual)				•					1294.28
20.13	17.60 er storag	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor store (k'	,	/h/day)							0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stor	age loss			I	1	1	1	1	1	1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annu	ial)		•	1					0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi le	oss calcu	lated for	r each m	onth							
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00
Total he	at requir	ed for wa	ater heat	ing calcı	ulated fo	r each m	onth				
100 10	157.40						132.27	133.73	152.29	162.57	175.96
		ar hoator	for each	n month,	kWh/mo	onth					
	1			140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96
Output f 180.19		163.76	145.25			118.65	132.27	133.73	152.29	162.57	175.96 1786.54

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5. Internal gains

	0										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•								
120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92
Lighting	gains	•									
41.43	36.80	29.93	22.66	16.94	14.30	15.45	20.08	26.95	34.22	39.94	42.58
Applianc	ces gains	3	•				•				
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04
Cooking	gains		•		•		•	•	•		
49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11
Pumps a	and fans	gains	•	•	•		•	•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•	•	•		
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains	•				•				
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns									
478.90	474.53	456.29	428.47	400.25	374.80	360.19	368.00	384.20	412.21	443.22	466.57

6. Solar gains (calculation for January)

0. Solar gains (calculation for bain		~ 0 ГГ	Chadina	Caina	
Window - Double-glazed, argon fille	Area & Flux d. 0.9 x 0.510 11.51	g & FF	Shading 0.54	Gains 1.2581	
low-E, En=0.1, soft coat (NorthEast)	-	0.03 x 0.70	0.54	1.2501	
Slim Window					
Window - Double-glazed, argon fille	d, 0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581	
low-E, En=0.1, soft coat (NorthEast)	-	0.00 × 0.70	0.04	1.2001	
Slim Window					
Window - Double-glazed, argon fille	d, 0.9 x 1.670 37.39	0.63 x 0.70	1.00	24.7814	
low-E, En=0.1, soft coat (SouthWes					
Window	-,				
Window - Double-glazed, argon fille	d, 0.9 x 5.290 37.39	0.63 x 0.70	1.00	78.4992	
low-E, En=0.1, soft coat (SouthWes					
Window and Door					
Total solar gains, January				105.80	(83-1)
Solar gains					
105.80 181.21 241.63 300.70 33	32.71 339.12 331.90 307	.48 267.82 206.	37 127.00	90.31	(83)
Total gains					
584.70 655.75 697.92 729.17 73	32.96 713.91 692.10 675	.49 652.03 618.	58 570.22	556.88	(84)
					()
Lighting calculations	Area	a	EE v Shadi	na	
Window - Double-glazed, argon fille		g 0.80	FF x Shadi 0.70 x 0.67		
low-E, En=0.1, soft coat (NorthEast)		0.00	0.70 × 0.07	0.17	
Slim Window					
Window - Double-glazed, argon fille	d, 0.9 x 0.51	0.80	0.70 x 0.67	0.17	
low-E En=0.1 soft coat (NorthEast)		0.00	0.10 x 0.01	0.17	

low-E, En=0.1, soft coat (NorthEast) Slim Window

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Lighting calculations			
Window - Double-glazed, argon filled,	Area 0.9 x 1.67	g 0.80	FF x Shading 0.70 x 0.83
low-E, En=0.1, soft coat (SouthWest) Window			
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest)	0.9 x 5.29	0.80	0.70 x 0.83 2.21
Window and Door			
GL = 3.85 / 61.20 = 0.063			
C1 = 0.500			

C2 = 1.014EI = 293

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

induling	0,000	ooponoi									0.70	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	
alpha	•	•	1			1	1	1	1	1		
4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	
Utilisatio	on factor	for gains	s for livin	g area								
0.97	0.94	0.90	0.84	0.72	0.55	0.37	0.38	0.62	0.84	0.95	0.97	(86)
Mean in	ternal te	mperatu	re in livin	ig area T	1				•			
20.24	20.36	20.55	20.70	20.85	20.92	20.94	20.94	20.90	20.75	20.43	20.24	(87)
Temper	ature du	ring heat	ting peric	ds in res	st of dwe	illing Th2	2				- I	
20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing						/	
0.96	0.93	0.88	0.81	0.67	0.48	0.29	0.30	0.54	0.80	0.93	0.96	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling 7	2						
19.37	19.49	19.66	19.80	19.93	19.98	19.99	19.99	19.97	19.85	19.56	19.37	(90)
			0 / 61.20								0.41	(91)
Mean in	ternal te	mperatu	re (for th	e whole)						
19.72	19.85	20.02	20.17	20.30	20.36	20.37	20.37	20.35	20.22	19.91	19.72	(92)
Apply ac	djustmen	it to the r	mean inte	ernal ten	nperatur	e, where	appropr	iate				
19.72	19.85	20.02	20.17	20.30	20.36	20.37	20.37	20.35	20.22	19.91	19.72	(93)

21.00

0.75

(85)

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8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	n factor	for gains	5								
0.96	0.93	0.88	0.82	0.68	0.50	0.32	0.33	0.57	0.80	0.93	0.96
Useful g	ains	•	•								
558.42	609.87	616.79	595.60	500.12	357.48	220.42	220.31	369.26	496.91	530.37	533.62
Monthly	average	externa	Itempera	ature			•				
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure						
970.07	945.97	842.52	730.62	548.11	367.07	221.38	221.37	385.52	599.94	822.86	944.61
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
306.26	225.86	167.94	97.22	35.70	-	-	-	-	76.66	210.60	305.78
	ace heat					ar) (Octo	ober to N	lay)			1426.0
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						23.3

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	uremen	IS								kWh/yea	
Fraction	of spac	eating sy e heat fro in heating	om main	system	(s)				1.0000 3.30%		,	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	quireme	ent			1	1		1			
306.26	225.86	167.94	97.22	35.70	-	-	-	-	76.66	210.60	305.78	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1		1	1		
328.26	242.08	180.00	104.20	38.27	-	-	-	-	82.16	225.72	327.74	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)	1		1	1		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h				1		1	1		1	1		
		equireme										
		163.76		140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(64)
Efficiend	cy of wat	er heate	r								80.20	(216)
86.28	85.86	85.01	83.97	82.06	80.20	80.20	80.20	80.20	83.32	85.60	86.33	(217)
Water h	eating fu	lel										
208.86	183.33	192.63	172.98	171.37	154.42	147.94	164.93	166.75	182.77	189.91	203.82	(219)
Space h Water h	neating fu neating fu leating fu	uel used, uel (seco uel mps, fan	ndary)		ep-hot						kWh/year 1528.42 0.00 2139.71	(211) (215) (219)
mecha central boiler v Total ele Electrici	nical ver heating with a far ectricity f ty for ligh	ntilation -	balance d flue bove, kW 0.00% fix	d, extrac /h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.57	740)	115.71 130.00 45.00 290.71 292.67	(230a) (230c) (230e) (231) (232)
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	5							3428.90	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1528.424	3.100	47.38	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2139.71	3.100	66.33	(247)
Mech vent fans cost	115.714	11.460	13.26	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	292.667	11.460	33.54 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)́
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			192.30	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy cost denator	0.47	(200)
Energy cost factor (ECF)	0.85	(257)
SAP value	88.13	
SAP rating	88	(258)
SAP band	В	

12a. Carbon dioxide emissions

12a. Carbon dioxide emissions				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/ye	-
Space heating, main system 1	1528.42	0.198	302.63	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2139.71	0.198	423.66	(264)
Space and water heating			726.29	(265)
Electricity for pumps and fans	290.71	0.517	150.30	(267)
Electricity for lighting	292.67	0.517	151.31	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			592.73	(272)
			kg/m²/yea	r
CO2 emissions per m ²			9.69	(273)
El value			92.52	(273a)

D2 emissions per m ²
value
rating
band

EI EI

g/m²/year	
9.69	(273)
92.52	(273a)
93	(274)
Α	

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13a. Primary energy

isa. Fililialy ellergy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year)
Space heating, main	1528.42	1.020	1558.99	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2139.71	1.020	2182.50	(264)
Space and water heating			3741.49	(265)
Electricity for pumps/fans	290.71	2.920	848.89	(267)
Electricity for lighting	292.67	2.920	854.59	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			3042.93	(272)
Primary energy kWh/m²/year			49.72	(273)

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Project Information

Building type	Ground-floor f	lat	
Plot number Reference	5		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

main + seondary + other heatingNumber of chimneys $0 + 0 + 0$ $x 40$ 0.00 (6a)Number of open flues $0 + 0 + 0$ $x 20$ 0.00 (6b)Number of intermittent fans 2 $x 10$ 20.00 (7a)Number of passive vents 0 $x 10$ 0.00 (7b)Number of flueless gas fires 0 $x 40$ 0.00 (7c)Air changes per hourInfiltration due to chimneys, fans and flues 0.12 (8)Pressure test, result q50 10.00 (17)Air permeability 0.622 (18)Number of sides on which sheltered 2.00 (19)Shelter factor 0.85 (20)Infiltration rate incorporating shelter factor 0.53 (21)Infiltration rate modified for monthly wind speed 0.53 (21)JanFebMarAprMayJanFebMarAprMayJanFebMarApr(22)Wind Factor 1.33 1.27 1.13 1.02 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 Adjusted infiltration rate (allowing for shelter and wind speed) 7.14 (22b)Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	2. vem	Παιιοπτά	ale									m ³ per h	our
Number of chimneys $0 + 0 + 0$ x 40 0.00 (6a) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of intermittent fans 2 x 10 20.00 (7a) Number of passive vents 0 x 10 0.00 (7b) Number of flueless gas fires 0 x 40 0.00 (7c) Mumber of sides gas fires 0 x 40 0.00 (7c) Infiltration due to chimneys, fans and flues 0 x 40 0.00 (7c) Air permeability 0.62 10.00 (17) (17) Air permeability 0.62 (18) (17) Number of sides on which sheltered 2.00 (19) (19) Shelter factor 0.85 (20) (11) Infiltration rate incorporating shelter factor 0.53 (21) (21) Infiltration rate modified for monthly wind speed 0 3.70 3.70 4.20 4.50 4.80 5.10 S.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4									eondar	y + othe	er	•	
Number of flueless gas fires 0 x 40 0.00 (7c) Air changes per hour Air changes per hour 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed Ventilation rate modified for monthly wind speed (22) Monthly average wind speed from Table 7 54.0 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Vind Factor 13.53 (22a) Mind Factor 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) (0.71 0.67 7.14 (22b) Ventilation : natural ventilation, intermittent extract fans (22a)	Numbe Numbe	r of open r of inter	i flues mittent fa					0 + 0 + 0 2		x 20 x 10		0.00 20.00	(6b) (7a)
Infiltration due to chimneys, fans and flues 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.40 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Vind Factor 54.10 54.10 (22) 54.10 (22) 1.35 1.27 1.27 1.13 1.02 0.97 0.93 1.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.353 (22a) 13.53 (22a) 13.53 <td></td>													
Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 13.53 (22) Wind Factor 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	Infiltrati	on duo tr	o obimno	we fane	and fluo	c							
Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 51.0 5.10 4.50 4.10 3.90 3.70 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b) 7.14 (22b)					and nue	5				10.00		0.12	
Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 State 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 May 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22) 13.53 (22) Ventilation : natural ventilation, intermittent extract fans 7.14 (22b) 7.14 (22b)													
Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 0.510 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Set 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Motive and infiltration rate (allowing for shelter and wind speed) 7.14 (22) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 7.14 (22b) 7.14			s on whic	ch sheite	rea								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Sep 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 54.10 (22) Wind Factor 13.53 (22) Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) O.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans 7.14 (22b)	Infiltrati	on rate ir											
Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Stand Grad Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans				_	-				-1				
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 54.10 (22) Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans					-		Jul	Aug	Sep	Oct	Nov	Dec	
54.10 (22) Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.13 1.20 1.27 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans					-	-							
Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80		
Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 7.14 (22b) Ventilation : natural ventilation, intermittent extract fans	Wind Fa	actor										54.10	(22)
Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.49 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans	1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Ventilation : natural ventilation, intermittent extract fans	Adjuste	d infiltrat	ion rate	(allowing	for she	ter and	wind sp	eed)				13.53	(22a)
Ventilation : natural ventilation, intermittent extract fans	0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67	
					ntermitte	nt extrac	t fans				·	7.14	(22b)
0.75 0.73 0.68 0.65 0.63 0.62 0.65 0.68 0.70 0.73 (25)		-			0.65	0.63	0.62	0.62	0.65	0.68	0.70	0.73	(25)

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<i>3. Heat losses and heat lo</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	<i>ss paramete</i> Openings m²	r Net are A, m² 13.45 0	W	value ′m²K 35 (2.00)	A x U W/K 24.9	91			(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.85	D	2.00	3.7	70			(26)
Walls Ground floors Party wall Party ceiling		33.9 24.9 42.4 24.9	0 0	0.35 0.25 0.00 0.00	11.8 6.2 0.0 0.0	22)0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						74.10 46.70 11118.00 250.00 8.15 54.85	(33) (34) (35) (36)
	6.88 35.25	34.49	33.77	33.77	35.64	36.88	38.20	39.62	(38)
Heat transfer coefficient, W/	/K			·			•	<u>.</u>	
95.96 94.46 94.46 91	.73 90.10	89.34	88.61	88.61	90.49	91.73	93.05	94.46	
Heat loss parameter (HLP),	W/m²K							91.92	(39)
1.57 1.54 1.54 1.5	50 1.47	1.46	1.45	1.45	1.48	1.50	1.52	1.54	
HLP (average) Number of days in month (T	able 1a)							1.50	(40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	r heating d occupa	ancy, N	•			(1					kWh/year 2.02	(4
	average				· · · ·			-	-		86.38	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	er usage		-									
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02	(4
Energy	content c	of hot wa	ter used									
141.25	123.54	127.48	111.14	106.64	92.03	85.27	97.85	99.02	115.40	125.97	136.80	
	content (tion loss	annual)									1362.41	(4
21.19	18.53	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52	(4
lot wate olume emperationergy l	er storag er cylinde factor ature fac lost from orage los	er loss fa tor hot wate	ctor (kŴ	• •	day)						150.00 0.0191 0.9283 0.5400 1.44	(555) (555) (555)
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(5
let stor	age loss									•		
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(5
Primary Primary	circuit lo loss	ss (annu	al)		•	1					610.00	(5
51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(5
otal he	at require	ed for wa	ater heat	ing calcu	lated for	r each m	onth					
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth				•		
	210 55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(6
237.59	210.00											
	ins from			Nh/mont	h			•			2496.69	(6

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains, Watts											
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	Lighting gains										
26.68	23.70	19.27	14.59	10.91	9.21	9.95	12.93	17.36	22.04	25.72	27.42
Applianc	ces gains	5									
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains				•						
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains			•			•			
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)				•			
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72
Total int	ernal gai	ns									
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57
		-								-	

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 13.450 19.87	g & FF 0.72 x 0.70	Shading 0.77	Gains 93.3555
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
<i>Lighting calculations</i> Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area 0.9 x 13.45	g 0.80	FF x Shadir 0.70 x 0.83	•

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7. Mean internal temperature

Temper	ature du	ring heat	ting perio	ods in the	e living a	rea, Th1	(°C)				21.0	- (,
Heating	system	· ·	veness								1.0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau		•						•		•		
44.29	44.99	44.99	46.33	47.17	47.57	47.96	47.96	46.97	46.33	45.67	44.99	
alpha		•						•		•		
3.95	4.00	4.00	4.09	4.14	4.17	4.20	4.20	4.13	4.09	4.04	4.00	
Utilisatio	on factor	for gains	s for livin	g area						•		
0.99	0.98	0.96	0.91	0.78	0.60	0.41	0.44	0.74	0.93	0.98	0.99	(86)
Mean in	iternal te	mperatu	re in livin	ig area T	1			•		•		
19.49	19.70	20.05	20.45	20.80	20.95	20.99	20.99	20.88	20.46	19.87	19.53	(87
Temper	ature du	ring heat	ting perio	ds in res	st of dwe	illing Th2	2	•		•		
19.64	19.66	19.66	19.69	19.71	19.72	19.73	19.73	19.71	19.69	19.68	19.66	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing	•		•				
0.99	0.98	0.95	0.87	0.71	0.49	0.29	0.31	0.64	0.90	0.98	0.99	(89
Mean in	iternal te	mperatu	re in the	rest of d	welling 7	Г2				•		
18.31	18.53	18.88	19.28	19.59	19.70	19.73	19.73	19.65	19.30	18.72	18.37	(90)
	rea fracti Iternal te				dwelling)				•	0.4	1 (91
18.79	19.01	19.36	19.76	20.08	20.21	20.24	20.24	20.15	19.78	19.19	18.84	(92
Apply a	djustmen	it to the r	mean int	ernal ten	peratur	e, where	appropr	iate				
18.79	19.01	19.36	19.76	20.08	20.21	20.24	20.24	20.15	19.78	19.19	18.84	(93)

8. Space heating requirement

		9									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5								J
0.99	0.98	0.95	0.88	0.73	0.53	0.34	0.36	0.67	0.90	0.98	0.99
Useful g	ains										J
518.53	595.16	666.79	723.56	656.03	481.06	294.15	293.40	478.01	547.50	510.75	494.05
Monthly	average	external	Itempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•				
1371.13	1322.97	1186.03	1014.16	755.06	501.13	296.23	296.12	529.49	823.33	1133.88	1317.23
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•				
634.33	489.09	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45
	ace heat					ar) (Octo	ober to N	lay)	•	•	3058.9
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						49.9

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9a. Energy requirements

Fraction Fraction Efficiend Efficiend	n of heat n of spac cy of ma cy of sec	from sec e heat fro in heating ondary h	condary s om main g system leating s	system	(s)			78	0.1000 0.9000 8.90% 00.00%		kWh/year	(201) (202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	neating re	equireme	ent									
634.33	489.09	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45	(98)
Append	lix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	iel (main	heating	system	1)							
723.57	557.90	440.66	238.67	84.04	-	-	-	-	234.09	511.78	698.61	(211)
Append	lix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	lix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	stem)		I			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
63.43	48.91	38.63	20.92	7.37	-	-	-	-	20.52	44.87	61.24	(215)
Water h												
Water h	neating re	equireme	nt									
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(64)
Efficiend	cy of wat	er heate	r								68.80	(216)
75.64	75.32	74.61	73.30	71.04	68.80	68.80	68.80	68.80	73.16	75.02	75.60	(217)
Water h	neating fu	lel										
314.12	279.54	299.98	278.82	285.73	269.26	263.97	282.25	279.44	289.40	292.17	308.37	(219)
Space h Water h	neating fu neating fu neating fu		ndary)		on hot						kWh/year 3489.31 305.90 3443.05	(211) (215) (219)
central boiler Total ele Electrici	I heating with a far ectricity f ity for ligh saving/g	mps, fan pump n-assiste or the ab nting (30 eneratior	d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 471.15	(230c) (230e) (231) (232)
Energ		or gener):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	3							7884.41	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

Target Carbon Dioxide Emission Rate (TER)

= [(25.2911 x 1.0000 x 1.0206) + (3.2488 x 1.2251)] x 0.6000

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	3489.31	0.194	676.93	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	305.90	0.422	129.09	(263)
Water heating	3443.05	0.194	667.95	(264)
Space and water heating			1473.97	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	471.15	0.422	198.82	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1746.64	(272)
			kg/m²/yea	
Emissions per m ² for space and water heating			25.29	(272a)
Emissions per m ² for lighting			3.25	(272b)
Emissions per m ² for pumps and fans			1.21	(272c)

17.88

(273)

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Project Information

Building type	Ground-floor f	lat	
Plot number Reference	5		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	6 1.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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Element	t	and hea Gross area, m	Óp 2 m²	a <i>ramete</i> enings	Net are A, m ²	W	-value //m²K	A x U W/K	ł	kappa-val kJ/m²K	ue A x K kJ/K	
argon fil soft coa	led, low-				5.29	01.	42 (1.50)	7.4	19			(27)
Window	r - Doubl led, low- t (South'	e-glazed ∙E, En=0			1.67	01.	42 (1.50)	2.3	36			(27)
Window argon fil soft coa	· - Doubl led, low-	e-glazed -E, En=0 East)			0.51	01.	42 (1.50)	0.7	72			(27)
Window argon fil soft coa	- Doubl led, low-	e-glazed ·E, En=0 East)			0.51	01.	42 (1.50)	0.7	72			(27)
Walls					41.2		0.22	9.0		17.00	700.74	(-)
Ground Party wa					24.9 42.4		0.20 0.00	4.9 0.0		110.00 180.00	2739.0 7632.0	
Party ce					24.9		0.00	0.0		30.00	747.00	
Fabric h Heat ca Therma Effect of Total fat	eat loss pacity I mass p f therma oric heat	aramete I bridges	r, kJ/m²l	<	m²						74. 25.3 11818.7 193. 11. 36.4	34 (33) 74 (34) 12 (35) 11 (36)
27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	(38)
		efficient,	W/K	- -								- -
63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	63.72	
Heat los	s param	neter (HL	.P), W/m	²K							63.7	72 (39)
1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	
HLP (av		in month	, (Table	1a)							1.(04 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]
31	28	31	30	31	30	31	31	30	31	30	31	
L	1	1	1	1	1	1	- 1	1	1		1	J

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Assume	d occupa	ancy, N	/ require r usage i		oer day V	/d,avera	ge				kWh/year 2.02 82.06	(42 (43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot wate	er usage	in litres	per day f	or each	month		•					
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27	(4
Energy of	content o	of hot wa	ter used									
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96	
	content (ion loss	annual)									1294.28	(4
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(4
lot wate /olume empera nergy l		er loss fa tor store (k'	ctor (kW	'h/day)							0.00 0.0000 0.0000 0.0000 0.000	(5 (5 (5 (5 (5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Vet stora	age loss			I					1		1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Primary Primary	circuit lo loss	ss (annu	ial)			•				•	0.00	(5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Combi lo	oss calcu	lated for	r each m	onth								
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(6
otal he	at require	ed for wa	ater heat	ing calcu	lated fo	r each m	ionth					
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth						
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
leat gai	ns from	water he	ating, kV	Vh/mont	h						1786.54	(6
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(6

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts		•	•		•	•	•		
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	gains		•	•	•		•	•		•	
17.19	15.27	12.42	9.40	7.03	5.93	6.41	8.33	11.18	14.20	16.57	17.67
Applianc	ces gains	3					•		•		
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains				•		•		•		
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•	•	•		
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns					•			•	
331.81	329.25	317.29	298.55	279.77	261.59	250.13	256.13	266.04	284.97	306.54	322.63
۰ ـــ ــــ			•		•						

6. Solar gains (calculation for January)

				<u> </u>
Window - Double-glazed, argon filled,	Area & Flux 0.9 x 5.290 37.39	g & FF 0.63 x 0.70	Shading 0.77	Gains 60.4444
low-E, En=0.1, soft coat (SouthWest) Window and Door				
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 1.670 37.39	0.63 x 0.70	0.77	19.0817
Window - Double-glazed, argon filled,	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
low-E, En=0.1, soft coat (NorthEast) Slim Window				
Window - Double-glazed, argon filled,	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
low-E, En=0.1, soft coat (NorthEast) Slim Window				
Lighting calculations				
Lighting calculations	Area	g	FF x Shadii	ng
<i>Lighting calculations</i> Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	Area 0.9 x 5.29	g 0.80	FF x Shadii 0.70 x 1.00	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest)		g 0.80 0.80		2.67
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door Window - Double-glazed, argon filled,	0.9 x 5.29	0.80	0.70 x 1.00	2.67 0.84
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 5.29 0.9 x 1.67	0.80 0.80	0.70 x 1.00 0.70 x 1.00	2.67 0.84

Slim Window

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)21.00Heating system responsiveness0.75												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	
alpha												
4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	4.43	
Utilisatio	on factor	for gains	s for livin	g area			•			•		
0.99	0.98	0.97	0.93	0.85	0.70	0.50	0.51	0.77	0.93	0.98	0.99	(86)
Mean internal temperature in living area T1												
20.02	20.14	20.34	20.53	20.75	20.88	20.93	20.93	20.85	20.60	20.23	20.02	(87)
Temper	ature du	ring heat	ing perio	ds in res	st of dwe	illing Th2	2		•	•		
20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing			4				
0.99	0.98	0.96	0.92	0.81	0.62	0.39	0.40	0.70	0.91	0.98	0.99	(89)
Mean in	iternal te	mperatu	re in the	rest of d	welling 7	2		1		-		
19.15	19.27	19.47	19.65	19.85	19.96	19.99	19.99	19.94	19.72	19.36	19.16	(90)
	rea fracti Iternal te				dwelling)					0.41	(91)
19.50	19.62	19.82	20.01	20.22	20.34	20.37	20.37	20.31	20.08	19.72	19.51	(92)
Apply adjustment to the mean internal temperature, where appropriate												
19.50	19.62	19.82	20.01	20.22	20.34	20.37	20.37	20.31	20.08	19.72	19.51	(93)

8. Space heating requirement

	e neutin,	gregan	••••••										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatic	on factor	for gains	5										
0.99	0.98	0.95	0.91	0.82	0.64	0.43	0.44	0.72	0.91	0.98	0.99		
Useful gains													
408.07	458.50	481.92	488.13	441.95	339.95	218.03	217.67	341.54	405.58	395.48	387.66		
Monthly	Nonthly average external temperature												
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90		
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•						
956.07	931.82	829.89	720.60	542.76	365.46	221.14	221.10	382.98	591.42	810.26	931.03		
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•			•			
407.71	318.07	258.89	167.38	75.00	-	-	-	-	138.26	298.64	404.27		
Total space heating requirement per year (kWh/year) (October to May) Space heating requirement per m ² (kWh/m ² /year)											2068.2		
Space h	neating re	equireme	ent per m	² (kWh/r	n²/year)						33.7		

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy req	uirement	(S								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system	(s)				1.0000 3.30%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating r	equireme	ent	1	1	1	1	1	1	1	<u> </u>	
407.71	318.07	258.89	167.38	75.00	-	-	-	-	138.26	298.64	404.27	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1	1		1	· · · · · · · · · · · · · · · · · · ·	
436.99	340.91	277.48	179.40	80.39	-	-	-	-	148.19	320.08	433.30	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)	1		1	ļ]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)		1		I	1	11	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)	1	1	1	1			1	1	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h				1	1	1	1	1		1	· · · · · · · · · · · · · · · · · · ·	
		equireme										
		163.76		140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(64)
Efficiend	cy of wat	er heatei	ſ								80.20	(216)
86.94	86.69	86.10	85.31	83.45	80.20	80.20	80.20	80.20	84.71	86.46	86.98	(217)
Water h	eating fu	lel										
207.25	181.58	190.20	170.26	168.52	154.42	147.94	164.93	166.75	179.78	188.02	202.30	(219)
Space h Water h	neating fu neating fu leating fu	uel used, uel (seco uel mps, fan:	ndary)		ep-hot						kWh/year 2216.75 0.00 2121.95	(211) (215) (219)
mecha central boiler v Total ele Electrici	nical ver heating with a far ectricity f ty for lig	ntilation - pump n-assiste for the ab nting (100	balance d flue ove, kW 0.00% fix	d, extrac /h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.57	740)	115.71 130.00 45.00 290.71 303.57	(230a) (230c) (230e) (231) (232)
Energy saving/generation technologies PVs 0.80 x 1.070 x 961.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500										822.616 0.000 0.000 822.616	(233)	
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							4110.37	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions		
	kWh/year	kg CO2/kWh	kg CO2/ye	ear	
Space heating, main system 1	2216.75	0.198	438.92	(261)	
Space heating, main system 2	0.00	0.000	0.00	(262)	
Space heating, secondary	0.00	0.517	0.00	(263)	
Water heating	2121.95	0.198	420.15	(264)	
Space and water heating			859.06	(265)	
Electricity for pumps and fans	290.71	0.517	150.30	(267)	
Electricity for lighting	303.57	0.517	156.95	(268)	
Electricity generated - PVs	-822.62	0.529	-435.16	(269)	
Electricity generated - µCHP	0.00	0.000	0.00	(269)	
Appendix Q -					
Energy saved ():	0.00	0.000	0.00	(270)	
Energy used ():	0.00	0.000	0.00	(271)	
Total CO2, kg/year			731.14	(272)	
				-	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 11.95 (273)

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Project Information Building type Ground-floor flat

Plot number	6		
Reference			
Date	17 June 2016		
Client	Investland	Project	2
		-	10

252 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

1. Overall awening amensions	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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area m² A, m² W/m²K W/K kJ/K Window Q2480 1.42 (1.50) 3.51 (27) air-filled (NorthEast) Window - Double-glazed, 3.380 1.42 (1.50) 4.78 (27) air-filled (SouthEast) Window - Double-glazed, 0.680 1.42 (1.50) 0.96 (27) air-filled (SouthEast) Window Double-glazed, 0.680 1.42 (1.50) 0.51 (27) air-filled (SouthEast) Window Double-glazed, 0.510 1.42 (1.50) 0.51 (27) air-filled (NorthEast) Window Double-glazed, 0.510 1.42 (1.50) 0.72 (27) window Double-glazed, 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window Uindow Uindow Quintified (NorthEast) Quintified (NorthEast) <th><i>3. Heat lo</i> Element</th> <th></th> <th>Gross</th> <th>Ópe</th> <th>erameter enings</th> <th>, Net are A, m²</th> <th></th> <th>value</th> <th>A x U W/K</th> <th></th> <th>appa-valu</th> <th>ue A x K kJ/K</th> <th></th>	<i>3. Heat lo</i> Element		Gross	Ópe	e rameter enings	, Net are A, m ²		value	A x U W/K		appa-valu	ue A x K kJ/K	
Window - Double-glazed, ari-filled (NorthEast) 3.380 1.42 (1.50) 4.78 (27) window - Double-glazed, ari-filled (SouthEast) 0.680 1.42 (1.50) 0.96 (27) window - Double-glazed, ari-filled (SouthEast) 2.480 1.42 (1.50) 3.51 (27) window - Double-glazed, ari-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, ari-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, ari-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, ari-filled (NorthEast) 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, ari-filled (NorthEast) Window - 0.510 1.42 (1.50) 0.72 (27) window - Double-glazed, ari-filled (NorthEast) Window - 0.510 1.42 (1.50) 1.81 (27) Vindow - Double-glazed, ari-filled (NorthEast) Window - 0.510 1.42 (1.50) 1.81 (27) Vindow - Double-glazed, ari-filled (NorthEast) Window - 2.020 1.50 3.03 (28) Party celling 66.70 0.20 <	air-filled (N	NorthE	e-glazed			,					J/111-K	KJ/K	(27)
Window - Double-glazed, air-filled (SouthEast) 0.680 1.42 (1.50) 0.96 (27) Window Window - Double-glazed, air-filled (NouthEast) 2.480 1.42 (1.50) 3.51 (27) Window - Double-glazed, air-filled (NouthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NouthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (NouthEast) 0.510 1.42 (1.50) 0.72 (27) Window - Double-glazed, air-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) Window Ubule-glazed, air-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) Window Ubule-glazed, air-filled (SouthEast) 0.510 1.42 (1.50) 1.81 (27) Window Ubule-glazed, air-filled (SouthEast) 0.50 3.03 (26) 0.00 200 (28) Door Walls 77.90 0.22 17.37 17.00 1324.30 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 (31) Party ceiling 66.70 <t< td=""><td>Window - air-filled (N</td><td>Double NorthE</td><td>ast)</td><td>,</td><td></td><td>3.380</td><td>) 1.4</td><td>42 (1.50)</td><td>4.7</td><td>8</td><td></td><td></td><td>(27)</td></t<>	Window - air-filled (N	Double NorthE	ast)	,		3.380) 1.4	42 (1.50)	4.7	8			(27)
air-filled (SouthEast) 0.510 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window 0.510 1.42 (1.50) 0.72 (27) window Double-glazed, 0.510 1.42 (1.50) 0.72 (27) window Double-glazed, 0.510 1.42 (1.50) 0.72 (27) window Window Window Vindow (27) (27) Window Undow 0.510 1.42 (1.50) 0.72 (27) window Vindow 0.500 1.42 (1.50) 1.81 (27) window Vindow Vindow Vindow (26) 0.00 1.60 733.00 (26) Door Walls 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.00 0.00 180.00 4284.00 (28) Party wall 23.80 0.00 0.00 30.00 2001.00 (31) Total area of external elements Sigma A, m ² 157.94 (31) 431 14946.30 (34) Thermal mass	Window - air-filled (S	Double SouthE	e-glazed	,		0.680	0 1.4	42 (1.50)	0.9	6			(27)
air-filled (NorthEast) Window (27) window Vindow (27) air-filled (NorthEast) Window (27) window Double-glazed, 1.280 1.42 (1.50) 0.72 (27) air-filled (NorthEast) Window 1.280 1.42 (1.50) 1.81 (27) window Full glazed door - 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 (29) Total area of external elements Sigma A, m ² 157.94 (31) 49.76 (33) Fabric heat loss, W/K 49.76 (33) 49.76 (33) Heat capacity 14946.30 (34) 14946.30 (37) Ventilation heat loss calculated monthly 24.08 (35) Effect of thermal bridges 73.45 (37) Ventilation heat loss calculated monthly 103.17 1	air-filled (S	SouthE		,		2.480	0 1.4	42 (1.50)	3.5	1			(27)
air-filled (NorthEast) Window 1.280 1.42 (1.50) 1.81 (27) air-filled (SouthEast) Window 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) Vindow 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) Door Vindow (29) 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 2001.00 2001.00 2001.00 2001.00 2001.00 2001.00 2001.00 201.00 23.80 (36) (31) 49.76 (33) 49.76	air-filled (N	NorthE		3		0.510	0 1.4	42 (1.50)	0.7	2			(27)
air-filled (SouthEast) Window 2.020 1.50 3.03 (26) Double-glazed, air-filled (NorthEast) 000 11.50 3.03 (26) Door Walls 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) (31) 49.76 (33) Heat capacity 14946.30 (34) 49.76 (33) (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss V/m ² K 224.08 (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 (37) Ventilation heat loss calculated monthly 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.1	air-filled (N	NorthE		3		0.510	0 1.4	42 (1.50)	0.7	2			(27)
Double-glazed, air-filled (NorthEast) Door 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss calculated monthly 73.45 (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 39) Heat transfer coefficient, W/K 155 1.55 <td>air-filled (S Window</td> <td>SouthE</td> <td>ast)</td> <td>3</td> <td></td> <td>1.280</td> <td>) 1.4</td> <td>42 (1.50)</td> <td>1.8</td> <td>1</td> <td></td> <td></td> <td>(27)</td>	air-filled (S Window	SouthE	ast)	3		1.280) 1.4	42 (1.50)	1.8	1			(27)
Walls 77.90 0.22 17.37 17.00 1324.30 (29) Ground floors 66.70 0.20 13.34 110.00 7337.00 (28) Party wall 23.80 0.00 0.00 180.00 4284.00 (28) Party ceiling 66.70 0.00 0.00 180.00 4284.00 (28) Party ceiling 66.70 0.00 0.00 30.00 2001.00 (31) Fabric heat loss, W/K 49.76 (33) 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 103.17 </td <td>Double-gla (NorthEas</td> <td>azed, a</td> <td></td> <td></td> <td></td> <td>2.020</td> <td>)</td> <td>1.50</td> <td>3.0</td> <td>3</td> <td></td> <td></td> <td>(26)</td>	Double-gla (NorthEas	azed, a				2.020)	1.50	3.0	3			(26)
Party wall 23.80 0.00 0.00 180.00 4284.00 Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17	Walls												()
Party ceiling 66.70 0.00 0.00 30.00 2001.00 Total area of external elements Sigma A, m ² 157.94 (31) Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m ² K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) Ventilation heat loss calculated monthly 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 29.71 38) Heat transfer coefficient, W/K 103.17													
Fabric heat loss, W/K 49.76 (33) Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 29.71 38) Heat transfer coefficient, W/K 103.17 <td>Party ceili</td> <td>ng</td> <td></td> <td></td> <td></td> <td>66.70</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td>	Party ceili	ng				66.70							0
Heat capacity 14946.30 (34) Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 29.71 38) Heat transfer coefficient, W/K 103.17 105				ments S	igma A,	m²							
Thermal mass parameter, kJ/m²K 224.08 (35) Effect of thermal bridges 23.69 (36) Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 73.45 (37) 29.71 38) Heat transfer coefficient, W/K 103.17 <			VV/IX										()
Total fabric heat loss 73.45 (37) Ventilation heat loss calculated monthly 29.71 (38) Heat transfer coefficient, W/K				r, kJ/m²k	K								8 (35)
Ventilation heat loss calculated monthly 29.71<													
29.71 29.71 <td< td=""><td></td><td></td><td></td><td>ulated m</td><td>onthly</td><td></td><td></td><td></td><td></td><td></td><td></td><td>73.4</td><td>5 (37)</td></td<>				ulated m	onthly							73.4	5 (37)
103.17 103.17						29.71	29.71	29.71	29.71	29.71	29.71	29.71	(38)
103.17 (39) Heat loss parameter (HLP), W/m²K 1.55 <t< td=""><td>Heat trans</td><td>sfer co</td><td>efficient,</td><td>W/K</td><td>1</td><td>1</td><td>1</td><td></td><td>1</td><td>1</td><td>1</td><td>1</td><td></td></t<>	Heat trans	sfer co	efficient,	W/K	1	1	1		1	1	1	1	
Heat loss parameter (HLP), W/m²K 1.55 <td>103.17 1</td> <td>03.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td>103.17</td> <td></td> <td></td>	103.17 1	03.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17		
HLP (average) 1.55 (40) Number of days in month (Table 1a) 1.55 (40) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Heat loss	param	eter (HL	P), W/m [;]	²K							103.1	7 (39)
Number of days in month (Table 1a)JanFebMarAprMayJunJulAugSepOctNovDec			1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			in month	ı (Table '	1a)							1.5	5 (40)
				· ·	,	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
					-			-					

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Assume	r heating d occupa average	ancy, N	•		or day \	/d avera	ne				kWh/yea ı 2.16 85.58	r (*
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(
	er usage	in litres					-3			_		
94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14	(
Energy	content c	of hot wa	ter used			1				1		
139.94	122.39	126.30	110.11	105.65	91.17	84.48	96.95	98.10	114.33	124.80	135.52	
Energy content (annual) 1349.75 Distribution loss												
20.99	18.36 er storag	18.94	16.52	15.85	13.68	12.67	14.54	14.72	17.15	18.72	20.33	(
Volume Temper Energy	er cylinde factor ature fac lost from prage los	tor store (k	·	•							0.0000 0.0000 0.0000 0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Net stor	age loss	1	1	1	1	1	1	1	1	1		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Primary Primary	circuit lo loss	ss (annu	ial)								0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Combi l	oss calcı	lated fo	r each m	onth	-							
47.97	41.75	44.48	41.36	40.99	37.98	39.25	40.99	41.36	44.48	44.74	47.97	(
	at requir								1	1		
	164.15						137.94	139.46	158.81	169.54	183.50	
	rom wate											
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54		
Heat da	ins from	water he	eating, k\	Nh/mont	h						1863.10	
58.52	51.13	53.11	46.95	45.38	39.81	37.90	42.48	42.96	49.14	52.68	57.05	
	1	I	1	I	I	I	1	1	I	1		

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5. Internal gains

	5	_									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81	129.81
Lighting	gains									•	
43.57	38.70	31.47	23.82	17.81	15.04	16.25	21.12	28.34	35.99	42.00	44.78
Applianc	ces gains	3	•				•				
282.80	285.73	278.34	262.60	242.72	224.05	211.57	208.63	216.03	231.77	251.64	270.32
Cooking	gains		•		•		•	•	•		
50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14	50.14
Pumps a	and fans	gains	•	•	•		•	•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•	•	•		
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54
Water h	eating ga	ains	•				•				
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69
Total int	ernal gai	ns	•				•				
508.44	503.94	484.61	455.04	424.94	397.79	382.17	390.26	407.45	437.22	470.23	495.20

6. Solar gains (calculation for January)

or colar game (carcalation for canaary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 2.480 11.51	0.76 x 0.70	0.77	10.5236
Window - Double-glazed, air-filled (NorthEast) Window adjacent door	0.9 x 3.380 11.51	0.76 x 0.70	0.77	14.3426
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.480 37.39	0.76 x 0.70	0.77	34.1842
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.280 37.39	0.76 x 0.70	0.77	17.6434
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations	Area	g	FF x Shadi	ng

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7. Mean internal temperature

Temperature during he	ating perio	ods in the	e living ar	rea, Th1	(°C)	
Heating system respon	siveness					

Apply adjustment to the mean internal temperature, where appropriate

20.02

20.16

19.75

Heating	system	respons	iveness		•						0.75	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau		•	•	•	•	•			•	•		
40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	
alpha	-	•	•	1	•	•		•	•	•		
3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	
Utilisati	on factor	for gain	s for livin	ig area	•		_	•		•		
0.99	0.98	0.96	0.91	0.81	0.65	0.47	0.50	0.77	0.93	0.98	0.99	
Mean ir	nternal te	mperatu	re in livir	ng area T	1		-			-		
19.75	19.88	20.14	20.40	20.68	20.85	20.91	20.91	20.78	20.45	20.00	19.76	
Temper	rature du	ring hea	ting perio	ds in re	st of dwe	lling Th	2			•		
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	
Utilisati	on factor	for gain	s for rest	of dwell	ing	•				•		
0.98	0.97	0.94	0.88	0.75	0.54	0.32	0.35	0.67	0.90	0.97	0.98	
Mean ir	nternal te	mperatu	re in the	rest of d	welling 7	2	_	-	-			
18.55	18.68	18.93	19.18	19.43	19.55	19.58	19.58	19.51	19.23	18.80	18.57	
0	rea fract	(,	1	1		-			0.47	
Mean ir	nternal te	mperatu	re (for th	e whole	dwelling)	_	_	_			
19.12	19.24	19.50	19.75	20.02	20.16	20.21	20.20	20.11	19.81	19.37	19.13	
	12 1								•	•		

21.00

(85)

(93)

8. Space heating requirement

19.50

19.24

19.12

er epae	e neathig	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5					1			
0.98	0.97	0.94	0.89	0.77	0.58	0.38	0.41	0.70	0.90	0.97	0.98
Useful g	ains										
594.48	662.86	711.39	749.92	692.46	529.44	334.44	332.55	512.75	587.34	572.07	566.73
Monthly	average	external	l tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
1507.82	1469.60	1309.94	1140.04	858.30	573.78	341.07	340.84	599.48	929.06	1275.9 ⁻	1468.02
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55
	ace heat					ar) (Octo	ober to N	/lay)			3502.8
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						52.5

20.21

20.20

20.11

19.81

19.37

19.13

8c. Space cooling requirement - not applicable

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Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

9a. Energy requirements

9a. Energy	requirement	S								kWh/year	
Fraction of	ary heating sys space heat fro f main heating	om main	system(s)				1.0000 4.80%		,	(202) (206)
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heat	ing requireme	nt									
679.53 54	2.13 445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	(98)
Appendix Q	- monthly en	ergy sav	ed (mair	heating	system	1)			•		
0.00 0.0	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heat	ing fuel (main	heating	system	1)					•		
716.80 57	1.87 469.75	296.29	130.15	-	-	-	-	268.19	534.56	707.34	(211)
Appendix Q	- monthly en	ergy sav	ed (mair	heating	system	2)			•		
0.00 0.0	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heat	ing fuel (main	heating	system	2)					•		
0.00 0.0	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q	- monthly en	ergy sav	ed (seco	ndary he	eating sy	stem)			•		
0.00 0.0	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heat	ing fuel (seco	ndary)							•		
0.00 0.0	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heati Water heati	ng ng requireme	nt									
187.91 16	4.15 170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(64)
Efficiency o	f water heater	•								80.20	(216)
87.90 87	.73 87.25	86.48	84.52	80.20	80.20	80.20	80.20	86.13	87.54	87.92	(217)
Water heati	ng fuel									11	
213.78 18	7.10 195.73	175.14	173.51	161.04	154.28	171.99	173.89	184.39	193.68	208.71	(219)
Space heat Space heat Water heati	Annual totals kWh/y Space heating fuel used, main system 1 3694.9 Space heating fuel (secondary) 0.0							kWh/year 3694.95 0.00 2193.23	(211) (215) (219)		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year						49.21 130.00 45.00 224.21 307.77	(230a) (230c) (230e) (231) (232)				
PVs 0.80 PVs 0.80 PVs 0.80	x 1.070 x 961 x 0.000 x 0.00 x 0.000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
Appendix Q Energy sa Energy us	aved or genera	ated ():								0.000 0.000	(236a) (237a)
Total delive	red energy fo	r all uses	6							5597.55	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	3694.946	3.100	114.54	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2193.23	3.100	67.99	(247)
Mech vent fans cost	49.215	11.460	5.64	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	307.767	11.460	35.27 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			255.23	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy boot denator	0.17	(_00)
Energy cost factor (ECF)	1.07	(257)
SAP value	85.02	
SAP rating	85	(258)
SAP band	В	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	3694.95	0.198	731.60	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2193.23	0.198	434.26	(264)
Space and water heating			1165.86	(265)
Electricity for pumps and fans	224.21	0.517	115.92	(267)
Electricity for lighting	307.77	0.517	159.12	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1005.73	(272)
			kg/m²/yea	r
CO2 emissions per m ²			15.08	(273)

n

15.08 (273)87.93 (273a) 88 (274)В

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13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year	۸
Space heating, main	3694.95	1.020	3768.85	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2193.23	1.020	2237.10	(264)
Space and water heating			6005.94	(265)
Electricity for pumps/fans	224.21	2.920	654.71	(267)
Electricity for lighting	307.77	2.920	898.68	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			5157.29	(272)
Primary energy kWh/m²/year			77.32	(273)

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Project Information Building type Ground-floor flat

Duliding type		iai	
Plot number Reference	6		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

Z. Vem	Παιιοπτά	ale									m ³ per h	our
							main + s heating	eondar	y + othe	er		
Numbe Numbe Numbe	r of chim r of open r of inter r of pass	i flues mittent fa ive vents	S				0 + 0 + 0 0 + 0 + 0 2 0		x 40 x 20 x 10 x 10		0.00 0.00 20.00 0.00	(6a) (6b) (7a) (7b)
Numbe	r of fluele	ess gas f	fires				0		x 40		0.00	(7c)
Pressur Air perr Numbe Shelter Infiltrati	on due to re test, re neability r of sides factor on rate in on rate n	esult q50 s on whic ncorpora) ch shelte ting she	red Iter facto	r				10.00		Air chan 0.11 0.61 2.00 0.85 0.52	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	/ average			n Table	7			_				
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind F	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)		-		13.53	(22a)
0.70	0.66	0.66	0.58	0.53	0.51	0.48	0.48	0.55	0.58	0.62	0.66	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.02	(22b)
0.75	0.72	0.72	0.67	0.64	0.63	0.62	0.62	0.65	0.67	0.69	0.72	(25)

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<i>3. Heat losses and heat I</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	loss paramete Openings m²	r Net are A, m² 14.82	W/	/alue m²K 5 (2.00)	A x U W/K 27.4	5			(27)
Solid door - Double-glazed air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	1,	1.850)	2.00	3.7	0			(26)
Walls Ground floors Party wall Party ceiling		74.57 66.70 23.80 66.70))	0.35 0.25 0.00 0.00	26.1 16.6 0.0 0.0	8 0			(29) (28)
Total area of external elem Fabric heat loss, W/K Heat capacity Thermal mass parameter, Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcul	kJ/m²K	m²						157.9 73.9 13622.0 250.0 17.3 91.3	3 (33) 0 (34) 0 (35) 7 (36)
44.32 42.75 42.75 3	39.86 38.14	37.34	36.57	36.57	38.55	39.86	41.26	42.75	(38)
Heat transfer coefficient, V	V/K								
135.62 134.05 134.05 1	131.16 129.44	128.64	127.87	127.87	129.85	131.16	132.56	134.05	_ /
Heat loss parameter (HLP)), W/m²K							131.3	6 (39)
2.03 2.01 2.01 1	1.97 1.94	1.93	1.92	1.92	1.95	1.97	1.99	2.01	
HLP (average) Number of days in month ((Table 1a)							1.9	7 (40)
Jan Feb Mar A	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 3	30 31	30	31	31	30	31	30	31	

SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	e r heating ed occupa average	ancy, N	•		oer dav V	/d avera	ne				kWh/yea 2.16 90.09
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	er usage		•	,		••••	1.0.9	Cob	•••		200
99.09	95.49	91.89	88.28	84.68	81.08	81.08	84.68	88.28	91.89	95.49	99.09
Energy	content c	of hot wa	ter used	I	1	I				1	
147.31	128.83	132.95	115.90	111.21	95.97	88.93	102.05	103.27	120.35	131.37	142.66
	content (tion loss	annual)								1	1420.79
22.10	19.33 er storag	19.94	17.39	16.68	14.40	13.34	15.31	15.49	18.05	19.71	21.40 150.00
Volume	er cylinde factor	51 1055 14		n/uay)							0.0191 0.9283
Energy I	ature fac lost from orage los	hot wate	er cylinde	er (kWh/	day)						0.5400 1.44
Energy		hot wate	er cylinde	er (kWh/	day) 43.09	44.53	44.53	43.09	44.53	43.09	
Energy Total sto 44.53	lost from orage los	hot wate s 44.53				44.53	44.53	43.09	44.53	43.09	1.44
Energy Total sto 44.53	lost from orage los 40.22	hot wate s 44.53				44.53 44.53	44.53 44.53	43.09	44.53 44.53	43.09	1.44
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09 43.09	44.53	43.09						1.44 44.53
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09 43.09	44.53	43.09						1.44 44.53 44.53
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81	lost from prage los 40.22 age loss 40.22 circuit lo loss	hot wate s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28	43.09 43.09 aal) 50.14 ater heat 209.13	44.53 44.53 51.81 ing calcu 207.55	43.09 43.09 50.14 Jated for 189.20	44.53 51.81 each m 185.27	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28	43.09 43.09 aal) 50.14 ater heat 209.13	44.53 44.53 51.81 ing calcu 207.55	43.09 43.09 50.14 Jated for 189.20	44.53 51.81 each m 185.27	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64 Output f	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85	hot wate s 44.53 44.53 ss (annu 51.81 ed for wa 229.28 er heater	43.09 43.09 (al) 50.14 ater heat 209.13 for each	44.53 44.53 51.81 ing calcu 207.55 n month,	43.09 43.09 50.14 Jated for 189.20 kWh/mc	44.53 51.81 each m 185.27	44.53 51.81 onth	43.09 50.14 196.50	44.53 51.81 216.68	43.09 50.14	1.44 44.53 610.00 51.81 238.99 238.99
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 243.64 Output f 243.64	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 215.85 from wate	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 229.28 er heater 229.28	43.09 43.09 al) 50.14 ater heat 209.13 for each 209.13	44.53 51.81 ing calcu 207.55 month, 207.55	43.09 43.09 50.14 Jlated for 189.20 kWh/mo 189.20	44.53 51.81 r each m 185.27 onth	44.53 51.81 onth 198.38	43.09 50.14 196.50	44.53 51.81 216.68	43.09 50.14 224.60	1.44 44.53 610.00 51.81 238.99

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5. Internal gains

	u gun										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts				•				•	
108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17
Lighting	gains			•							
28.72	25.51	20.74	15.70	11.74	9.91	10.71	13.92	18.68	23.72	27.69	29.52
Appliand	ces gains	3									
189.48		186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12
Cooking	gains										
33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82
Pumps	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54
Water h	eating ga	ains									
169.42	167.33	163.00	157.11	153.29	147.91	143.33	149.19	151.28	157.37	164.25	167.34
Total int	ernal gai	ns									
453.06	449.73	435.68	414.21	393.11	373.38	361.24	368.35	380.15	401.83	425.99	443.43

6. Solar gains (calculation for January)

e. Colar gams (calculation for bandary)	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)		9.87 0.72 x 0.70	0	102.8993	
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	0.9 x 1.850 0.0	00 0.72 x 0.70	0.77	0.0000	
Reference Door Total solar gains, January				102.90	(83-1)
Solar gains					
102.90 199.45 318.78 473.32 575.89 60	0.91 583.25 5	507.62 381.12 2	42.89 127.93	84.88	(83)
Total gains	i i		ı		
555.96 649.18 754.47 887.52 969.00 97	4.29 944.50 8	375.97 761.27 6	644.72 553.93	528.31	(84)
Lighting calculations					
	Area	g	FF x Shac	ling	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 14.83	0.80	0.70 x 0.8	3 6.20	
GL = 6.20 / 66.70 = 0.093					
C1 = 0.850 C2 = 0.960					
El = 507					

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7. Mean internal temperature

Temper	ature du system		ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau			•			•		•				
34.15	34.55	34.55	35.32	35.79	36.01	36.22	36.22	35.67	35.32	34.94	34.55	
alpha			•			•		•	•		<u> </u>	
3.28	3.30	3.30	3.35	3.39	3.40	3.41	3.41	3.38	3.35	3.33	3.30	
Utilisatio	on factor	for gains	s for livin	g area				•		•		
0.99	0.99	0.97	0.93	0.85	0.70	0.52	0.55	0.82	0.95	0.99	0.99	(86)
Mean in	ternal te	mperatu	re in livin	g area T	1			•				
18.95	19.17	19.57	20.04	20.53	20.83	20.96	20.95	20.70	20.11	19.40	19.01	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2	•				
19.32	19.33	19.33	19.36	19.38	19.39	19.40	19.40	19.38	19.36	19.35	19.33	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing			•		•		
0.99	0.98	0.96	0.91	0.78	0.58	0.33	0.36	0.71	0.93	0.98	0.99	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2		•				
17.55	17.77	18.17	18.64	19.09	19.32	19.39	19.39	19.23	18.72	18.01	17.61	(90)
	rea fracti ternal te				dwelling)					0.47	7 (91)
18.21	18.43	18.83	19.30	19.77	20.03	20.13	20.12	19.92	19.38	18.67	18.27	(92)
Apply ad	djustmen	t to the r	nean int	ernal ten	peratur	e, where	appropr	iate		•		
18.21	18.43	18.83	19.30	19.77	20.03	20.13	20.12	19.92	19.38	18.67	18.27	(93)

8. Space heating requirement

JanFebMarAprMayJunJulAugSepOctNovUtilisation factor for gains	Dec
Utilisation factor for gains	
0.99 0.98 0.96 0.91 0.80 0.63 0.42 0.45 0.76 0.93 0.9	0.99
Useful gains	
548.46 634.72 720.54 804.49 775.11 615.63 398.61 394.87 574.90 598.03 542	14 521.69
Monthly average external temperature	
4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.0	4.90
Heat loss rate for mean internal temperature	
1859.42 1800.04 1612.72 1389.82 1044.13 698.62 412.73 412.11 730.08 1124.73 154	6.48 1792.50
Space heating requirement for each month, kWh/month	·
975.35 783.10 663.78 421.44 200.15 391.86 723	13 945.48
Total space heating requirement per year (kWh/year) (October to May)	5104.2
Space heating requirement per m ² (kWh/m ² /year)	76.5

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9a. Energy requirements

Fractior	n of heat of spac		ondary s		(s)				0.1000 0.9000		kWh/year	(201) (202)
Efficien	cy of mai	in heating	g system		(0)			7	8.90% 00.00%			(206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	heating re	equireme	ent								11	
975.35	783.10	663.78	421.44	200.15	-	-	-	-	391.86	723.13	945.48	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)				11	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1]	
1112.57	893.27	757.17	480.73	228.31	-	-	-	-	446.99	824.86	1078.49	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ondary he	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)			•		1				
97.54	78.31	66.38	42.14	20.01	-	-	-	-	39.19	72.31	94.55	(215)
Water h												
	eating re			1	1	1		1				
	215.85			207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(64)
	cy of wat										68.80	(216)
76.46	76.27	75.81	74.99	73.15	68.80	68.80	68.80	68.80	74.73	76.04	76.44	(217)
	eating fu	-		1	1	1		1				
318.65	282.99	302.43	278.89	283.73	275.00	269.28	288.35	285.60	289.97	295.38	312.66	(219)
Space h Water h	neating fu neating fu neating fu	uel (seco iel	ndary)		on hot						kWh/year 5822.38 510.43 3482.93	(211) (215) (219)
centra boiler Total ele Electrici	ity for pur I heating with a far ectricity f ity for ligh saving/g	pump n-assiste or the ab nting (30	d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 507.17	(230c) (230e) (231) (232)
Energ	ly saved ly used ()		ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							10497.91	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission: kg CO2/ye	-
Space heating, main system 1	5822.38	0.194	1129.54	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	510.43	0.422	215.40	(263)
Water heating	3482.93	0.194	675.69	(264)
Space and water heating			2020.63	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	507.17	0.422	214.03	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2308.51	(272)
			kg/m²/yea	r
Emissions per m ² for space and water heating			31.40	(272a)
Emissions per m ² for lighting			3.21	(272b)
Emissions per m ² for pumps and fans			1.11	(272c)
Target Carbon Dioxide Emission Rate (TER)			21.59	(273)

= [(31.4015 x 1.0000 x 1.0206) + (3.2088 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Duliuling type		ιαι	
Plot number Reference	6		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	66.70	2.70	180.09	(3a)
Total floor area	66.70			(4)
Dwelling volume (m ³)			180.09	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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3. Heat loss	es and hea	t loss pa	rameter	r							
Element	Gross		enings	Net are		value	A x U		appa-valu		
Window - Do	area, m uble-glazed			A, m ² 1.280		/m²K 12 (1.50)	W/K 1.8		J/m²K	kJ/K	(27)
air-filled (Sou		-,		0		((=-)
Window								~			(07)
Window - Do		d,		0.510) 1.4	42 (1.50)	0.7	2			(27)
air-filled (Nor Window	incasi)										
Window - Do	uble-glazed	ł,		0.510) 1.4	42 (1.50)	0.7	2			(27)
air-filled (Nor						. ,					()
Window											(07)
Window - Do air-filled (Sou		1,		2.480) 1.4	42 (1.50)	3.5	1			(27)
Window	incasi)										
Window - Do	uble-glazec	ł,		0.680) 1.4	42 (1.50)	0.9	6			(27)
air-filled (Sou	thEast)					. ,					. ,
Window				0.00			4 7	0			(07)
Window - Do air-filled (Nor		1,		3.380	J 1.4	42 (1.50)	4.7	8			(27)
Window ad											
Window - Do				2.48) 1.4	42 (1.50)	3.5	1			(27)
air-filled (Nor	thEast)										
Window				0.000	.	1 50	2.0	0			(06)
Full glazed d Double-glaze				2.020	J	1.50	3.0	3			(26)
(NorthEast)	a, an mea										
Door											
Walls				77.90		0.22	17.3		17.00	1324.30	()
Ground floor Party wall	3			66.70 23.80		0.20 0.00	13.3 0.0		110.00 180.00	7337.00 4284.00	
Party ceiling				66.70		0.00	0.0		30.00	2001.00	
i alty comig					-	0.00	0.0	•	00100		
Total area of		ements S	igma A,	m²						157.94	
Fabric heat le Heat capacit										49.76 14946.30	
Thermal mas		er, kJ/m²ł	<							224.08	· · ·
Effect of ther			·							23.69	
Total fabric h										73.4	5 (37)
Ventilation he				1			1				()
29.71 29.7		29.71	29.71	29.71	29.71	29.71	29.71	29.71	29.71	29.71	(38)
Heat transfer		,	1	1		- <u>_</u>	1				
103.17 103	.17 103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17	103.17		- ()
Heat loss pa	amotor (HI	P) W/m	214							103.17	7 (39)
1.55 1.55	•	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (averag		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.5	5 (40)
Number of da		h (Table	1a)								(10)
Jan Feb	-	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28	31	30	31	30	31	31	30	31	30	31	
L			1	1	I	1	1		1	· · · · · · · · · · · · · · · · · · ·	

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Assume	d occupa	ancy, N	/ <i>require</i> r usage i		oer day V	/d,averag	ge				kWh/year 2.16 85.58	(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres	per day f	or each	month	1	1	1		1		
94.14	90.72	87.29	83.87	80.45	77.02	77.02	80.45	83.87	87.29	90.72	94.14	(44
Energy of	content o	f hot wa	ter used	1	I		1		1		<u>. </u>	
139.94	122.39	126.30	110.11	105.65	91.17	84.48	96.95	98.10	114.33	124.80	135.52	
Energy o Distribut		annual)									1349.75	(45
20.99	18.36	18.94	16.52	15.85	13.68	12.67	14.54	14.72	17.15	18.72	20.33	(46
Hot wate Volume Tempera Energy le	factor ature fac	er loss fa tor store (k'	e (litres) actor (kW Wh/day)	(h/day)							0.00 0.0000 0.0000 0.0000 0.000	(50 (51 (52 (53 (55
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56
Net stora	age loss							•				
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57
Primary Primary	circuit lo loss	ss (annı	ial)								0.00	(58
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59
Combi lo	oss calcu	lated for	r each m	onth			•					
47.97	41.75	44.48	41.36	40.99	37.98	39.25	40.99	41.36	44.48	44.74	47.97	(61
Total he	at requir	ed for wa	ater heat	ing calcu	lated fo	r each m	onth					
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(62
Output fi	rom wate	er heater	for each	n month,	kWh/mo	onth						
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(64
			eating, k\								1863.10	(64
58.52	51.13	53.11	46.95	45.38	39.81	37.90	42.48	42.96	49.14	52.68	57.05	(65

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5. Internal gains

	5										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17	108.17
Lighting	gains		•								
17.43	15.48	12.59	9.53	7.12	6.01	6.50	8.45	11.34	14.40	16.80	17.91
Applianc	ces gains	5									
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12
Cooking	gains										
33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82	33.82
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)						•	
-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54	-86.54
Water h	eating ga	ains									
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69
Total int	ernal gai	ns				•				•	
351.01	348.46	335.92	316.13	296.19	276.87	264.65	270.78	281.19	301.18	324.02	341.17

6. Solar gains (calculation for January)

or colar game (calculation for calluary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.280 37.39	0.76 x 0.70	0.77	17.6434
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 0.510 11.51	0.76 x 0.70	0.77	2.1641
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.480 37.39	0.76 x 0.70	0.77	34.1842
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (NorthEast) Window adjacent door	0.9 x 3.380 11.51	0.76 x 0.70	0.77	14.3426
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 2.480 11.51	0.76 x 0.70	0.77	10.5236
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations	Aroo	a	EE y Shadi	20
	Area	g	FF x Shadi	ng

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Temper	n interna ature du system	ring hea	ting perio	ods in th	e living a	irea, Th1	(°C)				21.00 0.75	(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	•					•	•	•	•			
40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	40.24	
alpha	•					•	•	•	•			
3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	
Utilisatio	on factor	for gain	s for livin	g area								
0.99	0.99	0.98	0.94	0.86	0.71	0.53	0.57	0.84	0.96	0.99	1.00	(
Mean ir	iternal te	mperatu	re in livir	ig area 1	Γ1			-		-1		
19.59	19.73	20.00	20.29	20.62	20.82	20.90	20.89	20.73	20.33	19.86	19.61	(
Temper	ature du	ring hea	ting perio	ds in re	st of dwe	lling Th	2			1		
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(
Utilisatio	on factor	for gain	s for rest	of dwel	ling			1		1	11	
0.99	0.99	0.97	0.92	0.81	0.61	0.37	0.40	0.75	0.94	0.99	0.99	(
Mean ir	iternal te	mperatu	re in the	rest of c	welling ⁻	Г2	1		1	1		
18.39	18.53	18.80	19.08	19.38	19.53	19.58	19.58	19.48	19.13	18.66	18.41	(
	rea fract nternal te				dwelling)	1	-			0.47	(
18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(
Apply a	djustmer	t to the	mean int	ernal ter	nperatur	e, where	approp	riate	1	1		
18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(

8. Space heating requirement

	••	9.09	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	3								
0.99	0.98	0.97	0.92	0.82	0.65	0.44	0.47	0.78	0.94	0.99	0.99
Useful gains											
446.16	521.81	588.16	654.69	637.72	509.13	330.32	326.95	470.33	487.54	438.79	420.94
Monthly	average	externa	l tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
1491.32	1453.83	1296.06	1129.27	852.18	571.53	340.56	340.14	594.75	917.78	1261.02	1451.80
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96
	ace heat					ar) (Octo	ober to N	lay)			4110.9
Space h	leating re	equireme	ent per m	² (kWh/r	n²/year)						61.6

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	urement	[S								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system(s)				1.0000 4.80%		-	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	neating re	equireme	ent						•			
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)				,	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	neating fu	iel (main	heating	system	1)		•				,	
820.25	660.67	555.57	360.44	168.31	-	-	-	-	337.66	624.47	809.03	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)				,	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	neating fu	iel (main	heating	system	2)	•	•	•			,	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)	1	•		1	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	iel (seco	ndary)			•		4				
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
<u>Water h</u> Water h		quireme	nt							•		
187.91	164.15	170.78	151.47	146.65	129.15	123.73	137.94	139.46	158.81	169.54	183.50	(64)
Efficiend	by of wat	er heatei	r								80.20	(216)
88.14	88.00	87.60	86.94	85.16	80.20	80.20	80.20	80.20	86.68	87.84	88.16	(217)
Water h	eating fu	iel										
213.20	186.53	194.96	174.23	172.20	161.04	154.28	171.99	173.89	183.22	193.01	208.15	(219)
Space h Water h	neating fu neating fu neating fu		ndary)		en-hot						kWh/year 4336.41 0.00 2186.70	(211) (215) (219)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)49.21 49.21(2 130.00(2 130.00(2 2 130.00(2 2 130.00(2 2 224.21(2 2 224.21(2 2 224.21(2 2 224.21(2 										(230a) (230c) (230e) (231) (232)		
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	eneratior 170 x 961 100 x 0.00 100 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							6232.48	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

Eporav	Emission factor	Emission	~
kWh/year	kg CO2/kWh	kg CO2/ye	-
4336.41	0.198	858.61	(261)
0.00	0.000	0.00	(262)
0.00	0.517	0.00	(263)
2186.70	0.198	432.97	(264)
		1291.58	(265)
224.21	0.517	115.92	(267)
307.77	0.517	159.12	(268)
-822.62	0.529	-435.16	(269)
0.00	0.000	0.00	(269)
			, ,
0.00	0.000	0.00	(270)
0.00	0.000	0.00	(271)
		1131.45	(272)
			. ,
	4336.41 0.00 0.00 2186.70 224.21 307.77 -822.62 0.00 0.00	kWh/year kg CO2/kWh 4336.41 0.198 0.00 0.000 0.00 0.517 2186.70 0.198 224.21 0.517 307.77 0.517 -822.62 0.529 0.00 0.000 0.00 0.000	kWh/year kg CO2/kWh kg CO2/y 4336.41 0.198 858.61 0.00 0.000 0.00 0.00 0.517 0.00 2186.70 0.198 432.97 1291.58 1291.58 224.21 0.517 159.12 .822.62 0.529 -435.16 0.00 0.000 0.00 0.00 0.000 0.00

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 16.96 (273)

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Project Information Building type Ground-floor flat

Plot number	7		
Reference			
Date	17 June 2016		
Client	Investland	Project	252 L or

2 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

1. Overall awening amensions	Area (m ²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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3. Heat losses and heat l			lluchus	A I I			
Element Gross area, m ²	Openings m ²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A X K kJ/K	
Window - Double-glazed, air-filled (SouthEast)		2.310	1.42 (1.50)	3.27	Ko/m K	K0/1X	(27)
Window Window - Double-glazed, air-filled (SouthEast) Window		2.310	1.42 (1.50)	3.27			(27)
Window - Double-glazed, air-filled (SouthEast) Window		0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.320	1.42 (1.50)	1.87			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.680	1.42 (1.50)	2.38			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.080	1.42 (1.50)	1.53			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.200	1.42 (1.50)	1.70			(27)
Window - Double-glazed, air-filled (NorthEast) Window		3.090	1.42 (1.50)	4.37			(27)
Window - Double-glazed, air-filled (NorthEast) Window		3.190	1.42 (1.50)	4.51			(27)
Window - Double-glazed, air-filled (NorthWest) Window		3.780	1.42 (1.50)	5.35			(27)
Window - Double-glazed, air-filled (NorthWest) Window		1.370	1.42 (1.50)	1.94			(27)
Window - Double-glazed, air-filled (NorthWest) Window		0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled (NorthWest) Window		1.200	1.42 (1.50)	1.70			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door		2.020	1.50	3.03			(26)
Walls Ground floors Party wall		80.12 83.30 7.30	0.22 0.20 0.00	17.87 16.66 0.00	190.00 110.00 70.00	15222.80 9163.00 511.00	(29) (28)
Party ceiling		83.30	0.00	0.00	30.00	2499.00	

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3. Heat losses and heat loss parameter												
Element		Gross	Ope	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W	′m²K	W/K	kJ	/m²K	kJ/K	
Fabric heat loss, W/K71.36Heat capacity27395.80Thermal mass parameter, kJ/m²K328.88Effect of thermal bridges28.40Total fabric heat loss99.76Ventilation heat loss calculated monthly												6 (33) 60 (34) 68 (35) 60 (36)
37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	(38)
Heat tra	nsfer co	efficient,	W/K									
136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	
Heat los	s param	eter (HL	P), W/m [;]	²K	•					•	136.8	37 (39)
1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	
HLP (average) 1.64 (40										64 (40)		
Number of days in month (Table 1a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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	<i>r heatin</i>		require	ements							kWh/yea 2.52
	average		r usage	in litres p	oer day V	/d,avera	ge				94.11
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day t	for each	month						
103.52	99.76	95.99	92.23	88.46	84.70	84.70	88.46	92.23	95.99	99.76	103.52
Energy	content c	of hot wa	ter used								
153.88	134.59	138.88	121.08	116.18	100.26	92.90	106.61	107.88	125.72	137.24	149.03
Energy of Distribut	content (tion loss	annual)									1484.25
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35
Volume Tempera Energy I	er cylinde factor ature fac lost from prage los	tor store (k	·								0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stor	age loss							•			·
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annu	ial)	•		•				•	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi lo	oss calcı	lated for	r each m	onth							
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96
Total he	at requir	ed for wa	ater heat	ing calcı	ulated fo	r each m	ionth				
	180.50						151.69	153.36	174.64	186.43	199.99
Output f	rom wate										
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99
Heat ga	ins from	water he	eating, k	Nh/mont	h						2045.16
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29
L	1		1	1	1	1	1	1		1	

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5. Internal gains

	5										
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35	151.35
Lighting	gains	•	•								
50.41	44.78	36.42	27.57	20.61	17.40	18.80	24.44	32.80	41.64	48.61	51.82
Applianc	es gains	5									
337.61	341.11	332.29	313.49	289.77	267.47	252.57	249.07	257.90	276.69	300.42	322.71
Cooking	gains										
52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66	52.66
Pumps a	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water heating gains											
85.90	83.67	78.51	71.71	67.07	60.80	56.02	62.79	65.61	72.62	80.46	83.73
Total int	ernal gai	ns									
587.03	582.67	560.31	525.88	490.55	458.78	440.50	449.40	469.41	504.07	542.59	571.36

6. Solar gains (calculation for January)

o. Colar gains (calculation for bandary)		~ 0 ГГ	Chadina	Caina
Window - Double-glazed, air-filled (SouthEast) Window	Area & Flux 0.9 x 2.310 37.39	g & FF 0.76 x 0.70	Shading 0.77	Gains 31.8409
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.310 37.39	0.76 x 0.70	0.77	31.8409
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.320 37.39	0.76 x 0.70	0.77	18.1948
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.680 37.39	0.76 x 0.70	0.77	23.1570
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.080 37.39	0.76 x 0.70	0.77	14.8867
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.200 37.39	0.76 x 0.70	0.77	16.5407
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.090 11.51	0.76 x 0.70	0.77	13.1120
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.190 11.51	0.76 x 0.70	0.77	13.5364

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6. Solar gains (calculation for January)			.		
Window Double placed air filled	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled (NorthWest)	0.9 x 3.780 11.51	0.76 x 0.70	0.77	16.0399	
Window					
Window - Double-glazed, air-filled	0.9 x 1.370 11.51	0.76 x 0.70	0.54	4.0769	
(NorthWest)					
Window Window Davida stand air fillad	0.00.000.11.51	0.700.70	0.54	0.0000	
Window - Double-glazed, air-filled (NorthWest)	0.9 x 0.680 11.51	0.76 x 0.70	0.54	2.0236	
Window					
Window - Double-glazed, air-filled	0.9 x 1.200 11.51	0.76 x 0.70	0.54	3.5710	
(NorthWest)					
Window	0.00.000.11.51	0.700.70	0.77	0 5740	
Full glazed door - Double-glazed, air-filled (NorthEast)	0.9 x 2.020 11.51	0.76 X 0.70	0.77	8.5716	
Door					
Total solar gains, January				206.77	(83-1)
Solar gains					
	64.90 932.17 810.	14 633.64 438	.95 251.74	174.18	(83)
Total gains					、
793.79 955.97 1106.53 1288.46 1407.84 1	423.68 1372.68 1259	0.55 1103.05 943	.02 794.33	745.54	(84)
					、
Lighting calculations					
Lighting calculations	Area	g	FF x Shad		
Window - Double-glazed, air-filled	Area 0.9 x 2.31	g 0.80	FF x Shad 0.70 x 0.83		
Window - Double-glazed, air-filled (SouthEast)		g 0.80			
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31		0.70 x 0.83	3 0.97	
Window - Double-glazed, air-filled (SouthEast)		g 0.80 0.80		3 0.97	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31	0.80	0.70 x 0.83	3 0.97 3 0.97	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window	0.9 x 2.31		0.70 x 0.83	3 0.97 3 0.97	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 2.31 0.9 x 2.31	0.80	0.70 x 0.83	3 0.97 3 0.97	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68	0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window	0.9 x 2.31 0.9 x 2.31	0.80	0.70 x 0.83	3 0.97 3 0.97 3 0.28	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68	0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68	0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32	0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68	0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32	0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68	0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68	0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70 3 0.45	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68 0.9 x 1.08	0.80 0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70 3 0.45	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68 0.9 x 1.08 0.9 x 1.20	0.80 0.80 0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70 3 0.45 3 0.50	
Window - Double-glazed, air-filled (SouthEast) Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.31 0.9 x 2.31 0.9 x 0.68 0.9 x 1.32 0.9 x 1.68 0.9 x 1.08	0.80 0.80 0.80 0.80 0.80	0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83 0.70 x 0.83	3 0.97 3 0.97 3 0.28 3 0.55 3 0.70 3 0.45 3 0.50	

Window - Double-glazed, air-filled

Window

(NorthEast) Window

0.9 x 3.19

0.80

0.70 x 0.83

1.33

Lighting calculations				
Window - Double-glazed, air-filled (NorthWest) Window	Area 0.9 x 3.78	g 0.80	FF x Shading 0.70 x 0.83	1.58
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.37	0.80	0.70 x 0.67	0.46
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 0.68	0.80	0.70 x 0.67	0.23
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.20	0.80	0.70 x 0.67	0.41
GL = 9.73 / 83.30 = 0.117 C1 = 0.500 C2 = 0.960 El = 356				

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

21.00 0.75 (85)

Heating	system	responsi	veness								0.75)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau			•						•			
55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	
alpha	•								•			
4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	
Utilisatio	on factor	for gains	for livin	g area				•				
1.00	0.99	0.97	0.91	0.78	0.59	0.41	0.44	0.74	0.94	0.99	1.00	(86)
Mean in	iternal te	mperatu	re in livin	ig area T	1				•			
20.02	20.16	20.39	20.62	20.83	20.92	20.94	20.94	20.88	20.62	20.23	20.02	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	illing Th2	2					
19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	(88)
Utilisatio	on factor	for gains	for rest	of dwell	ing				•			
0.99	0.98	0.95	0.88	0.70	0.47	0.27	0.29	0.62	0.91	0.99	0.99	(89)
Mean in	iternal te	mperatu	re in the	rest of d	welling 7	2		•				
18.72	18.86	19.09	19.30	19.47	19.52	19.53	19.53	19.51	19.31	18.94	18.73	(90)
	rea fracti							•			0.33	8 (91)
Mean in	iternal te	mperatu	re (for th	e whole	dwelling)		-				
19.15	19.29	19.52	19.74	19.92	19.98	19.99	19.99	19.96	19.74	19.36	19.15	(92)
Apply a	djustmen	t to the r	nean inte	ernal ten	nperatur	e, where	appropr	iate				
19.15	19.29	19.52	19.74	19.92	19.98	19.99	19.99	19.96	19.74	19.36	19.15	(93)

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8. Space heating requirement

		0 1									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	n factor	for gains	5								
0.99	0.98	0.95	0.88	0.72	0.51	0.31	0.33	0.66	0.91	0.98	0.99
Useful gains											
787.64	938.86	1054.87	1138.31	1016.12	720.40	422.35	421.77	724.16	861.10	782.17	740.54
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
2005.1	1955.80	1741.02	1510.94	1125.12	736.79	423.51	423.44	774.53	1224.11	1692.10	1951.01
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59
	ace heat					ar) (Octo	ober to N	lay)			4274.8
Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						51.3

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	uirement	[S								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system((s)				1.0000 3.30%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	equireme	ent		1	1			1	1		
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1		1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	1	1		1	1		
970.85	732.46	547.16	287.56	86.91	-	-	-	-	289.47	702.20	965.26	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)		1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating			1	1	1	1			1		
Water h	eating re	equireme	nt									
			166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiend	cy of wat	er heater	r								80.20	(216)
88.25	87.98	87.34	86.14	83.32	80.20	80.20	80.20	80.20	86.04	87.85	88.28	(217)
Water h	eating fu	lel										
232.12	205.15	215.02	193.35	193.55	177.09	169.65	189.13	191.22	202.96	212.22	226.54	(219)
Space h Water h	neating fu neating fu neating fu	uel used, uel (seco uel mps, fan:	ndary)		ep-hot						kWh/year 4581.86 0.00 2408.01	(211) (215) (219)
mecha central boiler v Total ele Electrici	nical ver heating with a far ectricity f ty for ligh	ntilation -	balance d flue oove, kW 0.00% fix	d, extrac /h/year (ed LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.22	240)	61.46 130.00 45.00 236.46 356.13	(230a) (230c) (230e) (231) (232)
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							6759.85	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4581.859	3.100	142.04	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)́
Water heating cost	2408.01	3.100	74.65	(247)
Mech vent fans cost	61.463	11.460	7.04	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	356.134	11.460	40.81 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			296.33	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy cost factor (ECF)	1.09	(257)
SAP value	84.86	. ,
SAP rating	85	(258)
SAP band	В	

12a. Carbon dioxide emissions

El rating

El band

	Energy	Emission factor	Emission	-
.	kWh/year	kg CO2/kWh	kg CO2/ye	
Space heating, main system 1	4581.86	0.198	907.21	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2408.01	0.198	476.79	(264)
Space and water heating			1383.99	(265)
Electricity for pumps and fans	236.46	0.517	122.25	(267)
Electricity for lighting	356.13	0.517	184.12	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1255.20	(272)
			kg/m²/yea	
CO2 emissions per m ²			15.07	(273)
El value			86.89	(273a)

87

В

(274)

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13a. Primary energy

isa. Primary energy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year)
Space heating, main	4581.86	1.020	4673.50	<i>(</i> 261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2408.01	1.020	2456.17	(264)
Space and water heating			7129.66	(265)
Electricity for pumps/fans	236.46	2.920	690.47	(267)
Electricity for lighting	356.13	2.920	1039.91	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - μ CHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			6458.01	(272)
Primary energy kWh/m²/year			77.53	(273)

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Project Information Building type Ground-floor flat

building type	Ground-noor i	lai	
Plot number Reference	7		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

NW3 7AA

SAP 2009 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	. 83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

2. vem	Παιιοπτά	ale									m ³ per l	nour
							main + s heating	eondar	y + othe	er		
Numbe Numbe	r of chim r of open r of inten r of pass	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 3 0		x 40 x 20 x 10 x 10		0.00 0.00 30.00 0.00	(6b) (7a)
	r of fluele						0		x 40		0.00	(7c)
Pressur Air perr Numbe Shelter Infiltration	on due to re test, re neability r of sides factor on rate in on rate n	esult q50 s on whic ncorpora) ch shelte ting shel	red Iter facto	r				10.00		Air char 0.13 0.63 2.00 0.85 0.54	(17) (18) (19) (20)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	v average	e wind sp	peed fror	n Table	7							
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	tion rate	(allowing	g for she	Iter and	wind sp	eed)				13.53	(22a)
0.73	0.69	0.69	0.61	0.55	0.52	0.50	0.50	0.57	0.61	0.65	0.69	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.28	(22b)
0.76	0.74	0.74	0.68	0.65	0.64	0.62	0.62	0.66	0.68	0.71	0.74	(25)

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<i>3. Heat losses and heat los</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	ss parameter Openings m²	Net are A, m² 18.97	W/	/alue m²K 5 (2.00)	A x U W/K 35.1	4			(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.850)	2.00	3.7	0			(26)
Walls Ground floors Party wall Party ceiling		85.20 83.30 7.30 83.30)	0.35 0.25 0.00 0.00	29.8 20.8 0.0 0.0	2 0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						189.3 89.4 12173.0 250.0 20.8 110.3	9 (33) 0 (34) 0 (35) 3 (36)
56.71 54.60 54.60 50).72 48.41	47.34	46.31	46.31	48.97	50.72	52.60	54.60	(38)
Heat transfer coefficient, W/	· · · · · · · · · · · · · · · · · · ·								
167.03 164.91 164.91 16	61.04 158.72	157.65	156.63	156.63	159.28	161.04	162.91	164.91	
Heat loss parameter (HLP),	W/m²K							161.3	0 (39)
2.01 1.98 1.98 1.9	93 1.91	1.89	1.88	1.88	1.91	1.93	1.96	1.98	
HLP (average) Number of days in month (T	able 1a)							1.9	4 (40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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	<i>r heating</i> d occupa		/ require	ements							kWh/year 2.52
Annual a	average	hot wate	r usage i	in litres p	oer day V	d,avera	ge				99.06
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month		•	•			
108.97	105.01	101.04	97.08	93.12	89.16	89.16	93.12	97.08	101.04	105.01	108.97
Energy	content c	of hot wa	ter used								
161.98	141.67	146.19	127.45	122.30	105.53	97.79	112.22	113.56	132.34	144.46	156.87
	content (tion loss	annual)	-						-		1562.37
24.30	21.25 er storag	21.93	19.12	18.34	15.83	14.67	16.83	17.03	19.85	21.67	23.53 150.00
Hot wate Volume	er cylinde factor ature fac	er loss fa tor	ctor (kŴ	• •	dev ()						0.0191 0.9283 0.5400
	brage los				uay)						1.44
			43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	1.44
Total sto 44.53	orage los	s 44.53				44.53	44.53	43.09	44.53	43.09	
Total sto 44.53	orage los 40.22	s 44.53				44.53 44.53	44.53	43.09	44.53 44.53	43.09	
Total sto 44.53 Net stor 44.53 Primary	40.22 age loss 40.22 circuit lo	s 44.53 44.53	43.09	44.53	43.09			I			44.53
Total sto 44.53 Net stor 44.53 Primary Primary 51.81	age los 40.22 age loss 40.22 circuit lo loss 46.79	s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	I			44.53 44.53
Total sto 44.53 Net stor 44.53 Primary Primary 51.81	age loss 40.22 age loss 40.22 circuit lo loss	s 44.53 44.53 ss (annu 51.81	43.09 43.09 (al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	44.53 44.53 610.00
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he	age los 40.22 age loss 40.22 circuit lo loss 46.79	s 44.53 44.53 ss (annu 51.81 ed for wa	43.09 43.09 (al) 50.14 ater heat	44.53 44.53 51.81 ing calcu	43.09 43.09 50.14 ulated fo	44.53 51.81 r each m	44.53 51.81	43.09	44.53	43.09	44.53 44.53 610.00
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32	age los 40.22 age loss 40.22 circuit lo loss 46.79 at requir	s 44.53 44.53 ss (annu 51.81 ed for wa 242.53	43.09 43.09 aal) 50.14 ater heat 220.68	44.53 44.53 51.81 ing calcu 218.63	43.09 43.09 50.14 Jated for 198.76	44.53 51.81 r each m 194.13	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	44.53 44.53 610.00 51.81
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32 Output f	age loss 40.22 40.22 circuit lo loss 46.79 at requir 228.69	s 44.53 44.53 ss (annu 51.81 ed for wa 242.53 er heater	43.09 43.09 (al) 50.14 ater heat 220.68 r for each	44.53 44.53 51.81 ing calcu 218.63 n month,	43.09 43.09 50.14 Jated for 198.76 kWh/mo	44.53 51.81 r each m 194.13 onth	44.53 51.81 onth	43.09 50.14 206.79	44.53 51.81 228.68	43.09 50.14	44.53 610.00 51.81 253.21
Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 258.32 Output f 258.32	age loss 40.22 age loss 40.22 circuit lo loss 46.79 at requir 228.69 rom wate	44.53 44.53 ss (annu 51.81 ed for wa 242.53 er heater 242.53	43.09 43.09 al) 50.14 ater heat 220.68 for each 220.68	44.53 51.81 ing calcu 218.63 month, 218.63	43.09 43.09 50.14 Jlated for 198.76 kWh/mc 198.76	44.53 51.81 r each m 194.13 onth	44.53 51.81 onth 208.55	43.09 50.14 206.79	44.53 51.81 228.68	43.09 50.14 237.69	44.53 610.00 51.81 253.21

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13
Lighting	gains	•	•			•				•	
34.28	30.45	24.76	18.75	14.01	11.83	12.78	16.62	22.30	28.32	33.05	35.23
Applianc	ces gains	5									
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22
Cooking	gains										
35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration ((negative	e values)							
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water h	eating ga	ains									
175.98	173.69	168.92	162.45	158.24	152.32	147.29	153.74	156.03	162.73	170.30	173.70
Total int	ernal gai	ns									
507.30	503.52	487.15	462.07	437.24	414.20	400.14	408.07	421.96	447.27	475.47	495.99
	•	•	•	•	•	•	•	•	•	•	

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 18.975 19.87	g & FF 7 0.72 x 0.70	Shading 0.77	Gains 131.7042
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
<i>Lighting calculations</i> Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area 0.9 x 18.97	g 0.80	FF x Shadir 0.70 x 0.83	ng 7.94

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7. Mean internal temperature

Temper	ature dui system	ring heat	ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau					1	1			1			
34.63	35.08	35.08	35.92	36.45	36.69	36.93	36.93	36.32	35.92	35.51	35.08	
alpha								4	•			
3.31	3.34	3.34	3.39	3.43	3.45	3.46	3.46	3.42	3.39	3.37	3.34	
Utilisatio	on factor	for gains	for livin	g area			•					
0.99	0.99	0.97	0.94	0.85	0.71	0.52	0.56	0.83	0.96	0.99	0.99	(86)
Mean in	ternal ter	mperatu	re in livin	g area T	1							
18.93	19.15	19.56	20.04	20.53	20.83	20.96	20.95	20.69	20.10	19.38	18.99	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2					
19.34	19.35	19.35	19.38	19.40	19.41	19.42	19.42	19.40	19.38	19.37	19.35	(88)
Utilisatio	on factor	for gains	for rest	of dwell	ing							
0.99	0.98	0.96	0.91	0.79	0.58	0.34	0.37	0.73	0.94	0.99	0.99	(89)
Mean in	ternal tei	mperatu	re in the	rest of d	welling T	2						
17.54	17.77	18.17	18.65	19.11	19.34	19.41	19.41	19.25	18.72	18.01	17.61	(90)
	rea fracti ternal tei				dwelling))					0.33	(91)
18.00	18.22	18.63	19.11	19.58	19.84	19.92	19.92	19.73	19.18	18.46	18.06	(92)
Apply ac	djustmen	t to the r	nean inte	ernal ten	perature	e, where	appropr	iate	•			
18.00	18.22	18.63	19.11	19.58	19.84	19.92	19.92	19.73	19.18	18.46	18.06	(93)

8. Space heating requirement

	e. epae	0	9.094	••••••								
0.99 0.98 0.96 0.91 0.80 0.62 0.40 0.43 0.75 0.93 0.98 0.99 Useful gains 631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	Utilisatio	Jtilisation factor for gains										
631.91 744.07 857.96 970.57 937.08 735.00 460.35 456.40 685.59 707.12 627.72 598.49 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.90 1675.98 1250.61 825.34 473.63 472.97 864.31 1348.75 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2 6266.2 6266.2	0.99	0.98	0.96	0.91	0.80	0.62	0.40	0.43	0.75	0.93	0.98	0.99
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	Useful g	ains										
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	631.91	744.07	857.96	970.57	937.08	735.00	460.35	456.40	685.59	707.12	627.72	598.49
Heat loss rate for mean internal temperature 2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.27	Monthly	average	externa	tempera	ature							
2254.4 2180.7 1950.9 1675.9 1250.6 825.34 473.63 472.97 864.31 1348.7 1867.07 2170.7 Space heating requirement for each month, kWh/month 1207.1 965.42 813.15 507.90 233.27 - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.2	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month1207.15 965.42 813.15 507.90 233.27477.37 892.33 1169.69Total space heating requirement per year (kWh/year) (October to May)6266.2	Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•				
1207.15 965.42 813.15 507.90 233.27 - - - 477.37 892.33 1169.69 Total space heating requirement per year (kWh/year) (October to May) 6266.21 6266.21 6266.21	2254.4	2180.7	1950.90	1675.98	1250.61	825.34	473.63	472.97	864.31	1348.75	1867.07	2170.7
Total space heating requirement per year (kWh/year) (October to May) 6266.2	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
	1207.15	965.42	813.15	507.90	233.27	-	-	-	-	477.37	892.33	1169.69
Space heating requirement per m ² (kWh/m ² /year) 75.23							ar) (Octo	ober to N	lay)	•	•	
	Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						75.23

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9a. Energy requirements

9a. Energy requirements Fraction of heat from secondary system0.1000Fraction of space heat from main system(s)0.9000Efficiency of main heating system78.90%Efficiency of secondary heating system100.00%							kWh/year	(201) (202) (206) (208)				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	-	equireme										
		813.15		233.27		-	-	-	477.37	892.33	1169.69	(98)
	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)				·,	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1376.98	8 1101.24	927.55	579.35	266.08	-	-	-	-	544.52	1017.86	1334.25	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)						I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	stem)				I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
120.72	96.54	81.32	50.79	23.33	-	-	-	-	47.74	89.23	116.97	(215)
Water h	eating											
Water h	eating re	equireme	ent									
258.32	228.69	242.53	220.68	218.63	198.76	194.13	208.55	206.79	228.68	237.69	253.21	(64)
Efficiend	cy of wat	er heate	r	1				l	1		68.80	(216)
76.74	76.56	76.12	75.30	73.40	68.80	68.80	68.80	68.80	75.07	76.34	76.72	(217)
Water heating fuel												
336.64	298.71	318.62	293.07	297.85	288.90	282.16	303.13	300.56	304.61	311.35	330.06	(219)
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel							kWh/year 7147.83 626.63 3665.65	(211) (215) (219)				
Electricity for pumps, fans and electric keep-hot central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (30.00% fixed LEL) Energy saving/generation technologies Appendix Q -						130.00 45.00 175.00 605.43	(230c) (230e) (231) (232)					
Energy saved or generated (): Energy used ():							0.000 0.000	(236a) (237a)				
Total de	elivered e	energy fo	r all uses	6							12220.54	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy	Emission factor	Emissions kg CO2/year	
	kWh/year	kg CO2/kWh		
Space heating, main system 1	7147.83	0.194	1386.68	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	626.63	0.422	264.44	(263)
Water heating	3665.65	0.194	711.14	(264)
Space and water heating			2362.25	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	605.43	0.422	255.49	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2691.59	(272)
			kg/m²/year	
Emissions per m ² for space and water heating			29.24	(272a)
Emissions per m ² for lighting			3.07	(272b)
Emissions per m ² for pumps and fans			0.89	(272c)

20.16

(273)

Target Carbon Dioxide Emission Rate (TER) = [(29.2449 x 1.0000 x 1.0206) + (3.0671 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

building type	Ground-noor i	lai	
Plot number Reference	7		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	. 83.30	2.70	224.91	(3a)
Total floor area	83.30			(4)
Dwelling volume (m ³)			224.91	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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3. Heat losses and heat l							
Element Gross	Openings	Net area	U-value W/m²K	AxU	kappa-value A kJ/m²K		
area, m ² Window - Double-glazed, air-filled (NorthWest)	m²	A, m² 1.200	1.42 (1.50)	W/K 1.70	KJ/III ² K K	⟨J/K	(27)
Window Window - Double-glazed, air-filled (NorthWest) Window		0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled (NorthWest) Window		1.370	1.42 (1.50)	1.94			(27)
Window - Double-glazed, air-filled (NorthWest) Window		3.780	1.42 (1.50)	5.35			(27)
Window - Double-glazed, air-filled (NorthEast) Window		3.190	1.42 (1.50)	4.51			(27)
Window - Double-glazed, air-filled (NorthEast) Window		3.090	1.42 (1.50)	4.37			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.200	1.42 (1.50)	1.70			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.080	1.42 (1.50)	1.53			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.680	1.42 (1.50)	2.38			(27)
Window - Double-glazed, air-filled (SouthEast) Window		1.320	1.42 (1.50)	1.87			(27)
Window - Double-glazed, air-filled (SouthEast) Window		0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled (SouthEast) Window		2.310	1.42 (1.50)	3.27			(27)
Window - Double-glazed, air-filled (SouthEast) Window		2.310	1.42 (1.50)	3.27			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door		2.020	1.50	3.03			(26)
Walls Ground floors Party wall		80.12 83.30 7.30	0.22 0.20 0.00	17.87 16.66 0.00	110.00 9 70.00 5	15222.80 9163.00 511.00	(29) (28)
Party ceiling		83.30	0.00	0.00	30.00 2	2499.00	

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3. Heat losses and heat loss parameter												
Element	Ī	Gross	Öpe	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W/	′m²K	W/K	kJ	/m²K	kJ/K	
Fabric heat loss, W/K71.36(33)Heat capacity27395.80(34)Thermal mass parameter, kJ/m²K328.88(34)Effect of thermal bridges28.40(34)Total fabric heat loss99.76(34)Ventilation heat loss calculated monthly34)34)											36 (33) 30 (34) 38 (35) 40 (36)	
37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	37.11	(38)
Heat tra	nsfer co	efficient,	W/K									
136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	136.87	
Heat los	s param	eter (HL	P), W/m [;]	²K							136.8	37 (39)
1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	
HLP (av							1				1.6	64 (40)
Number		in month	(Table	1a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	d occupa	ancy, N	y require r usage i		oer day V	/d,avera	ge				kWh/year 2.52 94.11	(4) (4)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot wate	er usage	in litres	per day f	or each	month		1	1		1		
103.52	99.76	95.99	92.23	88.46	84.70	84.70	88.46	92.23	95.99	99.76	103.52	(4-
Energy o	content o	f hot wa	ter used	1	1			l	1	l	·]	
153.88	134.59	138.88	121.08	116.18	100.26	92.90	106.61	107.88	125.72	137.24	149.03	
	content (ion loss	annual)									1484.25	(4
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(4
	er storag		e (litres) ctor (kW	(h/dov)						-	0.00	(5 (5
olume		1055 18		n/uay)							0.0000	(5
	ature fac	tor									0.0000	(5
	ost from orage los		Wh/day)								0.00	Ì5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
let stora	age loss		1						•	•		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Primary Primary	circuit lo loss	ss (annu	ial)								0.00	(5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Combi lo	oss calcu	lated for	r each m	onth								
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(6
Fotal he	at requir	ed for wa	ater heat	ing calcı	lated fo	r each m	onth					
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth						
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(6
											2045.16	(6
			ating, kV					L		I		
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(6

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5. Internal gains

	0										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13	126.13
Lighting	gains	•	•								
20.17	17.91	14.57	11.03	8.24	6.96	7.52	9.77	13.12	16.66	19.44	20.73
Applianc	ces gains	3									
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22
Cooking	gains										
35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61
Pumps a	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•				
-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90	-100.90
Water heating gains											
85.90	83.67	78.51	71.71	67.07	60.80	56.02	62.79	65.61	72.62	80.46	83.73
Total internal gains											
403.10	400.97	386.54	363.61	340.29	317.80	303.60	310.28	322.36	345.50	372.02	391.51
			-		-		-	-	-		

6. Solar gains (calculation for January)

o. Colar gains (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.200 11.51		0.54	3.5710
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 0.680 11.51	0.76 x 0.70	0.54	2.0236
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.370 11.51	0.76 x 0.70	0.54	4.0769
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 3.780 11.51	0.76 x 0.70	0.77	16.0399
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.190 11.51	0.76 x 0.70	0.77	13.5364
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.090 11.51	0.76 x 0.70	0.77	13.1120
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.200 37.39	0.76 x 0.70	0.77	16.5407
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.080 37.39	0.76 x 0.70	0.77	14.8867
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.680 37.39	0.76 x 0.70	0.77	23.1570

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6. Solar gains (calculation for January)				
Window - Double-glazed, air-filled	Area & Flux 0.9 x 1.320 37.39	g & FF 0.76 x 0.70	Shading 0.77	Gains 18.1948
(SouthEast) Window				
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.680 37.39	0.76 x 0.70	0.77	9.3731
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.310 37.39	0.76 x 0.70	0.77	31.8409
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 2.310 37.39	0.76 x 0.70	0.77	31.8409
Full glazed door - Double-glazed, air-filled (NorthEast) Door	0.9 x 2.020 11.51	0.76 x 0.70	0.77	8.5716
Lighting calculations				
	Area	g	FF x Shadi	
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.20	0.80	0.70 x 0.67	0.41
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 0.68	0.80	0.70 x 0.67	0.23
Window - Double-glazed, air-filled (NorthWest)	0.9 x 1.37	0.80	0.70 x 0.67	0.46
Window Window - Double-glazed, air-filled (NorthWest)	0.9 x 3.78	0.80	0.70 x 0.83	1.58
Window Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.19	0.80	0.70 x 0.83	1.33
Window Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.09	0.80	0.70 x 0.83	1.29
Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.20	0.80	0.70 x 0.83	0.50
Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.08	0.80	0.70 x 0.83	0.45
Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.68	0.80	0.70 x 0.83	0.70
Window Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.32	0.80	0.70 x 0.83	0.55
Window Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.68	0.80	0.70 x 0.83	0.28

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Lignling calculations	Area	g	FF x Shading	
Window - Double-glazed, air-filled	0.9 x 2.31	0.80	0.70 x 0.83	0.97
(SouthEast)				
Window				
Window - Double-glazed, air-filled	0.9 x 2.31	0.80	0.70 x 0.83	0.97
(SouthEast)				
Window				

21.00

0.75

(85)

7. Mean internal temperature

Lighting coloulations

Temperature during heating periods in the living area, Th1 (°C)

Heating system responsiveness

loaning	System	responsi	VCHC33								0.75
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60	55.60
alpha										•	
4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71
Utilisatio	on factor	for gains	s for livin	g area						•	
1.00	1.00	0.98	0.94	0.83	0.64	0.45	0.49	0.81	0.97	1.00	1.00
Mean in	iternal te	mperatu	re in livin	g area T	1					•	
19.90	20.05	20.29	20.55	20.80	20.91	20.94	20.94	20.85	20.54	20.12	19.91
Temper	ature du	ring heat	ting perio	ds in res	st of dwe	illing Th2	2				
19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59	19.59
Utilisatio	on factor	for gains	s for rest	of dwell	ing						
1.00	0.99	0.98	0.92	0.76	0.52	0.30	0.33	0.69	0.95	0.99	1.00
Mean in	iternal te	mperatu	re in the	rest of d	welling T	2					
18.61	18.75	19.00	19.24	19.45	19.52	19.53	19.53	19.49	19.24	18.83	18.62
	rea fracti										0.33
Mean in	iternal te	mperatu	re (for th	e whole	dwelling)		_	_	_	
19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04
Apply a	djustmer	it to the i	mean int	ernal ten	nperatur	e, where	appropr	riate			
19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	5		•						
1.00	0.99	0.97	0.92	0.77	0.56	0.34	0.38	0.73	0.95	0.99	1.00
Useful g	ains	•	•		•						
608.24	768.08	908.47	1036.10	973.94	712.05	421.61	420.58	694.88	745.70	620.02	564.46
Monthly	average	externa	Itempera	ature			•				
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
1989.54	1940.90	1728.16	1501.95	1121.46	736.03	423.42	423.29	771.96	1213.96	1677.98	1935.73
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•				
1027.68	788.14	609.85	335.41	109.76	-	-	-	-	348.38	761.73	1020.22
Total space heating requirement per year (kWh/year) (October to May)5001.16Space heating requirement per m² (kWh/m²/year)60.04											
Space h	leating re	equireme	ent per m	² (kWh/r	n²/year)						60.04

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8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Energy requirements ki	Wh/year
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.30%	(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	C
Space heating requirement	
1027.68 788.14 609.85 335.41 109.76 348.38 761.73 102	20.22 (98)
Appendix Q - monthly energy saved (main heating system 1)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (210)
Space heating fuel (main heating system 1)	
1101.48 844.73 653.64 359.49 117.64 373.40 816.43 109	93.49 (211)
Appendix Q - monthly energy saved (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (212)
Space heating fuel (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (213)
Appendix Q - monthly energy saved (secondary heating system)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (214)
Space heating fuel (secondary)	
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0)0 (215)
Water heating	
Water heating requirement	
	9.99 (64)
Efficiency of water heater	80.20 (216)
88.45 88.23 87.70 86.68 84.01 80.20 80.20 80.20 86.66 88.12 88.	.47 (217)
Water heating fuel	
231.60 204.58 214.14 192.16 191.97 177.09 169.65 189.13 191.22 201.53 211.57 226	6.04 (219)
Space heating fuel used, main system 1 53 Space heating fuel (secondary)	Wh/year 360.30 (211) 0.00 (215) 400.69 (219)
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year	61.46(230a)130.00(230c)45.00(230e)236.46(231)356.13(232)
PVs 0.80 x 1.070 x 961.000 x 1.000 82 PVs 0.80 x 0.000 x 0.000 x 0.500 82 PVs 0.80 x 0.000 x 0.000 x 0.500 82 82 82 82 82 83 82 84 82 85 82 86 82 86 82 86 82 82 82 82 82 82 82 82 82 83 82 84 82 85 82 86 82 86 82 82 82 83 82 84 82 85 82 85 82 86 82 86 82 86 82 87 82 88 82 88 82 82 82 83 82 84 82 84 84 <t< td=""><td>22.616 0.000 0.000 22.616 (233)</td></t<>	22.616 0.000 0.000 22.616 (233)
Appendix Q - Energy saved or generated (): Energy used ():	0.000 (236a) 0.000 (237a)
Total delivered energy for all uses75	530.97 (238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

Energy	Emission factor	Emission	s
kWh/year	kg CO2/kWh		
5360.30	0.198	1061.34	(261)
0.00	0.000	0.00	(262)
0.00	0.517	0.00	(263)
2400.69	0.198	475.34	(264)
		1536.68	(265)
236.46	0.517	122.25	(267)
356.13	0.517	184.12	(268)
-822.62	0.529	-435.16	(269)
0.00	0.000	0.00	(269)
			· · ·
0.00	0.000	0.00	(270)
0.00	0.000	0.00	(271)
		1407.89	(272)
			. ,
	5360.30 0.00 2400.69 236.46 356.13 -822.62 0.00 0.00	kWh/year kg CO2/kWh 5360.30 0.198 0.00 0.000 0.00 0.517 2400.69 0.198 236.46 0.517 356.13 0.517 -822.62 0.529 0.00 0.000 0.00 0.000	kWh/year kg CO2/kWh kg CO2/ye 5360.30 0.198 1061.34 0.00 0.000 0.00 0.00 0.517 0.00 2400.69 0.198 475.34 1536.68 236.46 0.517 122.25 356.13 0.517 184.12 -822.62 0.529 -435.16 0.00 0.000 0.00 0.00 0.000 0.00

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 16.90 (273)

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Project Information Building type Ground-floor flat

Plot number	8		
Reference			
Date	17 June 2016		
Client	Investland	Project	252 Lon

Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	¥1.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

2. Venti											m ³ per h	nour
							main + s heating	eondar	y + othe	r		
Number Number Number Number Number	of open of interr of pass	flues nittent fa ive vents	3				$0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
- turnoor		loo guo i					Ũ		X 10			
Infiltratio Pressure Air perm Number Shelter f Infiltratio Infiltratio	e test, re leability of sides actor on rate ir	esult q50 s on whic ncorpora	ch shelte	red Iter facto	r				4.00		Air char 0.00 2.00 0.85 0.17	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed fror	n Table	7	•	•			·		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	ictor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjusted	d infiltrat	ion rate	(allowing	g for shel	ter and	wind spe	eed)	-			13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
Ventilation Effective				ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat</i> Element		and hea Gross	Ópe	a ramete i enings	Net are		-value	A x U		appa-val		
Window air-filled Windo	(SouthV	area, m [:] e-glazed Vest)			A, m ² 2.46		//m²K . 42 (1.50)	W/K 3.4		J/m²K	kJ/K	(27)
Window air-filled	- Double (SouthV	e-glazed Vest)	,		2.14	01.	.42 (1.50)	3.0)3			(27)
Windo Window air-filled Windo	- Double (SouthE	e-glazed ast)	3		0.61	01.	.42 (1.50)	0.8	36			(27)
	- Double (SouthE	e-glazed ast)	,		0.61	01.	.42 (1.50)	0.8	36			(27)
Window air-filled Windo	- Double (SouthE		,		0.34	01.	.42 (1.50)	0.4	18			(27)
Full glaz Double- (SouthW	ed door glazed, a				2.020	0	1.50	3.0)3			(26)
Door Walls Ground Party wa Party ce	all				36.60 41.74 30.50 41.74	4 0	0.22 0.20 0.00 0.00	8.1 8.3 0.0 0.0	35)0	190.00 110.00 70.00 100.00	6954.0 4591.4 2135.0 4174.0	0 (28) 0
Fabric h Heat ca Therma Effect of Total fat	eat loss pacity I mass p f therma pric heat	aramete I bridges	r, kJ/m²ł	<	m²						86.5 28.2 17854.4 427.7 12.9 41.2	6 (33) 0 (34) 5 (35) 8 (36)
18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	(38)
		efficient,										
59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	- ()
Heat los	s param	eter (HL	P), W/m	²K							59.8	3 (39)
1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	
HLP (av Number		in month	n (Table	1a)							1.4	3 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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4. Wate Assume Annual a	d occupa	ancy, N	-		oer dav ∖	/d.avera	ae				kWh/year 1.45 68.72
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month						1
75.59	72.84	70.09	67.34	64.59	61.84	61.84	64.59	67.34	70.09	72.84	75.59
Energy of	content o	of hot wa	ter used	1	1	1	1		1	1	11
112.36	98.27	101.41	88.41	84.83	73.20	67.83	77.84	78.77	91.80	100.21	108.82
Energy of Distribut		annual)									1083.76
16.85 Hot wate	14.74	15.21	13.26	12.72	10.98	10.18	11.68	11.82	13.77	15.03	16.32
Hot wate Volume Tempera Energy I Total sto	factor ature fac ost from	tor store (k	·	/h/day)							0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stora	age loss	1	1	1			1		1		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annı	ial)								0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	oss calcu		r each m		-						
38.52	33.53	35.72	33.21	32.92	30.50	31.52	32.92	33.21	35.72	35.92	38.52
			ater heat	<u> </u>				-			1
			121.62		103.70		110.76	111.98	127.52	136.13	147.34
Output f			for each								
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	
Heat gai	ins from	water he	ating, k\	Nh/mont	h						1495.94
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20	87.20
Lighting	gains										
29.77	26.44	21.51	16.28	12.17	10.27	11.10	14.43	19.37	24.59	28.70	30.60
Appliance	ces gains	5									
187.96	189.91	185.00	174.53	161.32	148.91	140.62	138.67	143.58	154.04	167.25	179.67
Cooking	gains										
45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains									
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57
Total internal gains											
365.13	361.69	348.06	327.41	306.71	287.82	276.86	283.18	295.10	315.90	338.94	356.08

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.460 37.39	0.76 x 0.70	0.77	33.9085	
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.140 37.39	0.76 x 0.70	0.77	29.4976	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.340 37.39	0.76 x 0.70	0.77	4.6865	
Full glazed door - Double-glazed, air-filled (SouthWest) Door	0.9 x 2.020 37.39	0.76 x 0.70	0.77	27.8436	
Total solar gains, January				112.75 (83-1)
Solar gains					
112.75 192.21 253.98 312.10 341.80 3	46.95 340.15 317.	68 280.16 218	.23 135.18	96.35 (83)
Total gains					
477.88 553.90 602.04 639.51 648.50 6	34.77 617.01 600.	87 575.25 534	.13 474.13	452.43 (84)

Lighting calculations

Area

g

FF x Shading

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

Mean internal temperature in living area T1 20.42 20.53 20.68 20.80 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) Temperature during heating periods in rest of dwelling Th2 19.74 <		system	•	• •		, inving a	ica, iiii	(0)				0.75	· · ·
82.89 <	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha 6.53 0.56 0.99 1.00 (4) Utilisation factor for gains for rest of dwelling 0.99 0.98 0.95 0.88 0.71 0.48 0.28 0.28 0.56 0.87 0.98 0.99 (4) Mean internal temperature in the rest of dwelling T2 19.24 19.35 19.49 19.60 19.68 19.70 19.70 19.70 19.62 19.39 19.24 (5) Living area fraction ($19.20/41.74$)0.46	tau								•		•		
	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	
Utilisation factor for gains for living area 1.00 0.99 0.97 0.92 0.79 0.59 0.40 0.41 0.68 0.92 0.99 1.00 (4)Mean internal temperature in living area T1 20.42 20.53 20.68 20.90 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) 20.42 20.53 20.68 20.90 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) 20.42 20.53 20.68 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) 20.42 20.53 20.68 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) 20.42 20.53 20.68 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) 19.74 <	alpha												
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	
Mean internal temperature in living area T1 20.42 20.53 20.68 20.80 20.91 20.95 20.96 20.95 20.83 20.57 20.42 (4) Temperature during heating periods in rest of dwelling Th2 19.74	Utilisatio	on factor	for gains	s for livin	g area				•				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1.00	0.99	0.97	0.92	0.79	0.59	0.40	0.41	0.68	0.92	0.99	1.00	(86)
Temperature during heating periods in rest of dwelling Th2 19.74 <t< td=""><td>Mean in</td><td>iternal te</td><td>mperatu</td><td>re in livin</td><td>ig area T</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Mean in	iternal te	mperatu	re in livin	ig area T	1							
19.74 19.74 <td< td=""><td>20.42</td><td>20.53</td><td>20.68</td><td>20.80</td><td>20.91</td><td>20.95</td><td>20.96</td><td>20.96</td><td>20.95</td><td>20.83</td><td>20.57</td><td>20.42</td><td>(87)</td></td<>	20.42	20.53	20.68	20.80	20.91	20.95	20.96	20.96	20.95	20.83	20.57	20.42	(87)
Utilisation factor for gains for rest of dwelling 0.99 0.98 0.95 0.88 0.71 0.48 0.28 0.28 0.56 0.87 0.98 0.99 (4) Mean internal temperature in the rest of dwelling T2 19.24 19.35 19.49 19.60 19.68 19.70 19.70 19.70 19.62 19.39 19.24 (4) Living area fraction (19.20 / 41.74) 0.46 0.46 (4)	Temper	rature du	ring heat	ing peric	ods in res	st of dwe	lling Th2	2					
0.99 0.98 0.95 0.88 0.71 0.48 0.28 0.28 0.56 0.87 0.98 0.99 (8) Mean internal temperature in the rest of dwelling T2 19.24 19.35 19.49 19.60 19.68 19.70 19.70 19.70 19.62 19.39 19.24 (9) Living area fraction (19.20 / 41.74) 0.46 (9) 0.46 (9)							19.74	19.74	19.74	19.74	19.74	19.74	(88)
Mean internal temperature in the rest of dwelling T2 19.24 19.35 19.49 19.60 19.68 19.70 19.70 19.70 19.62 19.39 19.24 (9) Living area fraction (19.20 / 41.74) 0.46 (9)	Utilisatio	on factor	for gains	s for rest	of dwell	ing	_	_	_				
19.24 19.35 19.49 19.60 19.68 19.70 19.70 19.70 19.62 19.39 19.24 (9) Living area fraction (19.20 / 41.74) 0.46 (9) 0.46 (9) (9)					••••			0.28	0.56	0.87	0.98	0.99	(89)
Living area fraction (19.20 / 41.74) 0.46 (9	Mean in	nternal te	mperatu	re in the	rest of d	welling T	2						
						19.70	19.70	19.70	19.70	19.62	19.39		(90)
mean internal temperature (for the whole dwelling)						dwelling)					0.46	(91)
19.79 19.89 20.04 20.15 20.25 20.27 20.28 20.28 20.27 20.18 19.93 19.78	19.79	19.89	20.04	20.15	20.25	20.27	20.28	20.28	20.27	20.18	19.93	19.78	(92)
Apply adjustment to the mean internal temperature, where appropriate													
19.79 19.89 20.04 20.15 20.25 20.27 20.28 20.28 20.27 20.18 19.93 19.78	19.79	19.89	20.04	20.15	20.25	20.27	20.28	20.28	20.27	20.18	19.93	19.78	(93)

21.00

(85)

8. Space heating requirement

e. epue	e neutin,	grequi	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5								
0.99	0.98	0.95	0.90	0.75	0.53	0.33	0.34	0.61	0.89	0.98	0.99
Useful g	ains										
474.56	544.21	574.40	572.42	483.82	336.85	202.03	202.02	351.01	474.09	466.43	449.74
Monthly	average	externa	tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ire						
914.53	890.88	791.87	685.20	511.36	339.53	202.13	202.13	357.22	561.23	773.83	890.54
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
327.34	232.97	161.80	81.21	20.50	-	-	-	-	64.83	221.33	327.96
	ace heat					ar) (Octo	ober to N	lay)			1437.9
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						34.4

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	ergy requ	uremen	IS								kWh/year	
Fraction	n of spac	eating sy e heat fro in heating	om main	system	(s)				1.0000 3.30%		, ,	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	heating re	quireme	ent			1			1			
327.34	232.97	161.80	81.21	20.50	-	-	-	-	64.83	221.33	327.96	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1		1	1		
350.85	249.70	173.42	87.04	21.97	-	-	-	-	69.49	237.22	351.51	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)	1		1	1		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h				1		1	1		1	1		
		equireme										
		137.13		117.75	103.70	99.35	110.76	111.98	127.52	136.13		(64)
Efficiend	cy of wat	er heate	r								80.20	(216)
86.85	86.37	85.37	83.96	81.55	80.20	80.20	80.20	80.20	83.34	86.17	86.91	(217)
Water h	eating fu	iel										
173.73	152.60	160.63	144.86	144.38	129.30	123.88	138.10	139.63	153.00	157.98	169.53	(219)
Annual totalskWh/yearSpace heating fuel used, main system 11541.19Space heating fuel (secondary)0.00Water heating fuel1787.62									(211) (215) (219)			
central heating pump130.00boiler with a fan-assisted flue45.00Total electricity for the above, kWh/year282.79									(230a) (230c) (230e) (231) (232)			
PVs 0 PVs 0 PVs 0	0.80 x 1.0 0.80 x 0.0 0.80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	5							2999.30	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1541.188	3.100	47.78	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	1787.62	3.100	55.42	(247)
Mech vent fans cost	107.793	11.460	12.35	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	210.313	11.460	24.10 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated (): Energy used ():	0.000 0.000	0.000 0.000	0.00 0.00	(253) (254)
Total energy cost			171.43	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

Energy boot denated	0.17	(200)
Energy cost factor (ECF)	0.93	(257)
SAP value	87.04	
SAP rating	87	(258)
SAP band	В	

12a. Carbon dioxide emissions

12a. Carbon dioxide emissions				
	Energy	Emission factor	Emission	-
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	1541.19	0.198	305.16	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	1787.62	0.198	353.95	(264)
Space and water heating			659.10	(265)
Electricity for pumps and fans	282.79	0.517	146.20	(267)
Electricity for lighting	210.31	0.517	108.73	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			478.88	(272)
			kg/m²/yea	ar
CO2 emissions per m ²			11.47	(273)

CO2 emissions per	m
El value	
El rating	
El band	

(273) 11.47 (273a) 92.60 93 (274) Α

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13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year	
Space heating, main	1541.19	1.020	1572.01	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	1787.62	1.020	1823.37	(264)
Space and water heating			3395.38	(265)
Electricity for pumps/fans	282.79	2.920	825.76	(267)
Electricity for lighting	210.31	2.920	614.11	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			2433.22	(272)
Primary energy kWh/m²/year			58.29	(273)

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Project Information Building type Ground-floor flat

Duliding type		ιαι	
Plot number Reference	8		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	¥1.74	2.70	`11́2.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

2. VCIII	Πατιστητά	ale									m ³ per h	our
							main + s heating	eondar	•			
Numbe	r of chim r of open r of inter	flues	ans				0 + 0 + 0 0 + 0 + 0 2		x 40 x 20 x 10		0.00 0.00 20.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
Infiltratio	on due to	o chimne	eys, fans	and flue	S						Air chan 0.18	ges per hour (8)
Air pern Number Shelter Infiltratio	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					10.00		0.68 2.00 0.85 0.58	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7		I	1		1		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	Iter and	wind sp	eed)				13.53	(22a)
0.78	0.73	0.73	0.65	0.59	0.56	0.53	0.53	0.60	0.65	0.69	0.73	
	ion : nati e air cha			ntermitte	nt extrac	t fans					7.79	(22b)
0.80	0.77	0.77	0.71	0.67	0.66	0.64	0.64	0.68	0.71	0.74	0.77	(25)

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<i>3. Heat losses and heat los</i> Element Gross area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West)	<i>ss paramete</i> Openings m²	Net area U-valu A, m ² W/m ² k			A x U W/K)) 15.90				(27)
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.85	D	2.00	3.7	70			(26)
Walls Ground floors Party wall Party ceiling		34.34 41.74 30.50 41.74	4 0	0.35 0.25 0.00 0.00	12.0 10.4 0.0 0.0	14)0			(29) (28)
Total area of external eleme Fabric heat loss, W/K Heat capacity Thermal mass parameter, k Effect of thermal bridges Total fabric heat loss Ventilation heat loss calcula	J/m²K	m²						86.52 42.05 10900.40 250.00 9.52 51.57	(31) (33) (34) (35) (36) (37)
	6.40 25.07	24.46	23.87	23.87	25.39	26.40	27.47	28.62	(38)
Heat transfer coefficient, W/	/K			•			-		
81.40 80.19 80.19 77	7.97 76.64	76.03	75.44	75.44	76.96	77.97	79.05	80.19	
Heat loss parameter (HLP),	W/m²K							78.12	(39)
1.95 1.92 1.92 1.8	87 1.84	1.82	1.81	1.81	1.84	1.87	1.89	1.92	
HLP (average) Number of days in month (T	able 1a)			1				1.87	(40)
Jan Feb Mar Ap	or May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30) 31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	r heating d occupa average	ancy, N	•		oer dav V	/d.avera	ae				kWh/year 1.45 72.33
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day	or each	month						
79.57	76.67	73.78	70.89	67.99	65.10	65.10	67.99	70.89	73.78	76.67	79.57
Energy of	content c	of hot wa	ter used	1	1			1	1		I
118.28	103.45	106.75	93.06	89.30	77.06	71.40	81.94	82.92	96.63	105.48	114.54
Energy of Distribut	content (tion loss	annual)									1140.80
17.74	15.52 er storag	16.01	13.96	13.39	11.56	10.71	12.29	12.44	14.49	15.82	17.18 150.00
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor hot wate		• /	day)						0.0191 0.9283 0.5400 1.44
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.50
44.00	40.22	44.53	1-0.00				11.00			40.00	44.53
	age loss	44.53	+0.00				11.00			40.00	44.53
	-	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53
Net stor 44.53 Primary	age loss 40.22 circuit lo	44.53	43.09			44.53			I		
Net stor 44.53 Primary Primary 51.81	age loss 40.22 circuit lo loss 46.79	44.53 ss (annu 51.81	43.09 Jal) 50.14	44.53 51.81	43.09 50.14	51.81	44.53 51.81		I		44.53
Net stor 44.53 Primary Primary 51.81	age loss 40.22 circuit lo loss	44.53 ss (annu 51.81	43.09 Jal) 50.14	44.53 51.81	43.09 50.14	51.81	44.53 51.81	43.09	44.53	43.09	44.53 610.00
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46	44.53 ss (annu 51.81 ed for wa 203.08	43.09 ial) 50.14 ater heat 186.29	44.53 51.81 ing calcu 185.63	43.09 50.14 Jated for 170.29	51.81 r each m 167.74	44.53 51.81	43.09	44.53	43.09	44.53 610.00
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08 er heater	43.09 Jal) 50.14 ater heat 186.29 r for each	44.53 51.81 ing calcu 185.63 n month,	43.09 50.14 Jlated for 170.29 kWh/mo	51.81 r each m 167.74 onth	44.53 51.81 onth 178.27	43.09 50.14 176.14	44.53 51.81 192.97	43.09 50.14 198.71	44.53 610.00 51.81 210.88
Net stor 44.53 Primary Primary 51.81 Total he 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08	43.09 Jal) 50.14 ater heat 186.29 r for each	44.53 51.81 ing calcu 185.63	43.09 50.14 Jlated for 170.29 kWh/mo	51.81 r each m 167.74 onth	44.53 51.81 onth	43.09 50.14 176.14	44.53 51.81	43.09 50.14	44.53 610.00 51.81 210.88 210.88
Net stor 44.53 Primary 51.81 Total he 214.61 Output f 214.61	age loss 40.22 circuit lo loss 46.79 at requir 190.46 rom wate	44.53 ss (annu 51.81 ed for wa 203.08 er heater 203.08	43.09 ial) 50.14 ater heat 186.29 for eacl 186.29	44.53 51.81 ing calcu 185.63 month, 185.63	43.09 50.14 Jated for 170.29 kWh/mo 170.29	51.81 r each m 167.74 onth	44.53 51.81 onth 178.27	43.09 50.14 176.14	44.53 51.81 192.97	43.09 50.14 198.71	44.53 610.00 51.81 210.88

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5. Internal gains

•••••••		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67
Lighting	gains		•								
19.17	17.03	13.85	10.48	7.84	6.62	7.15	9.29	12.47	15.83	18.48	19.70
Applianc	es gains	3					•		•		
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38
Cooking	gains										
30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27
Pumps a	and fans	gains		•	•		•	•	•		
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	(negative	values)			•	•	•		
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains					•				
156.45	154.77	151.29	146.57	143.50	139.17	135.50	140.21	141.88	146.77	152.30	154.78
Total int	ernal gai	ns									
356.35	353.84	343.89	328.78	314.22	300.36	291.66	297.20	305.35	320.62	337.64	349.66

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 8.585 19.87	g & FF 0.72 x 0.70	Shading 0.77	Gains 59.5879
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
Lighting calculations Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing GL = 3.59 / 41.74 = 0.086 C1 = 0.850 C2 = 0.964 El = 339	Area 0.9 x 8.59	g 0.80	FF x Shadi 0.70 x 0.83	•

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7. Mean internal temperature

Temper	Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness										21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	1	1		1			1	1	1	•	1]	
35.61	36.15	36.15	37.18	37.82	38.13	38.42	38.42	37.66	37.18	36.67	36.15	
alpha	•		•							•		
3.37	3.41	3.41	3.48	3.52	3.54	3.56	3.56	3.51	3.48	3.44	3.41	
Utilisatio	on factor	for gains	s for livin	g area								
0.99	0.98	0.96	0.92	0.81	0.66	0.47	0.50	0.77	0.93	0.98	0.99	(86)
Mean in	ternal te	mperatu	re in livin	ig area T	1							
19.17	19.38	19.75	20.19	20.63	20.88	20.97	20.97	20.78	20.27	19.61	19.23	(87)
Temper	ature du	ring heat	ing peric	ods in res	st of dwe	lling Th2	2					
19.37	19.39	19.39	19.43	19.45	19.46	19.47	19.47	19.45	19.43	19.41	19.39	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing							
0.98	0.97	0.94	0.88	0.74	0.53	0.30	0.32	0.66	0.90	0.97	0.98	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2						
17.80	18.02	18.38	18.82	19.23	19.41	19.47	19.47	19.35	18.91	18.26	17.87	(90)
	rea fracti ternal te				dwelling)					0.46	(91)
18.43	18.64	19.01	19.45	19.87	20.09	20.16	20.16	20.00	19.54	18.88	18.50	(92)
Apply ac	djustmen	t to the r	nean int	ernal ten	peratur	e, where	appropr	iate		•	·	
18.43	18.64	19.01	19.45	19.87	20.09	20.16	20.16	20.00	19.54	18.88	18.50	(93)

8. Space heating requirement

Space heating requirement for each month, kWh/month540.82429.99359.19219.7497.06198.27389.57520.67Total space heating requirement per year (kWh/year) (October to May)2755.3	er epae	o noutini	groqui	••••••									
0.98 0.97 0.94 0.88 0.77 0.59 0.38 0.40 0.70 0.90 0.97 0.98 Useful gains 406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.33 2755.33	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains 406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	Utilisatio	n factor	for gains	5					1			ı	
406.89 454.00 496.72 533.18 495.86 381.12 240.57 239.29 370.03 414.80 397.86 390.52 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3 2755.3 2755.3	0.98	0.97	0.94	0.88	0.77	0.59	0.38	0.40	0.70	0.90	0.97	0.98	
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3													
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	406.89	454.00	496.72	533.18	495.86	381.12	240.57	239.29	370.03	414.80	397.86	390.52	
Heat loss rate for mean internal temperature 1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	Monthly	average	externa	tempera	ature								
1133.80 1093.87 979.50 838.38 626.31 417.21 245.92 245.71 439.08 681.29 938.93 1090.35 Space heating requirement for each month, kWh/month 540.82 429.99 359.19 219.74 97.06 - - 198.27 389.57 520.67 Total space heating requirement per year (kWh/year) (October to May) 2755.3	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	
Space heating requirement for each month, kWh/month540.82429.99359.19219.7497.06198.27389.57520.67Total space heating requirement per year (kWh/year) (October to May)2755.3	Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•					
540.82 429.99 359.19 219.74 97.06 - - - 198.27 389.57 520.67 - Total space heating requirement per year (kWh/year) (October to May) 2755.3 2755.3 2755.3	1133.80	1093.87	979.50	838.38	626.31	417.21	245.92	245.71	439.08	681.29	938.93	1090.35	
Total space heating requirement per year (kWh/year) (October to May) 2755.3	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•					
	540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67	
Space heating requirement per m ² (kWh/m ² /year) 66.0							ar) (Octo	ober to N	/lay)				
	Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						66.0	

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9a. Energy requirements

Fraction	n of heat	from sec	ondary s		()				0.1000		kWh/year	(201)
Efficiend	cy of ma	e heat fro in heating ondary h	g system	1	(S)			7	0.9000 8.90% 00.00%			(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	()
	heating re	equireme		,			0					
540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67	(98)
Append	lix Q - mo	onthly en	ergy sav	ed (maii	heating	system	1)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)							
616.91	490.48	409.72	250.66	110.71	-	-	-	-	226.16	444.38	593.93	(211)
Append	lix Q - mo	onthly en	ergy sav	ed (maii	heating	system	2)			1	I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fi	uel (main	heating	system	2)	1	1		1	1	I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	lix Q - mo	onthly en	ergy sav	ed (seco	ondary he	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)	1		1						
54.08	43.00	35.92	21.97	9.71	-	-	-	-	19.83	38.96	52.07	(215)
Water h												
	-	equireme	-									
		203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(64)
	· · · · · · · · · · · · · · · · · · ·	er heate									68.80	(216)
75.51	75.26	74.67	73.66	71.74	68.80	68.80	68.80	68.80	73.31	74.92	75.46	(217)
	neating fu	-										
284.23	253.08	271.97	252.93	258.76	247.51	243.81	259.12	256.02	263.23	265.22	279.45	(219)
Space h Water h	neating fu neating fu neating fu	uel used, uel (seco uel mps, fan	ndary)		en-hot						kWh/year 3142.94 275.53 3135.33	(211) (215) (219)
central boiler Total ele Electrici	I heating with a far ectricity f ity for lig saving/g		d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 338.54	(230c) (230e) (231) (232)
Energ		or gener):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							7067.34	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	3142.94	0.194	609.73	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	275.53	0.422	116.27	(263)
Water heating	3135.33	0.194	608.25	(264)
Space and water heating			1334.26	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	338.54	0.422	142.86	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1550.97	(272)
			kg/m²/yea	ır
Emissions per m ² for space and water heating			33.74	(272a)
Emissions per m ² for lighting			3.42	(272b)
Emissions per m ² for pumps and fans			1.77	(272c)

(273)

23.17

Emissions per m² for pumps and fans Target Carbon Dioxide Emission Rate (TER)

= [(33.7353 x 1.0000 x 1.0206) + (3.4227 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Building type		iai	
Plot number Reference	8		
Date	17 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	¥1.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m ³)			112.70	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat</i> Element		and hea Gross	Óp	a ramete i enings	Net are		-value	AxU		appa-val		
	(SouthE	area, m e-glazed East)			A, m² 0.34		//m²K . 42 (1.50)	W/K 0.4		J/m²K	kJ/K	(27)
Window	· - Doubl (SouthE	e-glazed East)	,		0.61	01.	.42 (1.50)	0.8	86			(27)
Window	· - Doubl (SouthE	e-glazed East)	,		0.61	01.	.42 (1.50)	0.8	86			(27)
Window	· - Doubl (SouthV	e-glazed Vest)	,		2.14	01.	.42 (1.50)	3.0)3			(27)
	(SouthV	e-glazed Vest)	,		2.46	01.	.42 (1.50)	3.4	8			(27)
	zed door glazed, a Vest)				2.020	D	1.50	3.0)3			(26)
Walls Ground Party wa Party ce	all				36.60 41.74 30.50 41.74	4 0	0.22 0.20 0.00 0.00	8.1 8.3 0.0 0.0	85)0	190.00 110.00 70.00 100.00	6954.00 4591.40 2135.00 4174.00) (28))
Fabric h Heat ca Therma Effect o Total fal	leat loss pacity I mass p f therma bric heat	aramete I bridges	r, kJ/m²ł	<	m²						86.52 28.20 17854.40 427.75 12.99 41.25	6 (33) 0 (34) 5 (35) 8 (36)
18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	(38)
		efficient,	-	1	1	1		1				
59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	(22)
Heat los	s param	eter (HL	P), W/m	²K							59.83	3 (39)
1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	
HLP (av Number		in month	n (Table	1a)		-					1.43	3 (40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		ber day V	/d,avera	ge				kWh/year 1.45 68.72	(42 (43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	. ,
Hot wate	er usage	in litres	per day t	or each	month	1	1	1	1	1		
75.59	72.84	70.09	67.34	64.59	61.84	61.84	64.59	67.34	70.09	72.84	75.59	(44
Energy	content o	of hot wa	ter used	I	1	1	1	1	1	1		
112.36	98.27	101.41	88.41	84.83	73.20	67.83	77.84	78.77	91.80	100.21	108.82	
Energy Distribut	content (tion loss	annual)				•					1083.76	(45
16.85	14.74	15.21	13.26	12.72	10.98	10.18	11.68	11.82	13.77	15.03	16.32	(46
Hot wate Volume Temper Energy I	er storag er cylinde factor ature fac lost from orage los	er loss fa tor store (k'	ictor (kW	• •							0.00 0.0000 0.0000 0.0000 0.000	(50 (51 (52 (53 (55
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56
Net stor	age loss						•			•		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57
Primary Primary	circuit lo loss	ss (annu	ial)					- -			0.00	(58
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59
Combi le	oss calcu	lated for	r each m	onth								
38.52	33.53	35.72	33.21	32.92	30.50	31.52	32.92	33.21	35.72	35.92	38.52	(61
Total he	at requir	ed for wa	ater heat	ing calcı	lated fo	r each m	onth					
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	147.34	(62
Output f	rom wate	er heater	for eacl	n month,	kWh/mo	onth						
150.88	131.80	137.13	121.62	117.75	103.70	99.35	110.76	111.98	127.52	136.13	147.34	(64
Heat ga 46.99	ins from 41.06	water he 42.65	ating, k\ 37.70	Wh/mont 36.44	h 31.96	30.43	34.11	34.49	39.45	42.30	1495.94	(64 (65
40.99	+1.00	42.00	57.70	50.44	51.90	50.43	54.11	54.49	59.45	42.30	43.01	(0,

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•								
72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67	72.67
Lighting	gains										
11.91	10.58	8.60	6.51	4.87	4.11	4.44	5.77	7.75	9.84	11.48	12.24
Appliance	ces gains	3	•								
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38
Cooking	gains										
30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27	30.27
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13	-58.13
Water h	eating ga	ains	•								
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57
Total int	ernal gai	ns	•			•				•	
255.80	253.71	244.67	230.61	216.73	203.07	194.36	199.33	206.65	220.87	237.09	248.99

6. Solar gains (calculation for January)

er oorar game (ourouration for ouroury)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.340 37.39		0.77	4.6865
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.610 37.39	0.76 x 0.70	0.77	8.4082
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.140 37.39	0.76 x 0.70	0.77	29.4976
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.460 37.39	0.76 x 0.70	0.77	33.9085
Full glazed door - Double-glazed, air-filled (SouthWest) Door	0.9 x 2.020 37.39	0.76 x 0.70	0.77	27.8436
Lighting calculations				
Window - Double-glazed, air-filled (SouthEast) Window	Area 0.9 x 0.34	g 0.80	FF x Shadii 0.70 x 0.83	•
Window - Double-glazed, air-filled (SouthEast)	0.9 x 0.61	0.80	0.70 x 0.83	0.26

Window

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Window - Double-glazed, air-filled 0.9 x 0.61 0.80 0.70 x 0.83 0.26 SouthEast) Window Window - Double-glazed, air-filled 0.9 x 2.14 0.80 0.70 x 0.83 0.90 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 0.90 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 Window Pathenia Gamma A 0.9 x 2.46 0.80 0.70 x 0.83 1.03 Vindow Pathenia Mar Apr May Jun Jul Aug Sep 0.75 0.75 Jan Feb Mar Apr May	Lightin	g calcul	ations			Are	9		r	F	F x Sha	dina
Window - Double-glazed, air-filled 0.9 x 2.14 0.80 0.70 x 0.83 0.90 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window Vindow 0.75 1.03 SouthWest) Window Vindow 0.75 21.00 SouthWest) Mar Apr May Jun Jul Aug Sep Oct Nov Dec 82.89 <	(SouthE	East)	e-glazed	, air-filleo	b	-		().80			
Nindow - Double-glazed, air-filled 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window Nindow 0.9 x 2.46 0.80 0.70 x 0.83 1.03 SouthWest) Window Nindow New Description 1.03 1.03 7. Mean internal temperature Perpendenting periods in the living area, Th1 (°C) 21.00 0.75 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec au 82.89 <td< td=""><td>Window (SouthV</td><td>v - Doubl Vest)</td><td>e-glazed</td><td>, air-filleo</td><td>b</td><td>0.9</td><td>x 2.14</td><td>(</td><td>).80</td><td>C</td><td>).70 x 0.8</td><td>33 0.90</td></td<>	Window (SouthV	v - Doubl Vest)	e-glazed	, air-filleo	b	0.9	x 2.14	().80	C).70 x 0.8	33 0.90
Temperature during heating periods in the living area, Th1 (°C) 21.00 Heating system responsiveness 0.75 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec au 82.89	Window (SouthV	v - Doubl Vest)	e-glazed	, air-filleo	b	0.9	x 2.46	().80	C).70 x 0.8	33 1.03
au 82.89 82	Temper	ature du	ring heat	ting perio	ods in the	e living a	area, Th1	(°C)				
82.89 82.89 <td< td=""><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></td<>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha 6.53	tau					_				_		
6.53 6.53	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89	82.89
Jtilisation factor for gains for living area 1.00 1.00 0.99 0.96 0.87 0.67 0.46 0.47 0.77 0.96 1.00 1.00 Mean internal temperature in living area T1 20.31 20.42 20.58 20.73 20.88 20.95 20.96 20.96 20.93 20.76 20.47 20.31 Femperature during heating periods in rest of dwelling Th2 19.74 1	alpha					_				_	_	
1.00 1.00 0.99 0.96 0.87 0.67 0.46 0.47 0.77 0.96 1.00 1.00 Mean internal temperature in living area T1 20.31 20.42 20.58 20.73 20.88 20.95 20.96 20.96 20.93 20.76 20.47 20.31 20.31 20.42 20.58 20.73 20.88 20.95 20.96 20.96 20.93 20.76 20.47 20.31 19.74	6.53					6.53	6.53	6.53	6.53	6.53	6.53	6.53
Mean internal temperature in living area T1 20.31 20.42 20.58 20.73 20.88 20.95 20.96 20.96 20.93 20.76 20.47 20.31 Femperature during heating periods in rest of dwelling Th2 19.74 10.00 1.00 1.00 1.00 1.00	Utilisatio	on factor	for gains	s for livin	g area							
20.31 20.42 20.58 20.73 20.88 20.95 20.96 20.96 20.93 20.76 20.47 20.31 remperature during heating periods in rest of dwelling Th2 19.74 10.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 <	1.00	1.00	0.99	0.96	0.87	0.67	0.46	0.47	0.77	0.96	1.00	1.00
Femperature during heating periods in rest of dwelling Th2 19.74 10.74 10.00 1	Mean in	iternal te	mperatu	re in livir	ig area 1	Г 1						· · · · · · · · · · · · · · · · · · ·
19.74 10.0 1.00 <td>20.31</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>20.93</td> <td>20.76</td> <td>20.47</td> <td>20.31</td>	20.31								20.93	20.76	20.47	20.31
Jtilisation factor for gains for rest of dwelling 1.00 0.99 0.98 0.94 0.79 0.55 0.32 0.33 0.65 0.94 1.00 1.00 Mean internal temperature in the rest of dwelling T2 19.13 19.24 19.40 19.54 19.66 19.70 19.70 19.69 19.57 19.29 19.13 Living area fraction (19.20 / 41.74) 0.46 Mean internal temperature (for the whole dwelling) 0.46 19.67 19.78 19.95 20.09 20.22 20.27 20.28 20.26 20.12 19.83 19.67 Apply adjustment to the mean internal temperature, where appropriate 0.46	Temper	ature du	ring heat	ting perio	ods in re	st of dwe	elling Th2	2	1	•	•	
1.00 0.99 0.98 0.94 0.79 0.55 0.32 0.33 0.65 0.94 1.00 1.00 Mean internal temperature in the rest of dwelling T2 19.13 19.24 19.40 19.54 19.66 19.70 19.70 19.69 19.57 19.29 19.13 Living area fraction (19.20 / 41.74) 0.46 Mean internal temperature (for the whole dwelling) 0.46 19.67 19.78 19.95 20.09 20.22 20.27 20.28 20.26 20.12 19.83 19.67 Apply adjustment to the mean internal temperature, where appropriate 0.46 0.46 0.46 0.46 0.46	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74
Mean internal temperature in the rest of dwelling T2 19.13 19.24 19.40 19.54 19.66 19.70 19.70 19.69 19.57 19.29 19.13 Living area fraction (19.20 / 41.74) 0.46 Mean internal temperature (for the whole dwelling) 0.46 19.67 19.78 19.95 20.09 20.22 20.27 20.28 20.26 20.12 19.83 19.67 Apply adjustment to the mean internal temperature, where appropriate 0.46	Utilisatio	on factor	for gain	s for rest	of dwel	ling			1	•	•	
19.13 19.24 19.40 19.54 19.66 19.70 19.70 19.69 19.57 19.29 19.13 Living area fraction (19.20 / 41.74) 0.46 Mean internal temperature (for the whole dwelling) 0.46 19.67 19.78 19.95 20.09 20.22 20.27 20.28 20.26 20.12 19.83 19.67 Apply adjustment to the mean internal temperature, where appropriate 0.46	1.00	0.99	0.98	0.94	0.79	0.55	0.32	0.33	0.65	0.94	1.00	1.00
iving area fraction (19.20 / 41.74)0.46Mean internal temperature (for the whole dwelling)0.4619.6719.7819.9520.0920.2220.2720.2820.2820.2620.1219.8319.67Apply adjustment to the mean internal temperature, where appropriate	Mean in	iternal te	mperatu	re in the	rest of c	welling	T2					
Mean internal temperature (for the whole dwelling)19.6719.7819.9520.0920.2220.2720.2820.2820.2620.1219.8319.67Apply adjustment to the mean internal temperature, where appropriate	19.13	19.24	19.40	19.54	19.66	19.70	19.70	19.70	19.69	19.57	19.29	19.13
Apply adjustment to the mean internal temperature, where appropriate						dwelling)					0.46
	19.67									20.12	19.83	19.67
19.67 19.78 19.95 20.09 20.22 20.27 20.28 20.28 20.26 20.12 19.83 19.67	Apply a	djustmer	nt to the i	mean int	ernal ter	nperatur	e, where	approp	riate			
	19.67	19.78	19.95	20.09	20.22	20.27	20.28	20.28	20.26	20.12	19.83	19.67

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8. Space heating requirement

-											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	n factor	for gains	5								
1.00	0.99	0.98	0.94	0.82	0.61	0.38	0.39	0.70	0.95	1.00	1.00
Useful g	ains										
367.94	443.38	489.01	512.19	460.52	333.60	201.89	201.84	342.82	415.57	370.56	344.89
Monthly	average	externa	tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
907.84	884.53	786.47	681.40	509.89	339.31	202.11	202.11	356.67	557.54	767.79	883.96
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
401.68	296.45	221.31	121.83	36.73	-	-	-	-	105.62	286.01	401.07
Total spa	ace heat	ing requ	irement	oer year	(kWh/ye	ar) (Octo	ober to N	/lay)			1870.7
Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						44.8

8c. Space cooling requirement - not applicable

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9a. Energy requirements

		uirement									kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system	(s)				1.0000 3.30%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	, , , , , , , , , , , , , , , , , , ,
Space h	eating re	equireme	nt.		1					I		
401.68	296.45	221.31	121.83	36.73	-	-	-	-	105.62	286.01	401.07	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
430.53	317.74	237.20	130.58	39.37	-	-	-	-	113.21	306.55	429.87	(211)
Appendi	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)				1	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	/stem)		1	1	1	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h				1								
Water h	eating re	equireme	nt									
		137.13		117.75	103.70	99.35	110.76	111.98	127.52	136.13		(64)
Efficience	cy of wat	er heatei	ſ								80.20	(216)
87.30	86.93	86.15	84.96	82.39	80.20	80.20	80.20	80.20	84.48	86.78	87.34	(217)
Water h	eating fu	lel						_	-			
172.83	151.61	159.17	143.16	142.91	129.30	123.88	138.10	139.63	150.94	156.87	168.68	(219)
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel Electricity for pumps, fans and electric keep-hot											kWh/year 2005.05 0.00 1777.10	(211) (215) (219)
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL)											107.79 130.00 45.00 282.79 210.31	(230a) (230c) (230e) (231) (232)
Energy saving/generation technologies PVs 0.80 x 1.070 x 961.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500										822.616 0.000 0.000 822.616	(233)	
Appendix Q - Energy saved or generated (): Energy used ():											0.000 0.000	(236a) (237a)
Total delivered energy for all uses										3452.64	(238)	

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

Energy	Emission factor	Emissions	
kWh/year	kg CO2/kWh	kg CO2/year	
2005.05	0.198	397.00	(261)
0.00	0.000	0.00	(262)
0.00	0.517	0.00	(263)
1777.10	0.198	351.87	(264)
		748.87	(265)
282.79	0.517	146.20	(267)
210.31	0.517	108.73	(268)
-822.62	0.529	-435.16	(269)
0.00	0.000	0.00	(269)
			· · /
0.00	0.000	0.00	(270)
0.00	0.000	0.00	(271)
		568.64	(272)
			. ,
	2005.05 0.00 0.00 1777.10 282.79 210.31 -822.62 0.00 0.00	kWh/year kg CO2/kWh 2005.05 0.198 0.00 0.000 0.00 0.517 1777.10 0.198 282.79 0.517 210.31 0.517 -822.62 0.529 0.00 0.000 0.00 0.000	kWh/year kg CO2/kWh kg CO2/y 2005.05 0.198 397.00 0.00 0.000 0.00 0.00 0.517 0.00 1777.10 0.198 351.87 748.87 748.87 282.79 0.517 146.20 210.31 0.517 108.73 -822.62 0.529 -435.16 0.00 0.000 0.00 0.00 0.000 0.00

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 13.62 (273)

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Project Information Building type Ground-floor flat

Plot number	9		
Reference			
Date	16 June 2016		
Client	Investland	Project	252 L or

2 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

2. Venti											m ³ per h	nour
							main + s heating	eondar	y + othe	r		
Number Number Number Number Number	of open of interr of pass	flues nittent fa ive vents	3				$0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
- turnoor		loo guo i					Ũ		X 10			
Infiltratio Pressure Air perm Number Shelter f Infiltratio Infiltratio	e test, re leability of sides actor on rate ir	esult q50 s on whic ncorpora	ch shelte	red Iter facto	r				4.00		Air char 0.00 2.00 0.85 0.17	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed fror	n Table	7	•	•			·		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	ictor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjusted	d infiltrat	ion rate	(allowing	g for shel	ter and	wind spe	eed)	-			13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
Ventilation Effective				ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat losses and heat lo</i> Element Gross	Ópenings	Net area	U-value	AxU	kappa-valu		
area, m ² Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	m²	A, m² 4.710	W/m²K 1.42 (1.50)	W/K 6.67	kJ/m²K	kJ/K	(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window		2.090	1.42 (1.50)	2.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window		0.510	1.42 (1.50)	0.72			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window		0.510	1.42 (1.50)	0.72			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window		1.200	1.42 (1.50)	1.70			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window		1.200	1.42 (1.50)	1.70			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window		0.420	1.42 (1.50)	0.59			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window		1.120	1.42 (1.50)	1.58			(27)
Pitched roofs insulated betw Walls Ground floors Party wall Party ceiling	veen joists	38.10 82.60 99.40 76.70 61.30	0.18 0.22 0.20 0.00 0.00	6.86 18.17 19.88 0.00 0.00	9.00 17.00 110.00 180.00 30.00	342.90 1404.20 10934.00 13806.00 1839.00	(30) (29) (28)

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<i>3. Heat losses and heat loss parameter</i> Element Gross Openings Net area U-value A x U kappa-value A x K												
Element		Gross area, m ²		enings	Net are A, m ²		/m²K	A x U W/K		/m²K	kJ/K	
Total area of external elements Sigma A, m ² 231.86 Fabric heat loss, W/K 61.55 Heat capacity 28326.10 Thermal mass parameter, kJ/m ² K 462.84 Effect of thermal bridges 34.78 Total fabric heat loss 96.33 Ventilation heat loss calculated monthly 27.26												
27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	(38)
Heat tra	nsfer co	efficient,	W/K									
123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	
Heat los	s param	eter (HL	P), W/m [;]	²K	•			•			123.6	60 (39)
2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	
HLP (av											2.0)2 (40)
Number	of days	in month	(Table	1a)	-		_					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		ber day V	/d,avera	ge				kWh/year 2.02 82.06
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month	1	1	1		1	
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27
Energy	content c	of hot wa	ter used	1			I.		1		
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96
Energy of Distribut	content (tion loss	annual)				•					1294.28
20.13	17.60 er storag	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor store (k ¹	,	/h/day)							0.0000 0.0000 0.0000 0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stor	age loss			I	1	1	1	1	1	1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary	circuit lo loss	ss (annu	ial)		•	1					0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi le	oss calcu	lated for	r each m	onth							
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00
Total he	at requir	ed for wa	ater heat	ing calcı	ulated fo	r each m	onth				
100 10	157.40						132.27	133.73	152.29	162.57	175.96
		ar hoator	for each	n month,	kWh/mo	onth					
	1			140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96
Output f 180.19		163.76	145.25			118.65	132.27	133.73	152.29	162.57	175.96 1786.54

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•							•	
120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92	120.92
Lighting	gains	•								•	
39.21	34.83	28.32	21.44	16.03	13.53	14.62	19.01	25.51	32.39	37.81	40.30
Appliand	ces gains	3	•								
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04
Cooking	gains		•		•						
49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11	49.11
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns									
476.69	472.56	454.69	427.26	399.34	374.03	359.37	366.93	382.76	410.38	441.08	464.30

6. Solar gains (calculation for January)

0. Solar gains (carculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	0.9 x 4.710 37.39		1.00	69.8925
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 2.090 37.39	0.63 x 0.70	1.00	31.0139
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window	0.9 x 1.200 26.00	0.72 x 0.70	1.00	14.1523
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window	0.9 x 1.200 26.00	0.72 x 0.70	1.00	14.1523
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window	0.9 x 0.420 26.00	0.72 x 0.70	1.00	4.9533
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window	0.9 x 1.120 26.00	0.72 x 0.70	1.00	13.2088

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

	system	•	• •		, inving a	ica, iiii	(0)				0.75	`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau								•		•		
63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	
alpha												
5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	
Utilisati	on factor	for gains	s for livin	g area				•				
1.00	1.00	0.99	0.96	0.87	0.70	0.49	0.52	0.83	0.97	1.00	1.00	(86)
Mean ir	nternal te	mperatu	re in livin	ig area T	1			•				
20.06	20.17	20.38	20.59	20.81	20.92	20.94	20.94	20.87	20.61	20.25	20.07	(87)
Temper	rature du	ring heat	ting perio	ds in res	st of dwe	lling Th2	2	•				
19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	(88)
Utilisati	on factor	for gains	s for rest	of dwell	ing			•		•		
1.00	0.99	0.98	0.93	0.78	0.54	0.29	0.31	0.69	0.95	0.99	1.00	(89)
Mean ir	nternal te	mperatu	re in the	rest of d	welling T	2						
18.52	18.63	18.83	19.03	19.21	19.27	19.28	19.28	19.25	19.05	18.71	18.52	(90)
	irea fracti iternal te				dwelling)					0.41	(91)
19.14	19.25	19.46	19.66	19.86	19.94	19.95	19.95	19.91	19.68	19.33	19.15	(92)
Apply a	djustmen	it to the r	mean inte	ernal ten	nperatur	e, where	appropr	iate	•	•	·	
19.14	19.25	19.46	19.66	19.86	19.94	19.95	19.95	19.91	19.68	19.33	19.15	(93)

21.00

(85)

8. Space heating requirement

e. epue	e neutin,	grequi	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5								
1.00	0.99	0.98	0.94	0.82	0.60	0.36	0.39	0.74	0.96	0.99	1.00
Useful g	ains										
625.00	741.46	841.86	929.73	868.75	638.10	375.92	375.38	632.66	701.67	620.79	588.83
Monthly	average	externa	tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ire						
1809.67	1761.76	1564.47	1354.87	1008.08	659.51	377.15	377.08	693.12	1097.61	1524.38	1761.26
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
881.40	685.64	537.62	306.10	103.67	-	-	-	-	294.58	650.59	872.29
	ace heat					ar) (Octo	ober to N	lay)			4331.8
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						70.7

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	ergy requ	uiremen	IS								kWh/yea	r
Fraction	of spac	eating sy e heat fro in heating	om main	system((s)				1.0000 3.30%		-	(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	. ,
Space h	heating re	equireme	ent	-	1				1			
881.40	685.64	537.62	306.10	103.67	-	-	-	-	294.58	650.59	872.29	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1		1	1		
944.69	734.88	576.23	328.08	111.11	-	-	-	-	315.73	697.31	934.93	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	/stem)	1	1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)									
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating											. ,
Water h	leating re	equireme	nt									
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(64)
Efficiend	cy of wat	er heate	r								80.20	(216)
88.41	88.23	87.72	86.78	84.20	80.20	80.20	80.20	80.20	86.58	88.08	88.43	(217)
Water h	eating fu	iel										
203.81	178.41	186.69	167.37	167.02	154.42	147.94	164.93	166.75	175.88	184.57	198.98	(219)
Space h Water h	neating fu neating fu leating fu	uel used, uel (seco uel mps, fan	ndary)		ep-hot						kWh/year 4642.96 0.00 2096.76	(211) (215) (219)
mecha central boiler v Total ele Electrici	inical ver l heating with a far ectricity f ty for ligh	ntilation -	balance d flue oove, kW 0.00% fix	d, extrac h/year (ed LEL)	ct or posi	itive inpu	it from oi	utside (S	FP=0.57	740)	115.71 130.00 45.00 290.71 277.00	(230a) (230c) (230e) (231) (232)
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 961 000 x 0.00 000 x 0.00	.000 x 1 00 x 0.50	.000 00							822.616 0.000 0.000 822.616	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	3							6484.82	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4642.956	3.100	143.93	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2096.76	3.100	65.00	(247)
Mech vent fans cost	115.714	11.460	13.26	(249)
Pump/fan energy cost	175.000	11.460	20.05	(249)
Energy for lighting Additional standing charges	277.004	11.460	31.74 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	822.616	11.460	-94.27	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			285.72	(255)
11a. SAP rating			0 47	(256)

0.47	(200)
1.26	(257)
82.36	
82	(258)
В	
	1.26 82.36

12a. Carbon dioxide emissions

12a. Carbon dioxide emissions				
	Energy	Emission factor	Emission	-
	kWh/year	kg CO2/kWh	kg CO2/ye	ear
Space heating, main system 1	4642.96	0.198	919.31	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2096.76	0.198	415.16	(264)
Space and water heating			1334.46	(265)
Electricity for pumps and fans	290.71	0.517	150.30	(267)
Electricity for lighting	277.00	0.517	143.21	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1192.81	(272)
			kg/m²/yea	r
CO2 emissions per m ²			19.49	(273)

g/m²/year	
19.49	(273)
84.95	(273a)
85	(274)
В	. ,

El value El rating El band

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13a. Primary energy

isa. Fillilary ellergy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year	
Space heating, main	4642.96	1.020	4735.81	' (261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2096.76	1.020	2138.69	(264)
Space and water heating			6874.51	(265)
Electricity for pumps/fans	290.71	2.920	848.89	(267)
Electricity for lighting	277.00	2.920	808.85	(268)
Electricity generated - PV	-822.62	2.920	-2402.04	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			6130.21	(272)
Primary energy kWh/m²/year			100.17	(273)

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Project Information Building type Ground-floor flat

Duliding type		ιαι	
Plot number Reference	9		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for notional dwelling - calculation of target emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

main + seondary + other heating Number of chimneys $0 + 0 + 0$ $x 40$ 0.00 $(6a)$ Number of open flues $0 + 0 + 0$ $x 20$ 0.00 $(6b)$ Number of intermittent fans 2 $x 10$ 20.00 $(7a)$ Number of passive vents 0 $x 10$ 0.00 $(7c)$ Number of flueless gas fires 0 $x 40$ 0.00 $(7c)$ Number of sides on which sheltered 0 $x 40$ 0.00 $(7c)$ Number of sides on which sheltered 2.00 (17) (17) (17) Air permeability 0.62 (18) (17) (17) Number of sides on which sheltered 2.00 (19) (17) Air tencorporating shelter factor 0.85 (20) (17) Infiltration rate modified for monthly wind speed 0.53 (21) (17) Monthy average wind speed form Table 7 5.40 5.10 4.50 4.10 3.90 3.70 4.20 4.50	Z. Vent	Πατιστητά	ale									m ³ per h	our
Number of chimneys $0 + 0 + 0$ x 40 0.00 (6a) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of open flues $0 + 0 + 0$ x 20 0.00 (7a) Number of passive vents 0 x 10 0.00 (7c) Number of flueless gas fires 0 x 40 0.00 (7c) Infiltration due to chimneys, fans and flues 0.12 (8) (8) Pressure test, result q50 10.00 (17) (17) Air permeability 0.62 (18) (19) Number of sides on which sheltered 2.00 (19) (19) Shelter factor 0.85 (20) (11) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind									eondar	y + othe	r	•	
Infiltration due to chimneys, fans and flues 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.53 (21) Infiltration rate incorporating shelter factor 0.53 (21) Infiltration rate modified for monthly wind speed 0.53 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Vind Factor 54.10 5.10 4.10 3.90 3.70 3.70 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.55 0.59 0.63 0.67	Number Number Number	r of open r of inten r of pass	i flues mittent fa ive vents	S				0 + 0 + 0 0 + 0 + 0 2 0		x 20 x 10 x 10		0.00 20.00 0.00	(6b) (7a) (7b)
Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 State of the second secon	Pressur Air pern Number Shelter Infiltratio	re test, re neability r of sides factor on rate ir	esult q50 s on whic ncorpora) ch shelte ting she	red Iter facto	r				10.00		0.12 0.62 2.00 0.85	(8) (17) (18) (19) (20)
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 54.10 (22) Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind Factor 54.10 (22) 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans Effective air change rate	Monthly	/ average	e wind sp	beed from	n Table	7		·					
Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Effective air change rate	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Wind Fa	actor										54.10	(22)
Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.49 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans Effective air change rate	1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
7.14 (22b) Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Adjuste	d infiltrat	ion rate	(allowing	g for she	ter and	wind sp	eed)				13.53	(22a)
Ventilation : natural ventilation, intermittent extract fans Effective air change rate	0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67	
0.75 0.73 0.73 0.68 0.65 0.63 0.62 0.62 0.65 0.68 0.70 0.73 (25)					ntermitte	nt extrac	t fans	I				7.14	(22b)
	0.75	0.73	0.73	0.68	0.65	0.63	0.62	0.62	0.65	0.68	0.70	0.73	(25)

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3. Heat losses and h Element Gros area, Window - Double-glaz air-filled, low-E, En=0, hard coat (East/West)	s Óp m² m² ed,	arametei enings	r Net are A, m² 13.45 0	W/	value ′m²K 8 5 (2.00)	A x U W/K 24.9	1			(27)
Reference Glazing Solid door - Double-gl air-filled, low-E, En=0. hard coat (East/West) Reference Door	,		1.850	D	2.00	3.7	0			(26)
Pitched roofs insulate Walls Ground floors Party wall Party ceiling	l between	joists	42.04 75.12 99.40 76.70 61.30	2))	0.16 0.35 0.25 0.00 0.00	6.7 26.2 24.8 0.0 0.0	9 5 0			(30) (29) (28)
Total area of external Fabric heat loss, W/K Heat capacity Thermal mass param Effect of thermal bridg Total fabric heat loss Ventilation heat loss of	eter, kJ/m² es	K	m²						231.8 86.4 26957.3 250.0 25.5 111.9	8 (33) 6 (34) 0 (35) 0 (36)
41.11 39.62 39.6 Heat transfer coefficie		35.25	34.49	33.77	33.77	35.64	36.88	38.20	39.62	(38)
	,	147.00	140 47	145 75	145 75	147.00	1 40 00	150.10	151 00	
153.09 151.60 151. Heat loss parameter (146.47	145.75	145.75	147.62	148.86	150.19	151.60 149.0	5 (39)
2.50 2.48 2.48	2.43	2.41	2.39	2.38	2.38	2.41	2.43	2.45	2.48	
HLP (average) Number of days in mo	nth (Table	1a)							2.4	4 (40)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31	30	31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	e r heating ed occupa average	ancy, N	•		oer dav V	/d avera	ne				kWh/year 2.02 86.38
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	er usage			-			1.1.9				
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02
Energy	content c	of hot wa	ter used	1	1		1				
141.25	123.54	127.48	111.14	106.64	92.03	85.27	97.85	99.02	115.40	125.97	136.80
	content (tion loss	annual)		1			1				1362.41
21.19	18.53 er storag	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52 150.00
Volume				m/day)							0.0191 0.9283
Energy l	lost from	hot wate	er cylinde	er (kWh/	day)						0.5400 1.44
		hot wate	er cylinde	er (kWh/	day) 43.09	44.53	44.53	43.09	44.53	43.09	
Energy I Total sto 44.53	lost from orage los	hot wate s 44.53				44.53	44.53	43.09	44.53	43.09	1.44
Energy I Total sto 44.53	lost from prage los 40.22	hot wate s 44.53				44.53 44.53	44.53 44.53	43.09	44.53 44.53	43.09	1.44
Energy I Total sto 44.53 Net stor 44.53 Primary	lost from prage los 40.22 age loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09	44.53	43.09						1.44 44.53
Energy I Total sto 44.53 Net stor 44.53 Primary	lost from prage los 40.22 age loss 40.22 circuit lo	hot wate s 44.53 44.53	43.09	44.53	43.09						1.44 44.53 44.53
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81	lost from prage los 40.22 age loss 40.22 circuit lo loss	hot wate s 44.53 44.53 ss (annu 51.81	43.09 43.09 al) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 237.59	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 210.55	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 223.82	43.09 43.09 aal) 50.14 ater heat 204.37	44.53 44.53 51.81 ing calcu 202.98	43.09 43.09 50.14 Jated for 185.25	44.53 51.81 r each m 181.61	44.53 51.81 onth	43.09 50.14	44.53	43.09 50.14	1.44 44.53 44.53 610.00
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 237.59	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 223.82	43.09 43.09 aal) 50.14 ater heat 204.37	44.53 44.53 51.81 ing calcu 202.98	43.09 43.09 50.14 Jated for 185.25	44.53 51.81 r each m 181.61	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 237.59 Output f	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 210.55	hot wate s 44.53 44.53 ss (annu 51.81 ed for wa 223.82 er heater	43.09 43.09 al) 50.14 ater heat 204.37 for each	44.53 44.53 51.81 ing calcu 202.98 n month,	43.09 43.09 50.14 Jated for 185.25 kWh/mc	44.53 51.81 r each m 181.61 onth	44.53 51.81 onth	43.09 50.14 192.25	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 237.59 Output f 237.59	lost from prage los 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 210.55 from wate	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 223.82 er heater 223.82	43.09 43.09 al) 50.14 ater heat 204.37 for each 204.37	44.53 44.53 51.81 ing calcu 202.98 n month, 202.98	43.09 43.09 50.14 Jlated for 185.25 kWh/mo 185.25	44.53 51.81 r each m 181.61 onth	44.53 51.81 onth 194.19	43.09 50.14 192.25	44.53 51.81 211.74	43.09 50.14 219.20	1.44 44.53 44.53 610.00 51.81 233.13

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•	•	•						•
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	gains		•	•	•		•				•
26.68	23.70	19.27	14.59	10.91	9.21	9.95	12.93	17.36	22.04	25.72	27.42
Applianc	ces gains	3	•								
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains										
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72
Total int	ernal gai	ns									
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains						
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 13.450 19	9.87 0.72 x 0.70	0.77	93.3555						
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	Solid door - Double-glazed, air-filled, low-E, 0.9 x 1.850 0.00 0.72 x 0.70 0.77 En=0.2, hard coat (East/West)									
Total solar gains, January				93.36	(83-1)					
Solar gains										
93.36 180.95 289.22 429.42 522.48 54	45.18 529.16 40	60.54 345.77 22	20.36 116.07	77.01	(83)					
Total gains										
525.94 610.38 705.46 825.54 898.89 9	03.11 875.68 8 ⁻	13.83 710.09 60	05.00 523.36	500.58	(84)					
Lighting calculations										
	Area	g	FF x Shad	•						
Window - Double-glazed, air-filled, low-E, 0.9 x 13.45 0.80 0.70 x 0.83 5.63 En=0.2, hard coat (East/West) Reference Glazing										
GL = 5.63 / 61.20 = 0.092										
C1 = 0.850 C2 = 0.960										
El = 471										

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)21.00Heating system responsiveness1.00												()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau		•	•									
27.76	28.04	28.04	28.55	28.87	29.02	29.16	29.16	28.79	28.55	28.30	28.04	
alpha												
2.85	2.87	2.87	2.90	2.92	2.93	2.94	2.94	2.92	2.90	2.89	2.87	
Utilisatio	on factor	for gains	s for livin	g area						•		
0.99	0.99	0.97	0.94	0.88	0.76	0.59	0.62	0.85	0.96	0.99	0.99	(86)
Mean in	iternal te	mperatu	re in livin	g area T	1				•			
18.53	18.75	19.19	19.69	20.27	20.69	20.90	20.89	20.52	19.83	19.03	18.60	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	illing Th2	2					
19.03	19.04	19.04	19.07	19.09	19.09	19.10	19.10	19.08	19.07	19.06	19.04	(88)
Utilisatio	on factor	for gains	s for rest	of dwell	ing					•		
0.99	0.98	0.96	0.92	0.81	0.62	0.35	0.38	0.74	0.93	0.98	0.99	(89)
Mean in	iternal te	mperatu	re in the	rest of d	welling T	2						
16.93	17.15	17.59	18.09	18.64	18.97	19.09	19.08	18.86	18.24	17.45	17.01	(90)
	rea fracti Iternal te				dwelling)					0.41	(91)
17.58	17.80	18.24	18.74	19.30	19.66	19.82	19.81	19.53	18.88	18.09	17.65	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.58	17.80	18.24	18.74	19.30	19.66	19.82	19.81	19.53	18.88	18.09	17.65	(93)

8. Space heating requirement

Space heating requirement for each month, kWh/month1104.84 903.91789.31534.37284.04477.90831.671071.43Total space heating requirement per year (kWh/year) (October to May)5997.4			9.09	••••••								
0.98 0.97 0.95 0.91 0.82 0.67 0.45 0.48 0.78 0.93 0.98 0.98 Useful gains 517.31 595.05 672.74 752.37 737.32 603.80 398.06 392.34 550.55 561.16 510.52 492.85 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2002.3 1940.15 1733.64 1494.55 1119.09 741.84 425.88 424.79 772.49 1203.55 1665.62 1932.94 Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 517.31 595.05 672.74 752.37 737.32 603.80 398.06 392.34 550.55 561.16 510.52 492.85 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2002.3 1940.1 1733.6 1494.5 1119.09 741.84 425.88 424.79 772.49 1203.5 1665.6 1932.94 Space heating requirement for each month, kWh/month 1104.8 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.4	Utilisatio	n factor	for gains	5								
517.31 595.05 672.74 752.37 737.32 603.80 398.06 392.34 550.55 561.16 510.52 492.85 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2002.3 1940.15 1733.64 1494.55 1119.09 741.84 425.88 424.79 772.49 1203.50 1665.62 1932.94 Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.4	0.98	0.97	0.95	0.91	0.82	0.67	0.45	0.48	0.78	0.93	0.98	0.98
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2002.3 1940.1 1733.6 1494.5 1119.09 741.84 425.88 424.79 772.49 1203.5 1665.6 1932.94 Space heating requirement for each month, kWh/month 1104.8 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.4 171.4 1071.	Useful gains											
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2002.3 1940.15 1733.64 1494.55 1119.09 741.84 425.88 424.79 772.49 1203.50 1665.62 1932.94 Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.43	517.31	595.05	672.74	752.37	737.32	603.80	398.06	392.34	550.55	561.16	510.52	492.85
Heat loss rate for mean internal temperature 2002.3 1940.15 1733.64 1494.55 1119.09 741.84 425.88 424.79 772.49 1203.50 1665.62 1932.94 Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.45 Total space heating requirement per year (kWh/year) (October to May) 5997.45	Monthly average external temperature											
2002.3 1940.15 1733.64 1494.55 1119.09 741.84 425.88 424.79 772.49 1203.50 1665.62 1932.94 Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.43	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month 1104.84 903.91 789.31 534.37 284.04 - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.4	Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
1104.84 903.91 789.31 534.37 284.04 - - - 477.90 831.67 1071.43 Total space heating requirement per year (kWh/year) (October to May) 5997.43	2002.3	1940.15	1733.64	1494.55	1119.09	741.84	425.88	424.79	772.49	1203.50	1665.62	1932.94
Total space heating requirement per year (kWh/year) (October to May) 5997.4	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
	1104.84	903.91	789.31	534.37	284.04	-	-	-	-	477.90	831.67	1071.43
Space heating requirement per m ² (kWh/m ² /year) 98.00							ar) (Octo	ober to N	lay)		•	
	Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						98.0

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9a. Energy requirements

Fraction	n of heat of spac	from sec	ondary s		s)				0.1000 0.9000		kWh/year	(201) (202)
Efficiend	cy of mai	in heating	g system		,			78	8.90% 00.00%			(206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	· · /
Space h	heating re	equireme	ent									
1104.84	4 903.91	789.31	534.37	284.04	-	-	-	-	477.90	831.67	1071.43	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)			1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1			1		
1260.2	8 1031.08	900.36	609.54	324.00	-	-	-	-	545.13	948.68	1222.16	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)			1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)				I			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	iel (seco	ndary)		1							
110.48	90.39	78.93	53.44	28.40	-	-	-	-	47.79	83.17	107.14	(215)
Water h		1										
	eating re											
	210.55			202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(64)
	cy of wat										68.80	(216)
76.73	76.59	76.22	75.59	74.09	68.80	68.80	68.80	68.80	75.26	76.36	76.71	(217)
	eating fu											
309.65	274.92	293.65	270.37	273.98	269.26	263.97	282.25	279.44	281.36	287.06	303.92	(219)
Space h Water h	neating fu neating fu neating fu	uel (seco iel	ndary)		on hot						kWh/year 6841.23 599.75 3389.82	(211) (215) (219)
central boiler v Total ele Electrici	ity for pur I heating with a far ectricity f ity for ligh saving/g ix Q -	pump n-assiste or the ab nting (30	d flue ove, kW .00% fixe	′h/year ed LEL)	ep-not						130.00 45.00 175.00 471.15	(230c) (230e) (231) (232)
Energ	y saved y used ()		ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							11476.95	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	6841.23	0.194	1327.20	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	599.75	0.422	253.09	(263)
Water heating	3389.82	0.194	657.63	(264)
Space and water heating			2237.92	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	471.15	0.422	198.82	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2510.59	(272)
			kg/m²/yea	
Emissions per m ² for space and water heating			37.77	(272a)
Emissions per m ² for lighting			3.25	(272b)
Emissions per m ² for pumps and fans			1.21	(272c)
Target Carbon Dioxide Emission Rate (TER)			25.52	(273)

= [(37.7740 x 1.0000 x 1.0206) + (3.2488 x 1.2251)] x 0.6000

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Project Information Building type Ground-floor flat

Building type		iai	
Plot number Reference	9		
Date	16 June 2016		
Client	Investland	Project	252 Finchley Road London

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

NW3 7AA

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	61.20	2.70	165.24	(3a)
Total floor area	61.20			(4)
Dwelling volume (m ³)			165.24	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat losses and heat lo</i> Element Gross	Ópenings	Net area	U-value	A x U	kappa-valu		
area, m ² Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	m²	A, m² 0.510	W/m²K 1.42 (1.50)	W/K 0.72	kJ/m²K	kJ/K	(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window		0.510	1.42 (1.50)	0.72			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window		2.090	1.42 (1.50)	2.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door		4.710	1.42 (1.50)	6.67			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window		1.120	1.42 (1.50)	1.58			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window		0.420	1.42 (1.50)	0.59			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window		1.200	1.42 (1.50)	1.70			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window		1.200	1.42 (1.50)	1.70			(27)
Pitched roofs insulated betw Walls Ground floors Party wall Party ceiling	ween joists	38.10 82.60 99.40 76.70 61.30	0.18 0.22 0.20 0.00 0.00	6.86 18.17 19.88 0.00 0.00	9.00 17.00 110.00 180.00 30.00	342.90 1404.20 10934.00 13806.00 1839.00	(30) (29) (28)

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3. Heat losses and heat loss parameter													
Element	t	Gross	Öpe	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K		
		area, m ²	² m²		A, m²	W	′m²K	W/K	kJ	/m²K	kJ/K		
Total area of external elements Sigma A, m ² 231.86 (Fabric heat loss, W/K 61.55 (Heat capacity 28326.10 (Thermal mass parameter, kJ/m ² K 462.84 (Effect of thermal bridges 34.78 (Total fabric heat loss 96.33 (Ventilation heat loss calculated monthly 27.26													
27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	27.26	(38)	
Heat tra	nsfer co	efficient,	W/K										
123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60	123.60		
Heat los	s param	eter (HL	P), W/m [;]	²K				1			123.6	60 (39)	
2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02		
HLP (av		•						•			2.0)2 (40)	
Number	of days	in month	(Table	1a)	-		_						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

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Assume	d occupa	ancy, N	/ require r usage i		oer day V	/d,avera	ge				kWh/year 2.02 82.06	(42 (43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot wate	er usage	in litres	per day f	or each	month		•					
90.27	86.99	83.71	80.42	77.14	73.86	73.86	77.14	80.42	83.71	86.99	90.27	(4
Energy of	content o	of hot wa	ter used									
134.19	117.36	121.11	105.59	101.31	87.42	81.01	92.96	94.07	109.63	119.67	129.96	
	content (ion loss	annual)									1294.28	(4
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(4
lot wate /olume empera nergy l		er loss fa tor store (k'	ctor (kW	'h/day)							0.00 0.0000 0.0000 0.0000 0.000	(5 (5 (5 (5 (5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Vet stora	age loss			I					1		1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Primary Primary	circuit lo loss	ss (annu	ial)			•				•	0.00	(5
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5
Combi lo	oss calcu	lated for	r each m	onth								
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(6
otal he	at require	ed for wa	ater heat	ing calcu	lated fo	r each m	ionth					
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
Dutput f	rom wate	er heater	for each	n month,	kWh/mo	onth						
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(6
leat gai	ns from	water he	ating, kV	Vh/mont	h						1786.54	(6
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(6

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5. Internal gains

	0										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•								
100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77	100.77
Lighting	gains		•	•			•	•		•	
15.78	14.02	11.40	8.63	6.45	5.45	5.88	7.65	10.27	13.04	15.21	16.22
Applianc	es gains	3	•				•				
175.96	177.79	173.19	163.39	151.03	139.40	131.64	129.82	134.42	144.21	156.58	168.20
Cooking	gains		•				•	•			
33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08	33.08
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)			•				
-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61	-80.61
Water h	eating ga	ains									
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54
Total int	ernal gai	ns					•			•	
330.40	328.00	316.27	297.78	279.19	261.10	249.61	255.45	265.13	283.81	305.18	321.18
								-			

6. Solar gains (calculation for January)

6. Solar gains (carculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51		0.54	1.2581
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) Slim Window	0.9 x 0.510 11.51	0.63 x 0.70	0.54	1.2581
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 2.090 37.39	0.63 x 0.70	0.77	23.8807
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door	0.9 x 4.710 37.39	0.63 x 0.70	0.77	53.8172
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window	0.9 x 1.120 26.00	0.72 x 0.70	1.00	13.2088
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Roof Window	0.9 x 0.420 26.00	0.72 x 0.70	1.00	4.9533
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window	0.9 x 1.200 26.00	0.72 x 0.70	1.00	14.1523
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Roof Window	0.9 x 1.200 26.00	0.72 x 0.70	1.00	14.1523

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Mean internal temperature

Tempe	n interna rature du i system	ring heat	ting perio	ods in the	e living a	irea, Th1	(°C)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau				•		•		•		•
63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66
alpha				•		•				•
5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24
Utilisati	on factor	for gains	s for livin	ig area		•	•			•
1.00	1.00	1.00	0.98	0.93	0.79	0.58	0.62	0.91	0.99	1.00
Mean ir	nternal te	mperatu	re in livir	ng area T	1		•			•
19.95	20.06	20.26	20.48	20.74	20.89	20.94	20.94	20.82	20.51	20.15
Tempe	rature du	ring heat	ting perio	ds in re	st of dwe	elling Th2	2	•	•	•

I emper	ature dui	ing neat	ing perio	as in res	st of awe	lling i n2	2				
19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33	19.33
Utilisatio	on factor	for gains	for rest	of dwelli	ng		•			•	<u> </u>
1.00	1.00	0.99	0.97	0.87	0.64	0.35	0.38	0.80	0.98	1.00	1.00
Mean in	ternal ter	nperatu	re in the	rest of d	welling T	2	•				
18.41	18.52	18.72	18.94	19.16	19.26	19.27	19.27	19.23	18.96	18.61	18.42
	rea fracti						•				0.41
Mean in	ternal ter	mperatui	re (for th	e whole	dwelling)						
19.04	19.14	19.35	19.56	19.80	19.92	19.95	19.95	19.87	19.59	19.23	19.05
Apply adjustment to the mean internal temperature, where appropriate											
19.04	19.14	19.35	19.56	19.80	19.92	19.95	19.95	19.87	19.59	19.23	19.05

21.00

Dec

63.66

5.24

1.00

19.97

0.75

(85)

(86)

(87)

8. Space heating requirement

er epae	e neath,	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	5					1			
1.00	1.00	0.99	0.97	0.89	0.70	0.44	0.48	0.85	0.98	1.00	1.00
Useful gains											
456.82	561.12	663.65	774.06	778.70	614.63	373.94	372.46	573.15	553.46	459.86	426.96
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure		•				
1796.59	1747.70	1550.52	1342.63	1001.05	657.54	376.89	376.70	688.43	1086.00	1511.84	1748.67
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
996.79	797.39	659.83	409.37	165.43	-	-	-	-	396.21	757.43	983.35
	ace heat					ar) (Oct	ober to N	/lay)		•	5165.7
Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						84.4

8c. Space cooling requirement - not applicable

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9a. Energy requirements

<i>9a. Energy requirements</i>	kWh/year	
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.30%		(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	Dec	
Space heating requirement		
996.79 797.39 659.83 409.37 165.43 396.21 757.43 98	83.35	(98)
Appendix Q - monthly energy saved (main heating system 1)		
0.00 0.00 0.00 0.00 0.00 0.00	.00	(210)
Space heating fuel (main heating system 1)		
1068.37 854.65 707.22 438.76 177.31 424.66 811.82 10	053.97	(211)
Appendix Q - monthly energy saved (main heating system 2)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(212)
Space heating fuel (main heating system 2)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)		
0.00 0.00 0.00 0.00 0.00 0.00	.00	(214)
Space heating fuel (secondary)		
0.00 0.00 0.00 0.00 0.00 0.00	0.00	(215)
Water heating		
Water heating requirement		
	75.96	(64)
Efficiency of water heater	80.20	(216)
	8.61	(217)
Water heating fuel		
203.39 177.93 185.90 166.15 164.74 154.42 147.94 164.93 166.75 174.54 184.04 19	98.58	(219)
Space heating fuel used, main system 1 5 Space heating fuel (secondary)	kWh/year 5536.75 0.00 2089.31	(211) (215) (219)
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740) central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL) Energy saving/generation technologies	115.71 130.00 45.00 290.71 278.69	(230a) (230c) (230e) (231) (232)
PVs 0.80 x 1.070 x 961.000 x 1.000 8 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500	822.616 0.000 0.000 822.616	(233)
Appendix Q - Energy saved or generated (): Energy used ():	0.000 0.000	(236a) (237a)
Total delivered energy for all uses	7372.86	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission: kg CO2/ye	-
Space heating, main system 1	5536.75	0.198	1096.28	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2089.31	0.198	413.68	(264)
Space and water heating			1509.96	(265)
Electricity for pumps and fans	290.71	0.517	150.30	(267)
Electricity for lighting	278.69	0.517	144.09	(268)
Electricity generated - PVs	-822.62	0.529	-435.16	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				. ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1369.18	(272)

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 22.37 (273)

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Project Information

2016 and Project	252 Finchley Road London NW3 7AA
	and Project

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	` 70.70	2.70	`190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m ³)			190.89	(5)

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2. Ventilation rate

m ³ per ho	
main + seondary + other heating	-
Number of chimneys $0 + 0 + 0$ x 400.00Number of open flues $0 + 0 + 0$ x 200.00	(6a) (6b)
Number of intermittent fans0x 100.00Number of passive vents0x 100.00	(7a) (7b)
Number of flueless gas fires0x 100.00	(7c)
	es per hour
Infiltration due to chimneys, fans and flues 0.00 Pressure test, result q50 10.00	(8) (17)
Air permeability 0.50	(17)
Number of sides on which sheltered 2.00	(19)
Shelter factor 0.85	(20)
Infiltration rate incorporating shelter factor 0.42 Infiltration rate modified for monthly wind speed	(21)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10	
54.10 Wind Factor	(22)
1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27	
13.53 Adjusted infiltration rate (allowing for shelter and wind speed)	(22a)
0.57 0.54 0.54 0.48 0.44 0.41 0.39 0.39 0.45 0.48 0.51 0.54	
5.75	(22b)
Ventilation : Mechanical whole house extract ventilation Effective air change rate	
0.82 0.79 0.79 0.73 0.69 0.66 0.64 0.64 0.70 0.73 0.76 0.79	(25)

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<i>3. Heat losses and heat los</i> Element Gross	ss paramete Openings	Net area	U-value	AxU	kappa-valu	e A x K	
area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	m²	A, m² 3.150	W/m²K 1.42 (1.50)	W/K 4.46	kJ/m²K	kJ/K	(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		3.220	1.42 (1.50)	4.56			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		0.670	1.42 (1.50)	0.95			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		0.510	1.42 (1.50)	0.72			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)		0.920	1.42 (1.50)	1.30			(27)
Roof Window Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)		0.670	1.42 (1.50)	0.95			(27)
Roof Window Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)		0.800	1.42 (1.50)	1.13			(27)
Roof Window Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)		0.420	1.42 (1.50)	0.59			(27)
Roof Window Walls Ground floors Pitched roofs insulated betw Party wall Internal ceiling	een rafters	92.30 70.70 25.40 44.00 70.70	0.22 0.20 0.18 0.00 0.00	20.31 14.14 4.57 0.00 0.00	17.00 18.00 9.00 70.00 9.00	1569.10 1272.60 228.60 3080.00 636.30	(29) (28) (30)

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<i>3. Heat</i> Element		and heat Gross		rameter enings	Net are	a _	value	AxU	ka	ppa-valu		
Liemeni	-	area, m ²		2111195	A, m ²		/m²K	W/K		/m²K	kJ/K	
Total area of external elements Sigma A, m²198.76Fabric heat loss, W/K53.68Heat capacity6786.60Thermal mass parameter, kJ/m²K95.99Effect of thermal bridges29.81Total fabric heat loss83.49Ventilation heat loss calculated monthly51.40.5151.8949.8849.8845.8743.4944.85												58 (33) 50 (34) 99 (35) 31 (36)
51.89	49.88	49.88	45.87	43.19	41.85	40.51	40.51	43.86	45.87	47.88	49.88	(38)
Heat tra	nsfer co	efficient,	W/K									
135.38	133.38	133.38	129.36	126.68	125.34	124.01	124.01	127.35	129.36	131.37	133.38	
Heat los	s param	eter (HL	P), W/m [;]	²K						•	129.4	(39)
1.91	1.89	1.89	1.83	1.79	1.77	1.75	1.75	1.80	1.83	1.86	1.89	
HLP (av							•	•			1.8	3 (40)
Number	of days	in month	(Table	1a)			_					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	r heating d occupa average	ancy, N	•		her dav V	/d avera	ne				kWh/yea 2.26 87.95	ar
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres		,	month		5	1		1		
96.74	93.22	89.71	86.19	82.67	79.15	79.15	82.67	86.19	89.71	93.22	96.74	
Energy of	content c	f hot wa	ter used		1			1				
143.81	125.77	129.79	113.15	108.57	93.69	86.82	99.62	100.81	117.49	128.25	139.27	
Energy o Distribut	content (tion loss	annual)									1387.05	
21.57	18.87 er storag	19.47	16.97	16.29	14.05	13.02	14.94	15.12	17.62	19.24	20.89	
Volume Tempera Energy l	er cylinde factor ature fac lost from prage los	tor store (k	·	'h/day)							0.0000 0.0000 0.0000 0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Net stora	age loss	1	1	1		•			1			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Primary Primary	circuit lo loss	ss (annı	ial)								0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Combi lo	oss calcu		r each m	onth	-							
49.30	42.91	45.71	42.50	42.13	39.03	40.33	42.13	42.50	45.71	45.97	49.30	
	at requir								1	1		
	168.68						141.75	143.32	163.20	174.22	188.57	
•	rom wate			-			•			•		
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22		
	ing from	wator bo	ation 11		h						1914.58	
Heat gai		water ne	eating, Ki	wn/moni	.n							

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains, Watts											
135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78
Lighting gains											
46.57	41.36	33.64	25.47	19.04	16.07	17.37	22.57	30.30	38.47	44.90	47.86
Appliances gains											
296.90	299.98	292.22	275.69	254.83	235.22	222.12	219.04	226.80	243.33	264.19	283.80
Cooking gains											
50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52
Water h	eating ga	ains									
80.83	78.20	73.36	67.01	62.68	56.82	52.35	58.68	61.31	67.87	75.19	78.81
Total int	ernal gai	ns			•	•			•	•	
530.41	525.64	505.32	474.27	442.64	414.21	397.94	406.39	424.51	455.77	490.38	516.57
				•							

6. Solar gains (calculation for January)

o. Colar gams (calculation for calculary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 3.150 11.51		0.77	12.6631
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 3.220 11.51	0.72 x 0.70	0.77	12.9445
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 0.670 11.51	0.72 x 0.70	0.77	2.6934
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 0.510 11.51	0.72 x 0.70	0.77	2.0502
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.920 26.00	0.72 x 0.70	1.00	10.8501
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.670 26.00	0.72 x 0.70	1.00	7.9017
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.800 26.00	0.72 x 0.70	1.00	9.4349
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.420 26.00	0.72 x 0.70	1.00	4.9533
Lighting calculations				
	Area	g	FF x Shadi	ng

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7 Mean internal temperature

	7. Mean mernar temperature										
Temper	Temperature during heating periods in the living area, Th1 (°C)										21.
Heating	system	responsi	veness								0.
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	•	•	•		•		•	•		•	
13.92	14.13	14.13	14.57	14.88	15.04	15.20	15.20	14.80	14.57	14.35	14.13
alpha								•			•
1.93	1.94	1.94	1.97	1.99	2.00	2.01	2.01	1.99	1.97	1.96	1.94
Utilisatio	on factor	for gains	s for livin	g area							
0.94	0.93	0.90	0.84	0.74	0.62	0.47	0.50	0.73	0.87	0.93	0.94
Mean in	Mean internal temperature in living area T1										
18.31	18.52	18.96	19.49	20.09	20.50	20.73	20.71	20.33	19.64	18.84	18.39
Temper	ature du	ring heat	ing peric	ods in res	st of dwe	elling Th2	2				
19 40	19 42	19 42	1945	19 48	19 49	19 51	19 51	19 47	1945	19 44	19 42

•		-	• •			-						
19.40	19.42	19.42	19.45	19.48	19.49	19.51	19.51	19.47	19.45	19.44	19.42	(88)
Utilisatic	on factor	for gains	for rest	of dwelli	ng		•	•	•			
0.93	0.91	0.88	0.81	0.69	0.52	0.33	0.36	0.64	0.83	0.91	0.93	(89)
Mean in	iternal ter	mperatui	re in the	rest of d	welling T	2						
17.03	17.25	17.68	18.21	18.79	19.16	19.33	19.32	19.02	18.38	17.58	17.12	(90)
	rea fracti						•				0.33	3 (91)
Mean in	iternal ter	mperatui	re (for the									
17.45	17.66	18.10	18.63	19.22	19.60	19.79	19.78	19.45	18.79	17.99	17.53	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.45	17.66	18.10	18.63	19.22	19.60	19.79	19.78	19.45	18.79	17.99	17.53	(93)

21.00

0.75

(85)

(86)

(87)

8. Space heating requirement

e. epac	••a	grequi	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	5								<u> </u>
0.91	0.90	0.86	0.79	0.68	0.53	0.36	0.39	0.64	0.81	0.89	0.92
Useful g	jains										
543.06	588.30	627.91	666.78	623.47	492.58	321.53	315.28	452.41	504.32	510.72	520.53
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ire						
1753.06	1689.09	1507.34	1284.70	952.02	626.43	358.07	356.79	655.38	1033.68	1443.42	1685.05
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
900.24	739.73	654.30	444.90	244.44	-	-	-	-	393.85	671.54	866.40
		ting requ				ar) (Oct	ober to N	lay)			4915.4
Space h	leating re	equireme	ent per m	l² (kWh/r	n²/year)						69.5

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Energy requirements	kW	/h/year	
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.80%		(202) (206)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct N	Nov Dec		
Space heating requirement]	
900.24 739.73 654.30 444.90 244.44 393.85 6	671.54 866.4	40 (98)	
Appendix Q - monthly energy saved (main heating system 1)]	
0.00 0.00 0.00 0.00 0.00 0	0.00 0.00	(210))
Space heating fuel (main heating system 1)]	
959.74 788.62 697.54 474.31 260.60 419.88 7	715.93 923.	67 (211))
Appendix Q - monthly energy saved (main heating system 2)]	
0.00 0.00 0.00 0.00 0.00 0	0.00 0.00	(212))
Space heating fuel (main heating system 2)]	
0.00 0.00 0.00 0.00 0.00 0	0.00 0.00	(213))
Appendix Q - monthly energy saved (secondary heating system)]	
0.00 0.00 0.00 0.00 0.00 0	0.00 0.00	(214))
Space heating fuel (secondary)			
0.00 0.00 0.00 0.00 0.00 0	0.00 0.00	(215))
Water heating]	
Water heating requirement			
	174.22 188.	. ,	
Efficiency of water heater		31.50 (216)	
	90.97 91.3 [,]	4 (217))
Water heating fuel			
211.36 184.87 193.07 172.44 169.91 162.85 156.01 173.93 175.85 181.68 1	191.51 206.	45 (219))
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel Electricity for pumps, fans and electric keep-hot	524 217	'h/year 40.29 (211) 0.00 (215) 79.94 (219)))
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240 central heating pump boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL) Energy saving/generation technologies	13 4 22	52.17 (230a 30.00 (230c 45.00 (230c 27.17 (231) 28.98 (232)	c) e))
PVs 0.80 x 1.070 x 1027.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500	C C	9.112 0.000 0.000 9.112 (233))
Appendix Q - Energy saved or generated (): Energy used ():).000 (236a).000 (237a	
Total delivered energy for all uses	709	97.26 (238))

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	5240.294	3.100	162.45	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2179.94	3.100	67.58	(247)
Mech vent fans cost	52.166	11.460	5.98	(249)
Pump/fan energy cost	175.000	11.460	20.06	(249)
Energy for lighting	328.979	11.460	37.70	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs Appendix Q -	879.112	11.460	-100.75	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			299.02	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

(200)
(257)
(258)

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/ye	-
Space heating, main system 1	5240.29	0.198	1037.58	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2179.94	0.198	431.63	(264)
Space and water heating			1469.21	(265)
Electricity for pumps and fans	227.17	0.517	117.45	(267)
Electricity for lighting	328.98	0.517	170.08	(268)
Electricity generated - PVs	-879.11	0.529	-465.05	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				()
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1291.68	(272)
			kg/m²/yea	
CO2 emissions per m ²			19 27	(273)

CO2 emissions per m	2
El value	
El rating	
El band	

(273) 18.27 (273a) 85.04 85 (274) В

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13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year	1
Space heating, main	5240.29	1.020	5345.10	, (261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2179.94	1.020	2223.54	(264)
Space and water heating			7568.64	(265)
Electricity for pumps/fans	227.17	2.920	663.33	(267)
Electricity for lighting	328.98	2.920	960.62	(268)
Electricity generated - PV	-879.11	2.920	-2567.01	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			6625.57	(272)
Primary energy kWh/m²/year			93.71	(273)

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Project Information

Building type			
Plot number Reference	10		
Date Client	4 July 2016 Investland	Project	252 Finchley Road London NW3 7AA

SAP 2009 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	70.70	2.70	190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m ³)			190.89	(5)

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2. Ventilation rate

m	³ per hou	ır
main + seondary + other heating		
Number of chimneys $0 + 0 + 0$ $x 40$ Number of open flues $0 + 0 + 0$ $x 20$ Number of intermittent fans 2 $x 10$	0.00 0.00 20.00	(6a) (6b) (7a)
Number of passive vents0x 10Number of flueless gas fires0x 40	0.00 0.00	(7b) (7c)
Ai Infiltration due to chimneys, fans and flues	ir change 0.10	es per hour (8)
Pressure test, result q50 10.00		(17)
Air permeability Number of sides on which sheltered	0.60 2.00	(18) (19)
Shelter factor Infiltration rate incorporating shelter factor Infiltration rate modified for monthly wind speed	0.85 0.51	(20) (21)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	с	
Monthly average wind speed from Table 7		
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.1		
Wind Factor	54.10	(22)
1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.2	27	
Adjusted infiltration rate (allowing for shelter and wind speed)	13.53	(22a)
0.69 0.66 0.66 0.58 0.53 0.50 0.48 0.48 0.54 0.58 0.62 0.6		
Ventilation : natural ventilation, intermittent extract fans Effective air change rate	6.95	(22b)
0.74 0.71 0.71 0.67 0.64 0.63 0.61 0.61 0.65 0.67 0.69 0.7	'1	(25)

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	Gross area, m ² e-glazed En=0.2, Vest)	Öpe ² m²	enings	Net are A, m² 15.82	W/	value ′m²K 35 (2.00)	A x U W/K 29.3	1			(27)
Solid door - Doul air-filled, low-E, E hard coat (East/V Reference Doo	ole-glaze En=0.2, Vest)	ed,		1.850	0	2.00	3.7	0			(26)
Walls				82.17		0.35	28.7	-			(29)
Ground floors				70.70	-	0.25	17.6				(28)
Pitched roofs ins	ulated b	etween r	afters	28.2		0.16	4.5	-			(30)
Party wall Internal ceiling				44.00 70.70		0.00 0.00	0.0 0.0				
internal beining				10.10	5	0.00	0.0	0			
Total area of externation for the second sec	W/K aramete bridges loss	r, kJ/m²ŀ	ζ	m²						198.7(83.9) 5242.7(250.0) 21.8(105.8)	6 (33) 9 (34) 0 (35) 6 (36)
			· · · ·	00.44	00.00	00.00	40.07	40.00	40.40	45.00	(20)
46.67 45.03	45.03	42.03	40.24	39.41	38.62	38.62	40.67	42.03	43.48	45.03	(38)
Heat transfer coe			1 40 00	4.5.00			1 10 10	447.05	4 4 9 9 9	450.05	
152.48 150.85	150.85	147.85	146.06	145.23	144.44	144.44	146.49	147.85	149.30	150.85	(00)
Heat loss param	eter (HL	P), W/m [;]	²K							148.0	6 (39)
2.16 2.13	2.13	2.09	2.07	2.05	2.04	2.04	2.07	2.09	2.11	2.13	
HLP (average)						•		•	•	2.0	9 (40)
Number of days in month (Table 1a)											
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28	31	30	31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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	ed occupa average			in litroo r	or day V	/d overe	20				kWh/yea 2.26 92.57
	· · · · ·							0		NL.	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	er usage						1			1	
101.83		94.43	90.72	87.02	83.32	83.32	87.02	90.72	94.43	98.13	101.83
Energy	content c		ter used								
151.38		136.62	119.11	114.29	98.62	91.39	104.87	106.12	123.67	135.00	146.60
	content (tion loss	annual)									1460.05
22.71	19.86	20.49	17.87	17.14	14.79	13.71	15.73	15.92	18.55	20.25	21.99
	er storag				1.1.10		10170		10.00	20.20	150.00
	er cylinde			/h/dav)							0.0191
	factor		(· · · ,)							0.9283
volume	laotoi										
Temper	ature fac										0.5400
Temper Energy		hot wate	er cylinde	er (kWh/	day)						0.5400 1.44
Temper Energy	ature fac lost from	hot wate	er cylinde 43.09	er (kWh/ 44.53	day) 43.09	44.53	44.53	43.09	44.53	43.09	
Temper Energy Total sto 44.53	ature fac lost from prage los	hot wate s 44.53	-			44.53	44.53	43.09	44.53	43.09	1.44
Temper Energy Total sto 44.53	ature fac lost from prage los 40.22	hot wate s 44.53	-			44.53	44.53	43.09	44.53 44.53	43.09	1.44
Temper Energy Total sto 44.53 Net stor 44.53	ature fac lost from orage los 40.22 age loss 40.22 circuit lo	hot wate ss 44.53 44.53	43.09	44.53	43.09						1.44 44.53
Temper Energy Total sto 44.53 Net stor 44.53 Primary	ature fac lost from orage los 40.22 age loss 40.22 circuit lo	hot wate ss 44.53 44.53	43.09	44.53	43.09						1.44 44.53 44.53
Temper Energy Total stor 44.53 Net stor 44.53 Primary Primary 51.81	ature fac lost from orage loss 40.22 age loss 40.22 circuit lo loss	hot wate s 44.53 44.53 oss (annu 51.81	43.09 43.09 Jual) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Temper Energy Total stor 44.53 Net stor 44.53 Primary Primary 51.81 Total he	ature fac lost from prage loss 40.22 age loss 40.22 circuit lo loss 46.79	hot wate ss 44.53 44.53 ss (annu 51.81 ed for wa	43.09 43.09 (al) 50.14 ater heat	44.53 44.53 51.81 ing calcu	43.09 43.09 50.14 ulated fo	44.53 51.81 r each m	44.53 51.81	43.09 50.14	44.53	43.09	1.44 44.53 44.53 610.00 51.81
Temper Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 247.71	ature fac lost from prage loss 40.22 age loss 40.22 circuit lo loss 46.79 eat requir	hot wate ss 44.53 44.53 oss (annu 51.81 ed for wa 232.96	43.09 43.09 ual) 50.14 ater heat 212.34	44.53 44.53 51.81 ing calcu 210.62	43.09 43.09 50.14 Jated for 191.85	44.53 51.81 r each m 187.72	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Temper Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 247.71	ature fac lost from orage loss 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 219.41 from wate	hot wate ss 44.53 44.53 oss (annu 51.81 ed for wa 232.96	43.09 43.09 ial) 50.14 ater heat 212.34 r for each	44.53 44.53 51.81 ing calcu 210.62 n month,	43.09 43.09 50.14 Jated for 191.85 kWh/mc	44.53 51.81 r each m 187.72 onth	44.53 51.81 onth	43.09 50.14	44.53 51.81 220.01	43.09 50.14	1.44 44.53 610.00 51.81 242.94
Temper Energy Total stor 44.53 Net stor 44.53 Primary Primary 51.81 Total he 247.71 Output f 247.71	ature fac lost from orage loss 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 219.41 from wate 219.41	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 232.96 er heater 232.96	43.09 43.09 al) 50.14 ater heat 212.34 for each 212.34	44.53 44.53 51.81 ing calcu 210.62 n month, 210.62	43.09 43.09 50.14 Jlated for 191.85 kWh/mo 191.85	44.53 51.81 r each m 187.72 onth	44.53 51.81 onth 201.20	43.09 50.14 199.35	44.53 51.81 220.01	43.09 50.14 228.23	1.44 44.53 610.00 51.81 242.94
Temper Energy Total stor 44.53 Net stor 44.53 Primary Primary 51.81 Total he 247.71 Output f 247.71	ature fac lost from orage loss 40.22 age loss 40.22 circuit lo loss 46.79 eat requir 219.41 from wate	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 232.96 er heater 232.96	43.09 43.09 al) 50.14 ater heat 212.34 for each 212.34	44.53 44.53 51.81 ing calcu 210.62 n month, 210.62	43.09 43.09 50.14 Jlated for 191.85 kWh/mo 191.85	44.53 51.81 r each m 187.72 onth	44.53 51.81 onth 201.20	43.09 50.14 199.35	44.53 51.81 220.01	43.09 50.14 228.23	1.44 44.53 610.00 51.81 242.94 242.94

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5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15
Lighting	gains	•					•			•	
30.15	26.78	21.78	16.49	12.32	10.40	11.24	14.61	19.61	24.90	29.06	30.98
Appliance	ces gains	3									
	200.99	195.79	184.71	170.73	157.60	148.82	146.76	151.96	163.03	177.01	190.15
Cooking	gains										
34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31
Pumps a	and fans	gains		•	•						
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration (negative	values)							
-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52
Water h	eating ga	ains									
171.24	169.10	164.64	158.59	154.66	149.13	144.43	150.45	152.59	158.86	165.93	169.10
Total int	ernal gai	ns									
467.26	463.81	449.15	426.74	404.67	384.08	371.44	378.77	391.11	413.74	438.95	457.18

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains								
Window - Double-glazed, air-filled, low-E,		19.87 0.72 x 0.7	0	109.8402								
En=0.2, hard coat (East/West)												
Reference Glazing Solid door - Double-glazed, air-filled, low-E, 0.9 x 1.850 0.00 0.72 x 0.70 0.77 0.0000												
Solid door - Double-glazed, air-illied, low-E, $0.9 \times 1.850 0.00 = 0.72 \times 0.70 = 0.77 = 0.0000$ En=0.2, hard coat (East/West)												
Reference Door												
Total solar gains, January				109.84	(83-1)							
Solar gains												
109.84 212.90 340.29 505.24 614.74 6	641.45 622.60	541.86 406.82	259.27 136.56	90.61	(83)							
Total gains												
577.10 676.71 789.44 931.98 1019.40	1025.52 994.03	920.63 797.93	673.01 575.51	547.79	(84)							
Lighting calculations												
	Area	g	FF x Shad	0								
Window - Double-glazed, air-filled, low-E,	0.9 x 15.83	0.80	0.70 x 0.8	3 6.62								
En=0.2, hard coat (East/West) Reference Glazing												
GL = 6.62 / 70.70 = 0.094												
C1 = 0.850												
C2 = 0.960												

 $C_2 = 0.960$ El = 532

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7. Mean internal temperature

	ature du system			ods in the	e living a	rea, Th1	(°C)				21.00 1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau								4		•		
32.20	32.55	32.55	33.21	33.61	33.81	33.99	33.99	33.52	33.21	32.88	32.55	
alpha						•					<u>.</u>	
3.15	3.17	3.17	3.21	3.24	3.25	3.27	3.27	3.23	3.21	3.19	3.17	
Utilisatic	on factor	for gains	for livin	g area						•		
0.99	0.99	0.97	0.94	0.86	0.73	0.55	0.58	0.84	0.96	0.99	0.99	(86)
Mean in	ternal ter	mperatu	re in livin	g area T	1							
18.82	19.03	19.45	19.93	20.45	20.79	20.94	20.93	20.64	20.02	19.28	18.88	(87)
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	lling Th2	2					
19.24	19.25	19.25	19.28	19.30	19.30	19.31	19.31	19.29	19.28	19.27	19.25	(88)
Utilisatic	on factor	for gains	for rest	of dwell	ing					•		
0.99	0.98	0.96	0.91	0.80	0.59	0.34	0.37	0.73	0.93	0.98	0.99	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2						
17.36	17.58	17.99	18.47	18.96	19.22	19.30	19.30	19.12	18.57	17.84	17.43	(90)
	rea fracti ternal te				dwelling)					0.33	(91)
17.83	18.05	18.47	18.95	19.45	19.73	19.84	19.83	19.62	19.04	18.31	17.90	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.83	18.05	18.47	18.95	19.45	19.73	19.84	19.83	19.62	19.04	18.31	17.90	(93)

8. Space heating requirement

Space heating requirement for each month, kWh/month1089.3(878.84 748.74 482.17 233.15<		• ••••••••	9.09	•••••								
0.99 0.98 0.95 0.91 0.80 0.63 0.41 0.44 0.75 0.93 0.98 0.99 Useful gains 569.20 661.50 753.91 845.61 817.91 648.32 409.01 404.98 602.22 624.34 563.16 540.82 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2033.3 1969.24 1760.28 1515.28 1131.29 745.42 424.53 423.82 779.27 1218.88 1688.31 1960.94 Space heating requirement for each month, kWh/month 1089.34 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2 5741.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 569.20 661.50 753.91 845.61 817.91 648.32 409.01 404.98 602.22 624.34 563.16 540.82 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2033.3 1969.2 1760.2 1515.2 1131.2 745.42 424.53 423.82 779.27 1218.8 1688.3 1960.94 Space heating requirement for each month, kWh/month 1089.3 878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2 5741.2	Utilisatio	n factor	for gains	5								
569.20 661.50 753.91 845.61 817.91 648.32 409.01 404.98 602.22 624.34 563.16 540.82 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2033.3 1969.24 1760.28 1515.28 1131.24 745.42 424.53 423.82 779.27 1218.88 1688.31 1960.94 Space heating requirement for each month, kWh/month 1089.34 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2 5741.2 5741.2	0.99	0.98	0.95	0.91	0.80	0.63	0.41	0.44	0.75	0.93	0.98	0.99
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2033.3 1969.2 1760.2 1515.2 1131.2 745.42 424.53 423.82 779.27 1218.8 1688.3 1960.94 Space heating requirement for each month, kWh/month 1089.3 878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2	Useful g	ains										
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 2033.3 1969.2 1760.2 1515.2 1131.2 745.42 424.53 423.82 779.27 1218.8 1688.3 1960.94 Space heating requirement for each month, kWh/month 1089.3 878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.22	569.20	661.50	753.91	845.61	817.91	648.32	409.01	404.98	602.22	624.34	563.16	540.82
Heat loss rate for mean internal temperature 2033.3 1969.2 1760.2 1515.2 1131.2 745.42 424.53 423.82 779.27 1218.8 1688.31 1960.94 Space heating requirement for each month, kWh/month 1089.3 878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May)	Monthly	average	externa	tempera	ature							
2033.3 1969.2 1760.2 1515.2 1131.2 745.42 424.53 423.82 779.27 1218.8 1688.3 1960.94 Space heating requirement for each month, kWh/month 1089.3 878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month 1089.30 878.84 748.74 482.17 233.15 - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.2	Heat los	s rate fo	r mean ii	nternal te	emperati	ire						
1089.3(878.84 748.74 482.17 233.15 - - - 442.34 810.11 1056.57 Total space heating requirement per year (kWh/year) (October to May) 5741.22	2033.3	1969.29	1760.28	1515.28	1131.29	745.42	424.53	423.82	779.27	1218.88	1688.31	1960.94
Total space heating requirement per year (kWh/year) (October to May) 5741.22	Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•				
	1089.30	878.84	748.74	482.17	233.15	-	-	-	-	442.34	810.11	1056.57
Space heating requirement per m² (kWh/m²/year)81.2							ar) (Oct	ober to N	lay)	•	•	• • • • • • • •
	Space h	eating re	quireme	ent per m	² (kWh/r	n²/year)						81.2

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9a. Energy requirements

9a. Energy requirements kWh/ye	ər
Fraction of heat from secondary system 0.1000	(201)
Fraction of space heat from main system(s) 0.9000	(202)
Efficiency of main heating system78.90%Efficiency of secondary heating system100.00%	(206) (208)
	(200)
JanFebMarAprMayJunJulAugSepOctNovDecSpace heating requirement	
	(98)
	(90)
Appendix Q - monthly energy saved (main heating system 1) 0.00	(210)
	(210)
Space heating fuel (main heating system 1)	(011)
1242.5 ⁴ 1002.4 ⁸ 854.08 550.00 265.96 504.57 924.08 1205.21	(211)
Appendix Q - monthly energy saved (main heating system 2)	(010)
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	(212)
Space heating fuel (main heating system 2)	(0, (0))
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)	(- · · · ·
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	(214)
Space heating fuel (secondary)	
108.93 87.88 74.87 48.22 23.32 44.23 81.01 105.66	(215)
Water heating	
Water heating requirement	
247.71 219.41 232.96 212.34 210.62 191.85 187.72 201.20 199.35 220.01 228.23 242.94	(64)
Efficiency of water heater 68.8	()
76.63 76.46 76.03 75.27 73.50 68.80 68.80 68.80 68.80 74.98 76.23 76.61	(217)
Water heating fuel	
323.25 286.95 306.39 282.10 286.58 278.85 272.85 292.45 289.75 293.42 299.38 317.10	(219)
Annual totals kWh/ye	ar
Space heating fuel used, main system 1 6548.9	
Space heating fuel (secondary) 574.1	()
Water heating fuel 3529.0	8 (219)
Electricity for pumps, fans and electric keep-hot	(000 -)
central heating pump 130.0 boiler with a fan-assisted flue 45.0	
Total electricity for the above, kWh/year 175.0	
Electricity for lighting (30.00% fixed LEL) 532.3	
Energy saving/generation technologies	()
Appendix Q -	()
Energy saved or generated (): 0.00	
Energy used (): 0.00) (237a)
Total delivered energy for all uses 11359.5	2 (238)

10a. Does not apply

11a. Does not apply

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= [(32.1253 x 1.0000 x 1.0206) + (3.1778 x 1.2251)] x 0.6000

12a. Carbon dioxide emissions

	Energy	Emission factor	Emission	s
	kWh/year	kg CO2/kWh	kg CO2/ye	ear
Space heating, main system 1	6548.92	0.194	1270.49	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	574.12	0.422	242.28	(263)
Water heating	3529.08	0.194	684.64	(264)
Space and water heating			2197.41	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	532.39	0.422	224.67	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2495.93	(272)
			kg/m²/yea	r
Emissions per m ² for space and water heating			32.13	(272a)
Emissions per m ² for lighting			3.18	(272b)
Emissions per m ² for pumps and fans			1.04	(272c)
Target Carbon Dioxide Emission Rate (TER)			22.01	(273)

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Project Information

Building type	Top-floor flat		
Plot number Reference	10		
Date	4 July 2016		
Client	Investland	Project	252 Finchley Road
		-	London
			NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	70.70	2.70	190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m ³)			190.89	(5)

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2. Ventilation rate

Z. Vent	nation i	ale									m ³ per	hou	ır
							main + s heating	eondar	y + othe	r	·		
	r of chim						0 + 0 + 0		x 40		0.00	-	(6a)
	r of open						0 + 0 + 0		x 20		0.00		(6b)
	r of inter						0		x 10		0.00		(7a)
	r of pass						0		x 10		0.00		(7b)
Numbe	r of fluele	ess gas l	fires				0		x 40		0.00)	(7c)
											Air cha	nge	s per hour
	on due to			and flue	S						0.00)	(8)
	re test, re	esult q50)						10.00				(17)
	neability										0.50	-	(18)
	r of sides	s on whic	ch shelte	red							2.00		(19)
Shelter											0.85		(20)
	on rate ir										0.42	2	(21)
	on rate n	_			· ·			1 -	1-	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	average			-	-	-				_			
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10		
Wind Fa	actor										54.10	C	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27		
											13.53	3	(22a)
	d infiltrat	_	``	, 	_	· ·	eed)						
0.57	0.54	0.54	0.48	0.44	0.41	0.39	0.39	0.45	0.48	0.51	0.54		
											5.75	5	(22b)
	ion : Meo e air cha			ouse ext	ract ven	tilation							
0.82	0.79	0.79	0.73	0.69	0.66	0.64	0.64	0.70	0.73	0.76	0.79		(25)
L			1		1								

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<i>3. Heat losses and heat lo</i> Element Gross	o ss paramete Openings	r Net area	U-value	AxU	kappa-valu	o A x K	
area, m ²	m ²	A, m^2	W/m ² K	W/K	kJ/m ² K	kJ/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		0.510	1.42 (1.50)	0.72		10/17	(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		0.670	1.42 (1.50)	0.95			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		3.220	1.42 (1.50)	4.56			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window		3.150	1.42 (1.50)	4.46			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window		0.420	1.42 (1.50)	0.59			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window		0.800	1.42 (1.50)	1.13			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window		0.670	1.42 (1.50)	0.95			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window		0.920	1.42 (1.50)	1.30			(27)
Walls Ground floors Pitched roofs insulated betv Party wall Internal ceiling	veen rafters	92.30 70.70 25.40 44.00 70.70	0.22 0.20 0.18 0.00 0.00	20.31 14.14 4.57 0.00 0.00	17.00 18.00 9.00 70.00 9.00	1569.10 1272.60 228.60 3080.00 636.30	(29) (28) (30)

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3. Heat losses and heat loss parameter												
Element		Gross	Öpe	enings	Net are	a U-'	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W	′m²K	W/K	kJ	/m²K	kJ/K	
Fabric heat loss, W/K53.68(3)Heat capacity6786.60(3)Thermal mass parameter, kJ/m²K95.99(3)Effect of thermal bridges29.81(3)Total fabric heat loss83.49(3)Ventilation heat loss calculated monthly95.91(3)										68 (33) 60 (34) 99 (35) 81 (36)		
51.89	49.88	49.88	45.87	43.19	41.85	40.51	40.51	43.86	45.87	47.88	49.88	(38)
Heat tra	nsfer co	efficient,	W/K							•		
135.38	133.38	133.38	129.36	126.68	125.34	124.01	124.01	127.35	129.36	131.37	133.38	
Heat los	s param	eter (HLI	P), W/m [;]	²K							129.4	(39)
1.91	1.89	1.89	1.83	1.79	1.77	1.75	1.75	1.80	1.83	1.86	1.89	
HLP (av							1		•		1.8	33 (40)
Number	of days	in month		1a)		•						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	d occupa	ancy, N	r require r usage i		oer day V	/d,avera	ge				kWh/year 2.26 87.95
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot wate	er usage	in litres	per day f	or each	month						
96.74	93.22	89.71	86.19	82.67	79.15	79.15	82.67	86.19	89.71	93.22	96.74
Energy of	content o	of hot wa	ter used								
143.81	125.77	129.79	113.15	108.57	93.69	86.82	99.62	100.81	117.49	128.25	139.27
Energy o Distribut	content (ion loss	annual)									1387.05
21.57	18.87	19.47	16.97	16.29	14.05	13.02	14.94	15.12	17.62	19.24	20.89
Hot wate Volume Tempera Energy l	er cylinde factor ature fac	tor store (k\	ictor (kŴ	/h/day)							0.00 0.0000 0.0000 0.0000 0.000
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net stora	age loss			I	1	1	I	1		1	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary Primary		ss (annu	ial)			•				•	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combi lo	oss calcu	lated for	r each m	onth							
49.30	42.91	45.71	42.50	42.13	39.03	40.33	42.13	42.50	45.71	45.97	49.30
Total he	•		ater heat				onth	_			
	168.68		155.66				141.75	143.32	163.20	174.22	188.57
193.11			for ood	n month	kWh/mo	onth					
Output f	rom wate			-							
			155.66	-	132.72	127.15	141.75	143.32	163.20	174.22	188.57
Output fi 193.11	rom wate 168.68	175.50		150.70		127.15	141.75	143.32	163.20	174.22	188.57 1914.58

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5. Internal gains

	•										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts									
113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15	113.15
Lighting	gains	•					•				
18.63	16.55	13.46	10.19	7.61	6.43	6.95	9.03	12.12	15.39	17.96	19.15
Appliance	ces gains	3	•	•							
198.93	200.99	195.79	184.71	170.73	157.60	148.82	146.76	151.96	163.03	177.01	190.15
Cooking	gains										
34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	(negative	values)							
-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52
Water h	eating ga	ains									
80.83	78.20	73.36	67.01	62.68	56.82	52.35	58.68	61.31	67.87	75.19	78.81
Total int	ernal gai	ns			•	•					
365.33	362.67	349.55	328.86	307.97	287.79	275.06	281.41	292.34	313.23	337.10	355.04
		•							•		

6. Solar gains (calculation for January)

o. Colar game (calculation for calculary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 0.510 11.51		0.77	2.0502
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 0.670 11.51	0.72 x 0.70	0.77	2.6934
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 3.220 11.51	0.72 x 0.70	0.77	12.9445
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthEast) Window	0.9 x 3.150 11.51	0.72 x 0.70	0.77	12.6631
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.420 26.00	0.72 x 0.70	1.00	4.9533
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.800 26.00	0.72 x 0.70	1.00	9.4349
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.670 26.00	0.72 x 0.70	1.00	7.9017
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof Window	0.9 x 0.920 26.00	0.72 x 0.70	1.00	10.8501
Lighting calculations	Aroo	a.	EE y Shadi	20
	Area	g	FF x Shadi	ng

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7 Mean internal temperature

Tempera	ature du system	•	ing peric	ods in the	e living a	rea, Th1	(°C)				21.00 0.75	(85
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
13.92	14.13	14.13	14.57	14.88	15.04	15.20	15.20	14.80	14.57	14.35	14.13	
alpha												
1.93	1.94	1.94	1.97	1.99	2.00	2.01	2.01	1.99	1.97	1.96	1.94	
Utilisatic	on factor	for gains	s for livin	g area						•		
0.97	0.95	0.93	0.88	0.79	0.67	0.53	0.56	0.78	0.91	0.96	0.97	(86
Mean in	ternal te	mperatu	re in livin	ig area T	1					•		
18.09	18.31	18.78	19.34	19.98	20.44	20.70	20.68	20.23	19.48	18.63	18.17	(87
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	illing Th2	2			•		
19.40	19.42	19.42	19.45	19.48	19.49	19.51	19.51	19.47	19.45	19.44	19.42	(88
Utilisatio	n factor	for gains	s for rest	of dwell	ing				•			
0.96	0.95	0.91	0.85	0.74	0.58	0.38	0.41	0.71	0.88	0.95	0.96	(89
Mean in	ternal te	mperatu	re in the	rest of d	welling 7	2		-				
16.81	17.04	17.51	18.08	18.71	19.12	19.32	19.31	18.95	18.23	17.38	16.91	(90
Living area fraction (23.10 / 70.70) 0.33 (9 Mean internal temperature (for the whole dwelling)										(91		
17.23	17.46	17.92	18.49	19.12	19.55	19.77	19.76	19.37	18.64	17.79	17.32	(92
Apply ac	djustmen	t to the r	nean int	ernal ten	peratur	e, where	appropr	riate			· · · · · · · · · · · · · · · · · · ·	
17.23	17.46	17.92	18.49	19.12	19.55	19.77	19.76	19.37	18.64	17.79	17.32	(93

8. Space heating requirement

Space heating requirement for each month, kWh/month980.02807.49718.56492.88276.42446.70740.00945.03Total space heating requirement per year (kWh/year) (October to May)5407.00	er epae	e neathig	groqui	••••••								
0.95 0.93 0.90 0.83 0.72 0.58 0.40 0.44 0.70 0.87 0.93 0.95 Useful gains 406.41 459.82 517.54 581.84 568.99 463.96 310.82 302.06 404.17 413.75 389.79 386.13 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 11266.34 940.52 620.58 355.88 354.07 645.17 1014.14 1417.57 1656.33 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.00 5407.00 5407.00	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains 406.41 459.82 517.54 581.84 568.99 463.96 310.82 302.06 404.17 413.75 389.79 386.13 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1723.64 1661.44 1483.35 1266.35 940.52 620.58 355.88 354.07 645.17 1014.15 1417.57 1656.33 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0 5407.0 5407.0	Utilisatio	n factor	for gains	5								
406.41 459.82 517.54 581.84 568.99 463.96 310.82 302.06 404.17 413.75 389.79 386.13 Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 11.70 14.60 16.90 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1266.35 940.52 620.58 355.88 354.07 645.17 1014.16 1417.57 1656.33 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0 5407.0 5407.0 5407.0	0.95	0.93	0.90	0.83	0.72	0.58	0.40	0.44	0.70	0.87	0.93	0.95
Monthly average external temperature 4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1723.64 1661.44 1483.34 1266.34 940.52 620.58 355.88 354.07 645.17 1014.14 1417.57 1656.33 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0 5407.0 5407.0	Useful g	ains										
4.50 5.00 6.80 8.70 11.70 14.60 16.90 14.30 10.80 7.00 4.90 Heat loss rate for mean internal temperature 1723.64 1661.44 1483.35 1266.35 940.52 620.58 355.88 354.07 645.17 1014.16 1417.57 1656.33 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0 5407.0 5407.0	406.41	459.82	517.54	581.84	568.99	463.96	310.82	302.06	404.17	413.75	389.79	386.13
Heat loss rate for mean internal temperature 1723.64 1661.44 1483.35 1266.35 940.52 620.58 355.88 354.07 645.17 1014.16 1417.57 1656.35 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0	Monthly	average	externa	tempera	ature							
1723.64 1661.44 1483.35 1266.35 940.52 620.58 355.88 354.07 645.17 1014.16 1417.57 1656.35 Space heating requirement for each month, kWh/month 980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 Total space heating requirement per year (kWh/year) (October to May) 5407.0	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Space heating requirement for each month, kWh/month980.02807.49718.56492.88276.42446.70740.00945.03Total space heating requirement per year (kWh/year) (October to May)5407.0	Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
980.02 807.49 718.56 492.88 276.42 - - - 446.70 740.00 945.03 - Total space heating requirement per year (kWh/year) (October to May) 5407.0	1723.64	1661.44	1483.35	1266.39	940.52	620.58	355.88	354.07	645.17	1014.16	1417.57	1656.33
Total space heating requirement per year (kWh/year) (October to May) 5407.0	Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
	980.02	807.49	718.56	492.88	276.42	-	-	-	-	446.70	740.00	945.03
Space heating requirement per m ² (kWh/m ² /year) 76.4							ar) (Octo	ober to N	lay)		•	5407.0
	Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						76.4

8c. Space cooling requirement - not applicable

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9a. Energy requirements

<i>9a. Energy requirements</i> kWh/year											
No secondary heating system selectedFraction of space heat from main system(s)1.0000Efficiency of main heating system93.80%		(202) (206)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D	Dec										
Space heating requirement											
980.02 807.49 718.56 492.88 276.42 446.70 740.00 9	945.03	(98)									
Appendix Q - monthly energy saved (main heating system 1)											
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00	(210)									
Space heating fuel (main heating system 1)											
1044.80 860.86 766.06 525.45 294.69 476.23 788.91 1	1007.49	(211)									
Appendix Q - monthly energy saved (main heating system 2)											
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00	(212)									
Space heating fuel (main heating system 2)											
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00	(213)									
Appendix Q - monthly energy saved (secondary heating system)											
0.00 0.00 0.00 0.00 0.00 0.00 0	0.00	(214)									
Space heating fuel (secondary)											
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00	(215)									
Water heating											
Water heating requirement											
	188.57	(64)									
Efficiency of water heater	81.50	(216)									
	91.50	(217)									
Water heating fuel											
210.98 184.52 192.64 171.96 169.22 162.85 156.01 173.93 175.85 181.02 191.08 2	206.08	(219)									
Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel Electricity for pumps, fans and electric keep-hot	kWh/year 5764.49 0.00 2176.14	(211) (215) (219)									
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)52.17(central heating pump130.00(boiler with a fan-assisted flue45.00(Total electricity for the above, kWh/year227.17(Electricity for lighting (100.00% fixed LEL)328.98(
PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500	879.112 0.000 0.000 879.112	(233)									
Appendix Q - Energy saved or generated (): Energy used ():	0.000 0.000	(236a) (237a)									
Total delivered energy for all uses	7617.66	(238)									

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	5764.49	0.198	1141.37	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2176.14	0.198	430.88	(264)
Space and water heating			1572.24	(265)
Electricity for pumps and fans	227.17	0.517	117.45	(267)
Electricity for lighting	328.98	0.517	170.08	(268)
Electricity generated - PVs	-879.11	0.529	-465.05	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1394.72	(272)

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 19.73 (273)

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Project Information

Building type	Top-floor flat		
Plot number Reference	11		
Date Client	4 July 2016 Investland	Project	252 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area Dwelling volume (m ³)	95.40		257.58	(4) (5)

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2. Ventilation rate

2. Venti											m ³ per h	nour
							main + s heating	eondar	y + othe	r		
Number Number Number Number Number	of open of interr of pass	flues nittent fa ive vents	3				$0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
- turnoor		loo guo i					Ũ		X 10			
Infiltratio Pressure Air perm Number Shelter f Infiltratio Infiltratio	e test, re leability of sides actor on rate ir	esult q50 s on whic ncorpora	ch shelte	red Iter facto	r				4.00		Air char 0.00 2.00 0.85 0.17	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed fror	n Table	7	•	•			·		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	ictor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjusted	d infiltrat	ion rate	(allowing	g for shel	ter and	wind spe	eed)	-			13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
Ventilation Effective				ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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3. Heat losses and heat loss paramete					
Element Gross Openings area. m ² m ²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value A x K kJ/m²K kJ/K	
area, m ² m ² Window - Double-glazed,	2.500	1.42 (1.50)	3.54		(27)
air-filled, low-E, En=0.2,					()
hard coat (East)					
Window top floor	0.000	4 40 (4 50)	4.05		(07)
Window - Double-glazed, air-filled, low-E, En=0.2,	2.860	1.42 (1.50)	4.05		(27)
hard coat (SouthEast)					
Window					
Window - Double-glazed,	0.680	1.42 (1.50)	0.96		(27)
air-filled, low-E, En=0.2,					
hard coat (SouthEast) Window					
Window - Double-glazed,	1.220	1.42 (1.50)	1.73		(27)
air-filled, low-E, En=0.2,					(=-)
hard coat (SouthEast)					
Window			0.00		(07)
Window - Double-glazed, air-filled, low-E, En=0.2,	0.680	1.42 (1.50)	0.96		(27)
hard coat (SouthEast)					
Window					
Window - Double-glazed,	4.390	1.42 (1.50)	6.21		(27)
air-filled, low-E, En=0.2,					
hard coat (East) Window Balcony					
Window - Double-glazed,	1.500	1.42 (1.50)	2.12		(27)
air-filled, low-E, En=0.2,					(=-)
hard coat (NorthWest)					
Window	0.000		4.00		(07)
Window - Double-glazed, air-filled, low-E, En=0.2,	0.960	1.42 (1.50)	1.36		(27)
hard coat (NorthWest)					
Window					
Window - Double-glazed,	1.220	1.42 (1.50)	1.73		(27)
air-filled, low-E, En=0.2,					
hard coat (NorthWest) Window					
Window - Double-glazed,	0.680	1.42 (1.50)	0.96		(27)
air-filled, low-E, En=0.2,		()			()
hard coat (NorthWest)					
Window Walls	218.10	0.22	47.98	17.00 3707.70	(20)
Floors	218.10 95.40	0.22	47.98	17.00 3707.70 20.00 1908.00	
Pitched roofs insulated between rafters	47.70	0.18	8.59	9.00 429.30	(30)
Party wall	7.30	0.00	0.00	70.00 511.00	. ,
Internal ceiling	95.40	0.00	0.00	9.00 858.60	

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<i>3. Heat</i> Element		and heat Gross		<i>rameter</i> enings	Net are	a -	value	AxU	ka	ppa-valu	ωΔγΚ	
Liemen		area, m ²		, ingo	A, m ²		m²K	W/K		/m²K	kJ/K	
Total area of external elements Sigma A, m²377.89Fabric heat loss, W/K99.27Heat capacity7414.60Thermal mass parameter, kJ/m²K77.72Effect of thermal bridges56.68Total fabric heat loss155.95Ventilation heat loss calculated monthly12.5042.5042.5042.5042.5042.5042.50										$\begin{array}{ccc} (33) \\ (34) \\ (35) \\ (35) \\ (36) \\ $		
42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	(38)
Heat tra	nsfer co	efficient,	W/K									
198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	
Heat los	s param	eter (HL	P), W/m [;]	²K							198.4	15 (39)
2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	
HLP (av											2.0	08 (40)
Number	of days	in month	(Table	1a)					-			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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Assume	er heating ed occupa average	ancy, N	-		or day)	(d avora	a o				kWh/yea 2.69 98.15	(•
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(•
	er usage			-			1.1.3					
107.97				92.26	88.34	88.34	92.26	96.19	100.11	104.04	107.97	(•
Energy	content c	of hot wa	ter used									·
160.49	140.37	144.85	126.28	121.17	104.56	96.89	111.18	112.51	131.12	143.13	155.43	
	content (tion loss	annual)	1	I	1		1		I		1547.99	(•
24.07	21.06	21.73	18.94	18.18	15.68	14.53	16.68	16.88	19.67	21.47	23.31	(
Hot wat Volume Temper Energy	er storag er cylinde factor ature fac lost from orage los	er loss fa tor store (k'	ictor (kŴ	/h/day)							0.00 0.0000 0.0000 0.0000 0.00	() () ()
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(
Net stor	age loss	1	1	1	1	•	1			•	11	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(
Primary Primary	circuit lo loss	ss (annı	ial)								0.00	(
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(
Combi I	oss calcı		r each m	onth								
50.96	46.03	50.96	47.44	47.02	43.56	45.01	47.02	47.44	50.96	49.32	50.96	(
Τ.Ι.Ι					Late of fa		11.					
	at requir							ı	1	1	1	
211.45	186.40	195.81	173.72	168.19	148.12	141.91	158.20	159.95	182.08	192.44	206.39	(
211.45 Output f	186.40 from wate	195.81 er heater	173.72 for each	168.19 n month,	148.12 kWh/mo	141.91 onth	158.20]	,
211.45	186.40 from wate	195.81 er heater	173.72	168.19 n month,	148.12	141.91 onth		159.95	182.08 182.08	192.44	206.39	(
211.45 Output 1 211.45	186.40 from wate	195.81 er heater 195.81	173.72 for each 173.72	168.19 n month, 168.19	148.12 kWh/mo 148.12	141.91 onth	158.20]	,

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5. Internal gains

	- 3										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts				•					
161.56	161.56	161.56	161.56	161.56	161.56	161.56	161.56	161.56	161.56	161.56	161.56
Lighting gains											
56.87	50.51	41.08	31.10	23.25	19.63	21.21	27.57	37.00	46.98	54.83	58.45
Appliances gains											
371.15	375.00	365.29	344.63	318.55	294.04	277.66	273.81	283.52	304.18	330.26	354.77
Cooking	gains										
53.85	53.85	53.85	53.85	53.85	53.85	53.85	53.85	53.85	53.85	53.85	53.85
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71
Water h	eating ga	ains									
88.85	86.58	81.86	74.79	69.95	63.41	58.43	65.49	68.43	75.72	83.22	86.59
Total int	ernal gai	ns									
634.57	629.79	605.93	568.22	529.45	494.78	475.00	484.57	506.65	544.58	586.02	617.51

6. Solar gains (calculation for January)

o. Colar gains (carculation for cardary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window top floor	0.9 x 2.500 19.87		0.77	17.3523
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 2.860 37.39	0.72 x 0.70	0.77	37.3472
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.680 37.39	0.72 x 0.70	0.77	8.8798
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.220 37.39	0.72 x 0.70	0.77	15.9313
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.680 37.39	0.72 x 0.70	0.77	8.8798
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window Balcony	0.9 x 4.390 19.87	0.72 x 0.70	0.77	30.4707
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.500 11.51	0.72 x 0.70	0.77	6.0301
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 0.960 11.51	0.72 x 0.70	0.77	3.8592
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.220 11.51	0.72 x 0.70	0.77	4.9044

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6. Solar gains (calculation for January)					
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window Total solar gains, January	Area & Flux 0.9 x 0.680 11.51	g & FF 0.72 x 0.70	Shading (0.77	Gains 2.7336	0 1)
				136.39 (8	3-1)
Solar gains					
136.39 249.66 370.80 519.85 619.69 6 Total gains	626.97 550.	92 431.67 295	.45 166.75 11	4.41 (8	3)
770.96 879.46 976.73 1088.08 1149.14 1	141.12 1101.97 1035	5.4938.32 840	.03 752.76 73	81.92 (8	4)
Lighting calculations					
Window Double glazad air filled low E	Area	g 0.80	FF x Shading		
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window top floor	0.9 x 2.50	0.80	0.70 x 0.83	1.05	
Window op hoor Window - Double-glazed, air-filled, low-E,	0.9 x 2.86	0.80	0.70 x 0.83	1.20	
En=0.2, hard coat (SouthEast) Window	0.0 x 2.00	0.00	0.70 × 0.00	1.20	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast)	0.9 x 0.68	0.80	0.70 x 0.83	0.28	
Window					
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.22	0.80	0.70 x 0.83	0.51	
Window - Double-glazed, air-filled, low-E,	0.9 x 0.68	0.80	0.70 x 0.83	0.28	
En=0.2, hard coat (SouthEast) Window					
Window - Double-glazed, air-filled, low-E,	0.9 x 4.39	0.80	0.70 x 0.83	1.84	
En=0.2, hard coat (East) Window Balcony					
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.50	0.80	0.70 x 0.83	0.63	
Window - Double-glazed, air-filled, low-E,	0.9 x 0.96	0.80	0.70 x 0.83	0.40	
En=0.2, hard coat (NorthWest) Window	0.0 × 0.00	0.00	0.70 × 0.00	0.40	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.22	0.80	0.70 x 0.83	0.51	
Window - Double-glazed, air-filled, low-E,	0.9 x 0.68	0.80	0.70 x 0.83	0.28	
En=0.2, hard coat (NorthWest) Window			-		
GL = 6.98 / 95.40 = 0.073					
C1 = 0.500					
C2 = 0.985 EI = 402					
LI = +UZ					

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		ring heat responsi	ing perio veness	ods in the	e living a	rea, Th1	(°C)				21.0 0.7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	I	1	1	1	1	1	1	1	1	1	1
10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38
alpha	1	1				1	•	1			
1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69
Utilisatio	on factor	for gains	s for livin	g area		1	•				
0.93	0.91	0.88	0.84	0.77	0.66	0.53	0.55	0.73	0.85	0.92	0.94
Mean in	iternal te	mperatu	re in livin	ig area T	1	1	•				
17.89	18.10	18.59	19.08	19.73	20.25	20.58	20.57	20.10	19.34	18.43	17.94
Temper	ature du	ring heat	ing peric	ds in re	st of dwe	lling Th2	2				
19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29
Utilisatio	on factor	for gains	s for rest	of dwell	ing	•	•				•
0.92	0.90	0.86	0.81	0.71	0.56	0.36	0.38	0.65	0.82	0.90	0.92
Mean in	iternal te	mperatu	re in the	rest of d	welling 1	2	•			-	
16.56	16.77	17.24	17.72	18.34	18.80	19.05	19.04	18.69	17.98	17.10	16.61
			0 / 95.40 re (for th		dwelling)					0.2
16.92	17.13	17.61	18.09	18.71	19.19	19.47	19.46	19.07	18.35	17.46	16.97
Apply a	djustmer	nt to the i	nean inte	ernal ten	peratur	e, where	approp	riate	1	1	1
16.92	17.13	17.61	18.09	18.71	19.19	19.47	19.46	19.07	18.35	17.46	16.97

(85)

(86)

(87)

(88)

(89)

(90) (91)

(92)

(93)

8. Space heating requirement

	• •••••••••	9.09	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5					1			
0.90	0.88	0.84	0.78	0.69	0.56	0.39	0.40	0.63	0.79	0.88	0.90
Useful gains											
693.41	770.63	816.91	849.92	789.55	635.20	424.32	416.58	592.46	664.30	660.49	660.63
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
2464.8	2407.4	2144.5	1863.39	1391.71	911.63	509.07	507.21	947.01	1497.64	2075.5	2395.8
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•				
1317.92	1099.92	987.74	729.70	448.01	-	-	-	-	620.00	1018.83	1290.98
	ace heat					ar) (Octo	ober to N	/lay)		•	7513.0
Space h	eating re	equireme	ent per m	² (kWh/r	n²/year)						78.7

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	rgy requ	uirement	IS								kWh/year	
Fraction	of spac	eating sys e heat fro in heating	om main	system((s)				1.0000 3.80%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	equireme	nt	1	1	l	1	I	1	I	11	
1317.92	1099.9	987.74	729.70	448.01	-	-	-	-	620.00	1018.83	1290.98	(98)
Appendi	x Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	•	•	•		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	•				•		
1405.03	1172.62	1053.02	777.93	477.63	-	-	-	-	660.98	1086.17	1376.31	(211)
Appendi	x Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)	•	1				1	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	x Q - mo	onthly en	ergy sav	ed (seco	ondary he	eating sy	vstem)	l				
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	uel (seco	ndary)		1		1					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating					•		•		•		
	-	equireme			1	1	1	1	1	1		<i>(</i>)
		195.81	173.72	168.19	148.12	141.91	158.20	159.95	182.08	192.44		(64)
		er heater		1			1		1		81.50	(216)
	91.79	91.52	91.15	90.09	81.50	81.50	81.50	81.50	90.69	91.60	91.89	(217)
Water h	-	-		1	1	1	1	1	1	1	,	
230.13	203.06	213.96	190.57	186.69	181.75	174.12	194.11	196.25	200.77	210.08	224.61	(219)
Space h Water h	eating fu eating fu eating fu	uel used, uel (seco uel mps, fan:	ndary)		en-hot						kWh/year 8009.69 0.00 2406.10	(211) (215) (219)
mecha central boiler v Total ele Electricit	nical ver heating vith a far ectricity f ty for ligh	ntilation -	balance d flue oove, kW 0.00% fix	d, extrac h/year (ed LEL)	ct or posi	itive inpu	it from oi	utside (S	FP=0.22	240)	70.39 130.00 45.00 245.39 401.76	(230a) (230c) (230e) (231) (232)
PVs 0. PVs 0.	.80 x 1.0 .80 x 0.0 .80 x 0.0	070 x 107 000 x 0.00 000 x 0.00	′3.000 x 00 x 0.50	0.800 00							734.790 0.000 0.000 734.790	(233)
Energ		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	3							10328.16	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	8009.691	3.100	248.30	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2406.10	3.100	74.59	(247)
Mech vent fans cost	70.391	11.460	8.07	(249)
Pump/fan energy cost	175.000	11.460	20.06	(249)
Energy for lighting Additional standing charges	401.761	11.460	46.04 106.00	(250) (251)
Electricity generated - PVs Appendix Q -	734.790	11.460	-84.21	(252)
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			418.85	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)

	0.17	(-00)
Energy cost factor (ECF)	1.40	(257)
SAP value	80.44	
SAP rating	80	(258)
SAP band	С	. ,

12a. Carbon dioxide emissions

El value

El rating

El band

12a. Carbon dioxide enlissions				
	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	8009.69	0.198	1585.92	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2406.10	0.198	476.41	(264)
Space and water heating			2062.33	(265)
Electricity for pumps and fans	245.39	0.517	126.87	(267)
Electricity for lighting	401.76	0.517	207.71	(268)
Electricity generated - PVs	-734.79	0.529	-388.70	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2008.20	(272)
			kg/m²/yea	
CO2 emissions per m ²			21.05	(273)

(273a)

(274)

80.83

81

В

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13a. Primary energy

isa. Primary energy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year	·)
Space heating, main	8009.69	1.020	8169.89	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2406.10	1.020	2454.23	(264)
Space and water heating			10624.11	(265)
Electricity for pumps/fans	245.39	2.920	716.54	(267)
Electricity for lighting	401.76	2.920	1173.14	(268)
Electricity generated - PV	-734.79	2.920	-2145.59	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			10368.21	(272)
Primary energy kWh/m²/year			108.68	(273)

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Project Information Building type Top-floor flat

Building type			
Plot number Reference	11		
Date Client	4 July 2016 Investland	Project	252 Finchley Road
Olion	Investiand	i lojoot	London NW3 7AA

SAP 2009 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area	95.40			(4)
Dwelling volume (m ³)			257.58	(5)

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2. Ventilation rate

$\begin{tabular}{ c c c c c c c } \hline main + seondary + other heating \\ \hline heating \\ \hline Number of open flues & 0 + 0 + 0 & x 40 & 0.00 & (6a) \\ \hline Number of intermittent fans & 3 & x 10 & 30.00 & (7a) \\ \hline Number of intermittent fans & 0 & x 10 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of flueless gas fires & 0 & x 40 & 0.00 & (7b) \\ \hline Number of sides on which sheltered & 10.00 & (17) & 0.62 & (18) \\ \hline Number of sides on which sheltered & 2.00 & (19) \\ \hline Shelter factor & 0.85 & (20) \\ \hline Infiltration rate incorporating shelter factor & 0.85 & (20) \\ \hline Infiltration rate modified for monthly wind speed & 2.00 & (19) \\ \hline Shelter factor & 0.52 & (21) \\ \hline Infiltration rate modified for monthly wind speed & 2.00 & 0.52 & (21) \\ \hline Infiltration rate modified for monthly wind speed & 2.00 & 0.52 & (21) \\ \hline Infiltration rate incorporating shelter factor & 0.52 & (21) \\ \hline Infiltration rate incorporating shelter factor & 0.52 & (21) \\ \hline Infiltration rate modified for monthly wind speed & 2.00 & 0.51 & 0.50 & 0.51 & 0.50 & 0.51 & 0.52 & (21) \\ \hline Infiltration rate incorporating shelter and wind speed & 2.00 & 0.00 &$	Z. Vent	πατιστητ	ale									m ³ per ho	our
Number of chimneys $0 + 0 + 0$ x 40 0.00 (6a) Number of open flues $0 + 0 + 0$ x 20 0.00 (6b) Number of passive vents $0 + 0 + 0$ x 20 0.00 (6b) Number of passive vents 0×10 0.00 (7a) Number of flueless gas fires 0×40 0.00 (7c) Air changes per hour Infiltration due to chimneys, fans and flues 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.52 (21) Infiltration rate modified for monthly wind speed 0.52 (21) Monthly average wind speed from Table 7 5.40 5.10 4.50 4.80 5.10 5.40 5.10 4.50 4.10 3.90 3.70 4.20 4.50 4.80 5.10 1.35 1.27 1.27 1.3									eondar	y + othe	er	•	
Infiltration due to chimneys, fans and flues 0.12 (8) Pressure test, result q50 10.00 (17) Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.52 (20) Infiltration rate incorporating shelter factor 0.52 (21) Infiltration rate modified for monthly wind speed 0.52 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Mind Factor 54.10 (22) 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.35 1.27 1.27 1.31 0.48 0.48 0.59 0.63 0.67	Number Number Number	r of oper r of inter r of pass	n flues mittent fa ive vents	S				0 + 0 + 0 0 + 0 + 0 3 0		x 20 x 10 x 10		0.00 30.00 0.00	(6b) (7a) (7b)
Air permeability 0.62 (18) Number of sides on which sheltered 2.00 (19) Shelter factor 0.85 (20) Infiltration rate incorporating shelter factor 0.52 (21) Infiltration rate modified for monthly wind speed 0.52 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 13.53 (22) Wind Factor 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.67 0.63 0.67 0.71 0.67 0.59 0.54 0.51 0.48 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Tog 7.09 (22b) 22b	Infiltratio	on due to	o chimne	eys, fans	and flue	S							
Infiltration rate incorporating shelter factor 0.52 (21) Infiltration rate modified for monthly wind speed 0.52 (21) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Sep Sep Oct Nov Dec Sep Oct Nov Dec Monthly average wind speed from Table 7 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Set 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 1.353 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.48 0.48 0.55 0.59 0.63 0.67 <td>Air pern</td> <td>neability</td> <td>•</td> <td></td> <td>ered</td> <td></td> <td></td> <td></td> <td></td> <td>10.00</td> <td></td> <td></td> <td>(18)</td>	Air pern	neability	•		ered					10.00			(18)
Monthly average wind speed from Table 7 5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 Status Status <td>Infiltratio</td> <td>on rate ii</td> <td></td>	Infiltratio	on rate ii											
5.40 5.10 5.10 4.50 4.10 3.90 3.70 3.70 4.20 4.50 4.80 5.10 54.10 (22) Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.48 0.48 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.10 (22) Wind Factor 1.35 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.48 0.48 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans Effective air change rate	Monthly	/ average	e wind sp	beed from	n Table	7	•		.		•		
Wind Factor 1.35 1.27 1.27 1.13 1.02 0.97 0.93 0.93 1.05 1.13 1.20 1.27 13.53 (22a) Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.48 0.48 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans Effective air change rate	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80		
Adjusted infiltration rate (allowing for shelter and wind speed) 13.53 (22a) 0.71 0.67 0.59 0.54 0.51 0.48 0.48 0.55 0.59 0.63 0.67 Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Wind Fa	actor										54.10	(22)
Adjusted infiltration rate (allowing for shelter and wind speed) 0.71 0.67 0.59 0.54 0.51 0.48 0.55 0.59 0.63 0.67 Yentilation : natural ventilation, intermittent extract fans Effective air change rate	1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
7.09 (22b) Ventilation : natural ventilation, intermittent extract fans Effective air change rate	Adjuste	d infiltrat	tion rate	(allowing	g for she	ter and	wind sp	eed)				13.53	(22a)
Ventilation : natural ventilation, intermittent extract fans Effective air change rate	0.71	0.67	0.67	0.59	0.54	0.51	0.48	0.48	0.55	0.59	0.63	0.67	
					ntermitte	nt extrac	t fans					7.09	(22b)
					0.64	0.63	0.62	0.62	0.65	0.67	0.70	0.72	(25)

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	paramete)penings 1 ²	r Net are A, m² 22.00	W	value ′m²K 35 (2.00)	A x U W/K 40.7	4			(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door		1.85	0	2.00	3.7	0			(26)
Walls Floors		210.9 95.4		0.35 0.25	73.8 23.8	-			(29) (28)
Pitched roofs insulated betwee	n rafters	47.7	0	0.16	7.6	3			(30)
Party wall Internal ceiling		7.3 95.4		0.00 0.00	0.0 0.0				
Total area of external element Fabric heat loss, W/K Heat capacity Thermal mass parameter, kJ/I Effect of thermal bridges Total fabric heat loss Ventilation heat loss calculate	1²K	m²						377.89 149.75 3706.90 250.00 41.57 191.32	5 (33) 0 (34) 0 (35) 7 (36)
63.77 61.47 61.47 57.2		53.59	52.49	52.49	55.37	57.27	59.30	61.47	(38)
Heat transfer coefficient, W/K		•							
255.09 252.79 252.79 248.	59 246.08	244.91	243.81	243.81	246.69	248.59	250.62	252.79	
Heat loss parameter (HLP), W	′m²K							248.88	8 (39)
2.67 2.65 2.65 2.61	2.58	2.57	2.56	2.56	2.59	2.61	2.63	2.65	
HLP (average) Number of days in month (Tab	le 1a)							2.61	(40)
Jan Feb Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31 28 31 30	31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	e r heatin g ed occupa average	ancy, N	•		or day \	/d avera	סר				kWh/yea 2.69 103.32
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	er usage			,		oui	Aug	OCP	001	INOV	DCC
113.65			101.25		92.99	92.99	97.12	101.25	105.38	109.52	113.65
	content c			••••=	000	000	••••=				
168.94			132.93	127.55	110.06	101.99	117.04	118.43	138.02	150.66	163.61
	L content (tion loss	annual)	I								1629.46
25.34	22.16	22.87	19.94	19.13	16.51	15.30	17.56	17.77	20.70	22.60	24.54
Volume	er cylinde factor	51 1055 Id		n/uay)							0.0191 0.9283
Energy l	ature fac lost from orage los	hot wate	er cylinde	er (kWh/	day)						0.5400 1.44
Energy l		hot wate	er cylinde	er (kWh/	day) 43.09	44.53	44.53	43.09	44.53	43.09	
Energy I Total sto 44.53	lost from orage los	hot wate s 44.53	-			44.53	44.53	43.09	44.53	43.09	1.44
Energy I Total sto 44.53	lost from orage los 40.22	hot wate s 44.53	-			44.53 44.53	44.53 44.53	43.09	44.53 44.53	43.09 43.09	1.44
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 r circuit lo	hot wate s 44.53 44.53	43.09	44.53	43.09						1.44 44.53
Energy Total sto 44.53 Net stor 44.53 Primary	lost from orage los 40.22 rage loss 40.22 r circuit lo	hot wate s 44.53 44.53	43.09	44.53	43.09						1.44 44.53 44.53
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81	lost from orage los 40.22 rage loss 40.22 circuit lo loss	hot wate s 44.53 44.53 ss (annu 51.81	43.09 43.09 Jual) 50.14	44.53 44.53 51.81	43.09 43.09 50.14	44.53 51.81	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he	lost from orage los 40.22 age loss 40.22 circuit lo loss 46.79	hot wate s 44.53 44.53 ss (annu 51.81 ed for wa	43.09 43.09 (al) 50.14 ater heat	44.53 44.53 51.81 ing calcu	43.09 43.09 50.14 ulated for	44.53 51.81	44.53 51.81	43.09	44.53	43.09	1.44 44.53 44.53 610.00 51.81
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 265.28	lost from orage los 40.22 rage loss 40.22 circuit lo loss 46.79 eat requir	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 248.81	43.09 43.09 ual) 50.14 ater heat 226.16	44.53 44.53 51.81 ing calcu 223.88	43.09 43.09 50.14 Jated for 203.29	44.53 51.81 each m 198.33	44.53 51.81 onth	43.09 50.14	44.53 51.81	43.09 50.14	1.44 44.53 44.53 610.00 51.81
Energy I Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 265.28 Output f	lost from orage los 40.22 rage loss 40.22 circuit lo loss 46.79 eat requir 234.77	hot wate s 44.53 44.53 ss (annu 51.81 ed for wa 248.81 er heater	43.09 43.09 ial) 50.14 ater heat 226.16 for each	44.53 44.53 51.81 ing calcu 223.88 n month,	43.09 43.09 50.14 Jated for 203.29 kWh/mc	44.53 51.81 each m 198.33	44.53 51.81 onth	43.09 50.14	44.53 51.81 234.36	43.09 50.14	1.44 44.53 610.00 51.81 259.95
Energy Total sto 44.53 Net stor 44.53 Primary Primary 51.81 Total he 265.28 Output f 265.28	lost from orage los 40.22 rage loss 40.22 circuit lo loss 46.79 eat requir 234.77 from wate	hot wate 44.53 44.53 ss (annu 51.81 ed for wa 248.81 er heater 248.81	43.09 43.09 al) 50.14 ater heat 226.16 for each 226.16	44.53 44.53 51.81 ing calcu 223.88 month, 223.88	43.09 43.09 50.14 Jlated for 203.29 kWh/mc 203.29	44.53 51.81 each m 198.33 onth	44.53 51.81 onth 213.37	43.09 50.14 211.66	44.53 51.81 234.36	43.09 50.14 243.89	1.44 44.53 610.00 51.81 259.95

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5. Internal gains

		-									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metaboli	ic gains,	Watts				•					
134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63
Lighting gains											
37.69	33.47	27.22	20.61	15.41	13.01	14.05	18.27	24.52	31.13	36.34	38.73
Applianc	es gains	5									
248.67	251.25	244.75	230.90	213.43	197.01	186.03	183.45	189.96	203.80	221.27	237.70
Cooking	gains										
36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses e	e.g. evap	oration (negative	values)							
-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71
Water h	eating ga	ains									
179.09	176.70	171.73	164.97	160.59	154.42	149.17	155.89	158.28	165.27	173.16	176.71
Total int	ernal gai	ns									
538.84	534.81	517.09	489.88	462.82	437.82	422.65	431.00	446.15	473.59	504.16	526.53
	•	-	•	•		•	•	•	•		·

6. Solar gains (calculation for January)

Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	Area & Flux 0.9 x 22.000 19.87	g & FF ' 0.72 x 0.70	Shading 0.77	Gains 152.7005
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000
Lighting calculations	Area	g	FF x Shadi	ng
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 22.00	ŭ.80	0.70 x 0.83	•

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C)21.00Heating system responsiveness1.00											(85)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau													
25.97	26.21	26.21	26.65	26.92	27.05	27.17	27.17	26.86	26.65	26.43	26.21		
alpha													
2.73	2.75	2.75	2.78	2.79	2.80	2.81	2.81	2.79	2.78	2.76	2.75		
Utilisation factor for gains for living area													
0.99	0.99	0.98	0.95	0.90	0.79	0.64	0.67	0.88	0.97	0.99	0.99	(86)	
Mean internal temperature in living area T1													
18.29	18.51	18.97	19.51	20.14	20.60	20.86	20.84	20.41	19.66	18.81	18.35	(87)	
Temper	ature du	ring heat	ing peric	ods in res	st of dwe	elling Th2	2						
18.93	18.95	18.95	18.97	18.99	18.99	19.00	19.00	18.98	18.97	18.96	18.95	(88)	
Utilisatio	on factor	for gains	s for rest	of dwell	ing								
0.99	0.99	0.97	0.93	0.84	0.65	0.38	0.41	0.78	0.95	0.99	0.99	(89)	
Mean in	ternal te	mperatu	re in the	rest of d	welling 7	2							
16.63	16.85	17.31	17.85	18.45	18.83	18.98	18.98	18.70	18.01	17.17	16.70	(90)	
	Living area fraction (25.80 / 95.40) 0.27 Mean internal temperature (for the whole dwelling)											(91)	
17.07	17.30	17.76	18.30	18.90	19.31	19.49	19.48	19.16	18.45	17.61	17.15	(92)	
Apply ac	djustmen	t to the r	nean int	ernal ten	nperatur	e, where	appropr	iate	•	•	·		
17.07	17.30	17.76	18.30	18.90	19.31	19.49	19.48	19.16	18.45	17.61	17.15	(93)	

8. Space heating requirement

	•	9.09	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	on factor	for gains	5								J
0.99	0.98	0.96	0.92	0.83	0.68	0.45	0.49	0.80	0.94	0.98	0.99
Useful g	jains										J
683.30	814.46	951.69	1098.53	1099.02	907.84	584.91	574.52	804.51	784.38	681.38	645.33
Monthly	average	externa	tempera	ature							
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
3207.6	3109.7	2771.5	2385.7	1772.72	1153.67	631.32	629.28	1199.19	1902.30	2659.3	3096.4
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
1878.05	1542.38	1353.91	926.80	501.23	-	-	-	-	831.74	1424.09	1823.61
Total space heating requirement per year (kWh/year) (October to May)										10281.8	
Space heating requirement per m ² (kWh/m ² /year)									107.7		

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9a. Energy requirements

9a. Energy requirementsFraction of heat from secondary system0.1000Fraction of space heat from main system(s)0.9000												(201) (202)
Efficiend	Efficiency of main heating system78.90%Efficiency of secondary heating system100.00%											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(208)
	leating re	equireme		, ,			5					
-	_	1353.91		501.23	-	-	-	-	831.74	1424.09	1823.61	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)							
2142.3	2142.3 1759.3 1544.3 1057.1 571.75 948.75 1624.4 2080											
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)		1	1	I]	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	iel (main	heating	system	2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary he	eating sy	vstem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	iel (seco	ndary)									
187.81	154.24	135.39	92.68	50.12	-	-	-	-	83.17	142.41	182.36	(215)
Water h							•					
	-	equireme			1		1	1				(2.1)
		248.81		223.88	203.29	198.33	213.37	211.66	234.36	243.89	259.95	(64)
	<u>. </u>	er heate			1		1	1		1	68.80	(216)
77.36	77.26	76.98	76.50	75.24	68.80	68.80	68.80	68.80	76.23	77.09	77.35	(217)
	eating fu											(010)
342.91	303.87	323.20	295.61	297.57	295.48	288.27	310.13	307.65	307.43	316.37	336.08	(219)
Space h Space h Water h	Annual totals Space heating fuel used, main system 1 Space heating fuel (secondary) Water heating fuel											
Electricity for pumps, fans and electric keep-hot130.00central heating pump130.00boiler with a fan-assisted flue45.00Total electricity for the above, kWh/year175.00Electricity for lighting (30.00% fixed LEL)665.57Energy saving/generation technologies45.00											45.00 175.00	(230c) (230e) (231) (232)
Energ	Appendix Q - Energy saved or generated ():0.000Energy used ():0.000											(236a) (237a)
Total de	Total delivered energy for all uses17321.63											

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy	Emission factor	Emission	S
	kWh/year	kg CO2/kWh	kg CO2/ye	ear
Space heating, main system 1	11728.30	0.194	2275.29	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	1028.18	0.422	433.89	(263)
Water heating	3724.58	0.194	722.57	(264)
Space and water heating			3431.75	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	665.57	0.422	280.87	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				. ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			3786.47	(272)
			kg/m²/yea	r
Emissions per m ² for space and water heating			36.75	(272a)
Emissions per m ² for lighting			2.94	(272b)
Emissions per m ² for pumps and fans			0.77	(272c)

24.67 (273)

Target Carbon Dioxide Emission Rate (TER)

= [(36.7463 x 1.0000 x 1.0206) + (2.9441 x 1.2251)] x 0.6000

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Project Information

Building type	Top-floor flat		
Plot number Reference	11		
Date	4 July 2016		
Client	Investland	Project	252 Finchley Road
			London
			NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area	95.40			(4)
Dwelling volume (m ³)			257.58	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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	penings Net area	U-value	A x U	kappa-value		
area, m ² m Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	² A, m ² 0.680	W/m²K 1.42 (1.50)	W/K 0.96	kJ/m²K l	kJ/K	(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	1.220	1.42 (1.50)	1.73			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.960	1.42 (1.50)	1.36			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	1.500	1.42 (1.50)	2.12			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window Balcony	4.390	1.42 (1.50)	6.21			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	1.220	1.42 (1.50)	1.73			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.680	1.42 (1.50)	0.96			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	2.860	1.42 (1.50)	4.05			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window top floor	2.500	1.42 (1.50)	3.54			(27)
Walls Floors Pitched roofs insulated betweer Party wall Internal ceiling	218.10 95.40 1 rafters 47.70 7.30 95.40	0.22 0.20 0.18 0.00 0.00	47.98 19.08 8.59 0.00 0.00	20.00 9.00 70.00	3707.70 1908.00 429.30 511.00 858.60	(29) (28) (30)

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3. Heat	losses a	and heat	loss pa	rameter								
Element	t	Gross	Öpe	enings	Net are	a U-v	value	ΑxU	ka	ppa-valu	ie A x K	
		area, m ²	² m²		A, m²	W/	′m²K	W/K	kJ	/m²K	kJ/K	
Total area of external elements Sigma A, m²377.89Fabric heat loss, W/K99.27Heat capacity7414.60Thermal mass parameter, kJ/m²K77.72Effect of thermal bridges56.68Total fabric heat loss155.95Ventilation heat loss calculated monthly42.5042.5042.5042.5042.5042.5042.5042.5042.5042.5042.5042.5042.50										$\begin{array}{ccc} (33) \\ (34) \\ (35) \\ (35) \\ (36) \\ $		
42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	(38)
Heat tra	nsfer co	efficient,	W/K									
198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	198.45	
Heat los	s param	eter (HL	P), W/m [;]	²K							198.4	15 (39)
2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	
HLP (av	erage)					1		1	1		2.0	08 (40)
Number	of days	in month	(Table	1a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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4. Wate Assume Annual a	d occupa	ancy, N	•		oer day V	/d,avera	ge				kWh/year 2.69 98.15	(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate					month	_			_	_		
107.97	104.04	100.11	96.19	92.26	88.34	88.34	92.26	96.19	100.11	104.04	107.97	(44)
Energy of	content c	of hot wa	ter used									
160.49	140.37	144.85	126.28	121.17	104.56	96.89	111.18	112.51	131.12	143.13	155.43	
Energy of Distribut		annual)									1547.99	(45)
24.07	21.06	21.73	18.94	18.18	15.68	14.53	16.68	16.88	19.67	21.47	23.31	(46)
Hot wate											0.00	(50)
Hot wate		er loss fa	ctor (kW	/h/day)							0.0000	(51)
Volume Tempera		tor									0.0000 0.0000	(52) (53)
Energy I Total sto	ost from	store (k'	Wh/day)								0.00	(55)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net stora	age loss		1	1	1		1	1				
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary Primary		ss (annı	ial)					1			0.00	(58)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi lo	oss calcu	lated for	r each m	onth								
50.96	46.03	50.96	47.44	47.02	43.56	45.01	47.02	47.44	50.96	49.32	50.96	(61)
Total he	at requir	ed for wa	ater heat	ing calcu	lated fo	r each m	ionth					
211.45	186.40	195.81	173.72	168.19	148.12	141.91	158.20	159.95	182.08	192.44	206.39	(62)
Output f	rom wate	er heater	for each	n month,	kWh/mo	onth						
211.45	186.40	195.81	173.72	168.19	148.12	141.91	158.20	159.95	182.08	192.44	206.39	(64)
								•			2124.65	(64)
Heat gai												
66.10	58.18	60.90	53.85	52.04	45.66	43.47	48.72	49.27	56.34	59.92	64.42	(65)

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5. Internal gains

	- 3-										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic gains,	Watts	•							•	
134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63	134.63
Lighting gains											
22.75	20.21	16.43	12.44	9.30	7.85	8.48	11.03	14.80	18.79	21.93	23.38
Appliances gains											
248.67	251.25	244.75	230.90	213.43	197.01	186.03	183.45	189.96	203.80	221.27	237.70
Cooking gains											
36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46
Pumps	and fans	gains	•	•	•						
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71	-107.71
Water h	eating ga	ains									
88.85	86.58	81.86	74.79	69.95	63.41	58.43	65.49	68.43	75.72	83.22	86.59
Total internal gains											
433.66	431.42	416.43	391.52	366.07	341.66	326.33	333.36	346.58	371.70	399.82	421.06

6. Solar gains (calculation for January)

o. Oolar gains (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 0.680 11.51		0.77	2.7336
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.220 11.51	0.72 x 0.70	0.77	4.9044
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 0.960 11.51	0.72 x 0.70	0.77	3.8592
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.500 11.51	0.72 x 0.70	0.77	6.0301
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window Balcony	0.9 x 4.390 19.87	0.72 x 0.70	0.77	30.4707
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.680 37.39	0.72 x 0.70	0.77	8.8798
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.220 37.39	0.72 x 0.70	0.77	15.9313
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.680 37.39	0.72 x 0.70	0.77	8.8798
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 2.860 37.39	0.72 x 0.70	0.77	37.3472

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6. Solar gains (calculation for January)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window top floor	0.9 x 2.500 19.87		0.77	17.3523
Lighting calculations	Area	~		22
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 0.68	g 0.80	FF x Shadii 0.70 x 0.83	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.22	0.80	0.70 x 0.83	0.51
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 0.96	0.80	0.70 x 0.83	0.40
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window	0.9 x 1.50	0.80	0.70 x 0.83	0.63
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window Balcony	0.9 x 4.39	0.80	0.70 x 0.83	1.84
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.68	0.80	0.70 x 0.83	0.28
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.22	0.80	0.70 x 0.83	0.51
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 0.68	0.80	0.70 x 0.83	0.28
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 2.86	0.80	0.70 x 0.83	1.20
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East) Window top floor	0.9 x 2.50	0.80	0.70 x 0.83	1.05

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7 Mean internal temperature

Temper	ature du system		ting perio	ods in the	e living a	rea, Th1	(°C)				21.00 0.75
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau							•				
10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38
alpha							•				
1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69
Utilisatio	on factor	for gains	s for livin	g area	•						
0.96	0.94	0.91	0.87	0.80	0.70	0.58	0.60	0.78	0.89	0.95	0.96
Mean in	ternal te	mperatu	re in livin	ig area T	1					•	
17.69	17.91	18.42	18.94	19.63	20.18	20.54	20.52	20.01	19.19	18.25	17.74
Temper	ature du	ring heat	ting perio	ds in res	st of dwe	illing Th2	2	•		•	
19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29
Utilisatio	on factor	for gains	s for rest	of dwell	ing					•	
0.95	0.93	0.90	0.85	0.75	0.61	0.41	0.43	0.70	0.86	0.93	0.95
Mean in	ternal te	mperatu	re in the	rest of d	welling T	2	•	-			
16.37	16.59	17.08	17.60	18.25	18.75	19.03	19.03	18.62	17.85	16.93	16.42
	rea fracti ternal te				dwelling))					0.27
16.72	16.95	17.45	17.96	18.62	19.14	19.44	19.43	19.00	18.21	17.28	16.78
Apply ac	djustmen	t to the r	nean int	ernal ten	nperatur	e, where	approp	riate	•		<u> </u>
16.72	16.95	17.45	17.96	18.62	19.14	19.44	19.43	19.00	18.21	17.28	16.78

8. Space heating requirement

e. epue	e neathig	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5					1			
0.93	0.91	0.87	0.82	0.73	0.60	0.43	0.45	0.68	0.84	0.91	0.94
Useful gains											
531.64	620.13	687.26	746.11	716.96	592.15	405.83	395.61	532.15	558.59	518.22	501.12
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
2425.7	2370.7	2112.6	1837.64	1373.75	901.18	504.61	502.13	932.11	1471.41	2040.9	2357.3
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth	•				
1409.18	1176.41	1060.44	785.90	488.65	-	-	-	-	679.14	1096.32	1381.01
	ace heat					ar) (Oct	ober to N	/lay)		•	8077.0
Space h	eating re	equireme	nt per m	² (kWh/r	n²/year)						84.6

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Energy I	requirement	IS								kWh/year	
No secondar Fraction of s Efficiency of	pace heat fro	om main	system((s)				1.0000 3.80%		,	(202) (206)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heatir	ng requireme	ent	•	•			•				
1409.18 117	6.41 1060.44	785.90	488.65	-	-	-	-	679.14	1096.32	1381.01	(98)
Appendix Q	- monthly en	ergy sav	ed (mair	heating	system	1)			•		
0.00 0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heatir	ng fuel (main	heating	system	1)		•			•		
1502.33 125	4.16 1130.54	837.85	520.95	-	-	-	-	724.03	1168.78	1472.29	(211)
Appendix Q	- monthly en	ergy sav	ed (mair	heating	system	2)			•		
0.00 0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heatir	ng fuel (main	heating	system	2)		•			•		
0.00 0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q	- monthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)	•		•		
0.00 0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heatir	ng fuel (seco	ndary)			•		•		•		
0.00 0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heatin Water heatin		nt				•					
	.40 195.81		168.19	148.12	141.91	158.20	159.95	182.08	192.44	206.39	(64)
Efficiency of			100.15	140.12	141.51	100.20	100.00	102.00	152.44	81.50	(216)
91.99 91.9		91.31	90.31	81.50	81.50	81.50	81.50	90.90	91.73	91.99	(217)
Water heatin		51.01	50.01	01.50	01.00	01.50	01.00	50.50	51.75	51.55	(= 17)
229.87 202		190.26	186.23	181.75	174.12	194.11	196.25	200.31	209.79	224.35	(219)
Annual totals Space heatir Space heatir Water heatin Electricity for	ng fuel used, ng fuel (seco ng fuel	ndary)		ep-hot	I	1	1	I	1	kWh/year 8610.92 0.00 2403.51	(211) (215) (219)
mechanical central hea	ventilation - ting pump a fan-assiste ity for the ab lighting (100	balance d flue oove, kW 0.00% fix	d, extrac /h/year ked LEL)	ct or pos	itive inpu	it from oi	utside (S	FP=0.22	240)	70.39 130.00 45.00 245.39 401.76	(230a) (230c) (230e) (231) (232)
PVs 0.80 x PVs 0.80 x PVs 0.80 x	1.070 x 107 0.000 x 0.00 0.000 x 0.00	′3.000 x 00 x 0.50	0.800 00							734.790 0.000 0.000 734.790	(233)
Appendix Q Energy sav Energy use	ed or gener	ated ():								0.000 0.000	(236a) (237a)
Total deliver	ed energy fo	r all uses	5							10926.79	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy	Emission factor	Emission	
- · · · · ·	kWh/year	kg CO2/kWh	kg CO2/ye	
Space heating, main system 1	8610.92	0.198	1704.96	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2403.51	0.198	475.89	(264)
Space and water heating			2180.86	(265)
Electricity for pumps and fans	245.39	0.517	126.87	(267)
Electricity for lighting	401.76	0.517	207.71	(268)
Electricity generated - PVs	-734.79	0.529	-388.70	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			2126.73	(272)
			ker/m2/hee	

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 22.29 (273)

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Project Information

Building type	Top-floor flat		
Plot number Reference	12		
Date Client	4 July 2016 Investland	Project	252 Finchley Road London NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m ³)	
Ground floor (1)	126.30	2.70	` 341.01	(3a)
Total floor area	126.30			(4)
Dwelling volume (m ³)			341.01	(5)

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2. Ventilation rate

2. Venti											m ³ per h	nour
							main + s heating	eondar	y + othe	r		
Number Number Number Number Number	of open of interr of pass	flues nittent fa ive vents	3				$0 + 0 + 0 \\ 0 + 0 + 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $		x 40 x 20 x 10 x 10 x 40		0.00 0.00 0.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
- turnoor		loo guo i					Ũ		X 10			
Infiltratio Pressure Air perm Number Shelter f Infiltratio Infiltratio	e test, re leability of sides actor on rate ir	esult q50 s on whic ncorpora	ch shelte	red Iter facto	r				4.00		Air char 0.00 2.00 0.85 0.17	(8) (17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	average	wind sp	beed fror	n Table	7	•	•			·		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	ictor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjusted	d infiltrat	ion rate	(allowing	g for shel	ter and	wind spe	eed)	-			13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
Ventilation Effective				ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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	enings Net area	U-value	AxU	kappa-value		
area, m ² m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	A, m² 1.770	W/m²K 1.42 (1.50)	W/K 2.50	kJ/m²K	kJ/K	(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) Window	1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	1.940	1.42 (1.50)	2.75			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	2.520	1.42 (1.50)	3.57			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	4.470	1.42 (1.50)	6.33			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)	0.950	1.42 (1.50)	1.34			(27)
Roof window Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window	2.060	1.42 (1.50)	2.92			(27)
Walls Ground floors Pitched roofs insulated between r Party wall Internal ceiling	50.40 126.30 rafters 63.15 37.20 63.15	0.22 0.20 0.18 0.00 0.00	11.09 25.26 11.37 0.00 0.00	17.00 75.00 9.00 70.00 9.00	856.80 9472.50 568.35 2604.00 568.35	(29) (28) (30)

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		and heat						A 11				
Element		Gross	Ope	enings	Net are	a U-	value	ΑxU		ppa-valu		
		area, m ²	² m²		A, m²	W	/m²K	W/K	kJ	/m²K	kJ/K	
Fabric h Heat cap Thermal Effect of Total fat	eat loss, pacity I mass p f thermal pric heat	aramete bridges	r, kJ/m²ŀ	<	m²						258.1 73.5 14070.0 111.4 38.7 112.2	57 (33) 00 (34) 10 (35) 72 (36)
56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	(38)
Heat tra	nsfer co	efficient,	W/K									
168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	
											168.5	55 (39)
Heat los	s param	eter (HL	P), W/m ²	²K								
1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	
HLP (av				•	•		•		•	•	1.3	33 (40)
Number	of days	in month	(Table	1a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for New dwelling as	designed - calculation of energy ratings
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Assume	r heating d occupa average	ancy, N	•		oer day \	/d,avera	ge				kWh/yea 2.88 102.71	ar ((
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres	per day f	for each	month							
112.98	108.87	104.77	100.66	96.55	92.44	92.44	96.55	100.66	104.77	108.87	112.98	
Energy	content c	of hot wa	ter used									
167.95	146.89	151.58	132.15	126.80	109.42	101.39	116.35	117.74	137.21	149.78	162.65	
Energy of Distribut	content (tion loss	annual)		•		•		•			1619.92	
25.19	22.03	22.74	19.82	19.02	16.41	15.21	17.45	17.66	20.58	22.47	24.40	
Hot wate Volume Tempera Energy I	er storag er cylinde factor ature fac lost from prage los	er loss fa tor store (k'	ctor (kŴ	/h/day)							0.00 0.0000 0.0000 0.0000 0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Net stor	age loss							•				
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Primary Primary	circuit lo loss	ss (annu	ial)								0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Combi lo	oss calcu	lated for	each m	onth								
50.96	46.03	50.96	49.32	49.20	45.59	47.11	49.20	49.32	50.96	49.32	50.96	
	at requir						onth					
	192.92						165.55	167.06	188.17	199.10	213.61	
Output f	rom wate											
218.91	192.92	202.54	181.47	176.00	155.01	148.50	165.55	167.06	188.17	199.10	213.61	
Heat ga	ins from	water he	ating, k	Nh/mont	h						2208.83	
68.58	60.35	63.14	56.27	54.46	47.78	45.49	50.99	51.48	58.36	62.13	66.82	
	1	1	I	1	1	1	1	1	I	1	I	

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5. Internal gains

	5										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metaboli	ic gains,	Watts									
173.08	173.08	173.08	173.08	173.08	173.08	173.08	173.08	173.08	173.08	173.08	173.08
Lighting	gains										
69.12	61.40	49.93	37.80	28.26	23.86	25.78	33.50	44.97	57.10	66.64	71.05
Applianc	es gains	5									
437.62	442.16	430.71	406.35	375.60	346.70	327.39	322.85	334.29	358.65	389.41	418.31
Cooking	gains										
55.19	55.19	55.19	55.19	55.19	55.19	55.19	55.19	55.19	55.19	55.19	55.19
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses e	e.g. evap	oration (negative	values)							
-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39
Water h	eating ga	ains									
92.18	89.80	84.87	78.15	73.20	66.36	61.14	68.53	71.50	78.45	86.29	89.81
Total int	ernal gai	ns									
721.81	716.24	688.40	645.19	599.95	559.80	537.20	547.77	573.65	617.09	665.23	702.05

6. Solar gains (calculation for January)

or colar game (carcalation for canaary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 1.770 37.39		0.77	23.1135
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) Window	0.9 x 1.520 47.32	0.72 x 0.70	0.77	25.1236
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.940 37.39	0.72 x 0.70	0.77	25.3334
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.520 37.39	0.72 x 0.70	0.77	19.8489
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.520 37.39	0.72 x 0.70	0.77	19.8489
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 2.520 37.39	0.72 x 0.70	0.77	32.9073
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 4.470 37.39	0.72 x 0.70	0.77	58.3714
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window	0.9 x 0.950 26.00	0.72 x 0.70	1.00	11.2039
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window	0.9 x 2.060 26.00	0.72 x 0.70	1.00	24.2948

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7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness

	g system	•	01		, inving a	ica, iiii	(0)				0.75	(00
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau										•		
23.19	23.19	23.19	23.19	23.19	23.19	23.19	23.19	23.19	23.19	23.19	23.19	
alpha												
2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	
Utilisati	on factor	for gains	s for livin	g area						•		
0.96	0.93	0.90	0.84	0.74	0.61	0.45	0.47	0.69	0.85	0.94	0.96	(86
Mean ir	nternal te	mperatu	re in livin	ig area T	1					•		
19.15	19.36	19.72	20.06	20.44	20.71	20.84	20.83	20.63	20.17	19.52	19.17	(87
Tempe	rature du	ring heat	ting perio	ds in res	st of dwe	illing Th2	2			•		
19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	(88)
Utilisati	on factor	for gains	s for rest	of dwell	ing					•		
0.95	0.92	0.88	0.81	0.69	0.53	0.33	0.35	0.61	0.82	0.93	0.95	(89
Mean ir	nternal te	mperatu	re in the	rest of d	welling T	2				•		
18.15	18.35	18.70	19.02	19.38	19.60	19.69	19.69	19.55	19.14	18.52	18.16	(90
	area fract nternal te				dwelling)				•	0.21	(91
18.35	18.56	18.91	19.24	19.60	19.83	19.93	19.92	19.77	19.35	18.72	18.37	(92
Apply a	djustmer	it to the r	mean int	ernal ten	peratur	e, where	appropr	riate	1		1	
18.35	18.56	18.91	19.24	19.60	19.83	19.93	19.92	19.77	19.35	18.72	18.37	(93

21.00

(85)

8. Space heating requirement

e. epac	e neutin,	gregan	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatio	on factor	for gains	5								
0.94	0.91	0.86	0.80	0.68	0.53	0.35	0.36	0.61	0.81	0.91	0.94
Useful gains											
900.06	1031.43	1094.51	1117.36	999.18	763.22	484.68	481.50	749.01	888.82	871.28	851.20
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure						
2335.2	2285.9	2041.4	1776.12	1331.49	881.50	510.21	509.70	921.94	1441.00	1976.22	2270.5
Space h	eating re	quireme	ent for ea	ch mont	h, kWh/r	nonth					
1067.74	843.02	704.49	474.31	247.24	-	-	-	-	410.82	795.56	1055.96
	Total space heating requirement per year (kWh/year) (October to May) 5599.1										
Space heating requirement per m² (kWh/m²/year)44.33											

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Ene	ergy requ	uirement	IS								kWh/year	
Fraction	of spac	eating sy e heat fro in heating	om main	system((s)				1.0000 3.80%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	heating re	quireme	ent		1	1		1	1	1	11	
1067.74	4843.02	704.49	474.31	247.24	-	-	-	-	410.82	795.56	1055.96	(98)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	1	1	1	11	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	heating fu	uel (main	heating	system	1)	1	1		1	1		
1138.32	898.74	751.06	505.66	263.58	-	-	-	-	437.98	848.15	1125.76	(211)
Append	ix Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)	1	1	1	11	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	heating fu	uel (main	heating	system	2)				1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	/stem)		1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	heating fu	uel (seco	ndary)			I						
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water h	eating											
Water h	eating re	equireme	ent									
218.91	192.92	202.54	181.47	176.00	155.01	148.50	165.55	167.06	188.17	199.10	213.61	(64)
Efficience	cy of wat	er heate	r								81.50	(216)
91.45	91.24	90.74	90.04	88.26	81.50	81.50	81.50	81.50	89.55	91.05	91.48	(217)
Water h	eating fu	iel										
239.37	211.45	223.20	201.54	199.41	190.19	182.21	203.13	204.98	210.12	218.67	233.51	(219)
Space h Water h	neating fu neating fu leating fu		ndary)		ep-hot						kWh/year 5969.24 0.00 2517.78	(211) (215) (219)
central heating pump130.00(2boiler with a fan-assisted flue45.00(2Total electricity for the above, kWh/year268.19(2Electricity for lighting (100.00% fixed LEL)488.30(2									(230a) (230c) (230e) (231) (232)			
PVs 0 PVs 0 PVs 0	.80 x 1.0 .80 x 0.0 .80 x 0.0	eneratior 070 x 107 000 x 0.00 000 x 0.00	′3.000 x 00 x 0.50	1.000 00							918.488 0.000 0.000 918.488	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	elivered e	energy fo	r all uses	6							8325.03	(238)

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10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	5969.238	3.100	185.05	(240)
Space heating - main system 2 Water heating	0.000	0.000	0.00	(241)
Water heating cost	2517.78	3.100	78.05	(247)
Mech vent fans cost	93.191	11.460	10.68	(249)
Pump/fan energy cost	175.000	11.460	20.06	(249)
Energy for lighting	488.302	11.460	55.96	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	918.488	11.460	-105.26	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			350.53	(255)
<i>11a. SAP rating</i> Energy cost deflator			0.47	(256)
			0.47	(200)

Lifelgy cost denator	0.47	(200)
Energy cost factor (ECF)	0.96	(257)
SAP value	86.58	
SAP rating	87	(258)
SAP band	В	
SAP band	В	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	5969.24	0.198	1181.91	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2517.78	0.198	498.52	(264)
Space and water heating			1680.43	(265)
Electricity for pumps and fans	268.19	0.517	138.65	(267)
Electricity for lighting	488.30	0.517	252.45	(268)
Electricity generated - PVs	-918.49	0.529	-485.88	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1585.66	(272)
			kg/m²/yea	r
CO2 emissions per m ²			12.55	(273)

CO2 emissions	per	n
El value	-	
El rating		
El band		

87.60 (273a) (274) 88 В

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13a. Primary energy

isa. Primary energy				
	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/year	
Space heating, main	5969.24	1.020	6088.62	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	2.920	0.00	(263)
Water heating	2517.78	1.020	2568.14	(264)
Space and water heating			8656.76	(265)
Electricity for pumps/fans	268.19	2.920	783.12	(267)
Electricity for lighting	488.30	2.920	1425.84	(268)
Electricity generated - PV	-918.49	2.920	-2681.98	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	2.920	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			8183.74	(272)
Primary energy kWh/m²/year			64.80	(273)

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Project Information

Building type			
Plot number Reference	12		
Date Client	4 July 2016 Investland	Project	252 Finchley Road London NW3 7AA

SAP 2009 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	126.30	2.70	`341.01	(3a)
Total floor area	126.30			(4)
Dwelling volume (m ³)			341.01	(5)

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2. Ventilation rate

2. Veni	Πατιστητά	ale									m ³ per ho	our
							main + s heating	eondar	y + othe	r	•	
Number Number Number	r of chim r of open r of inten r of pass r of fluele	i flues mittent fa ive vents	S				0 + 0 + 0 0 + 0 + 0 3 0 0		x 40 x 20 x 10 x 10 x 40		0.00 0.00 30.00 0.00 0.00	(6a) (6b) (7a) (7b) (7c)
Infiltratio	on due to	o chimne	evs. fans	and flue	S						Air chang 0.09	ges per hour (8)
Pressur Air pern	Infiltration due to chimneys, fans and flues Pressure test, result q50 Air permeability								10.00		0.59	(17) (18)
Number of sides on which sheltered Shelter factor Infiltration rate incorporating shelter factor											2.00 0.85 0.50	(19) (20) (21)
Jan	on rate n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	/ average	e wind sp		-								
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	ter and	wind sp	beed)		_	_	13.53	(22a)
0.67	0.64	0.64	0.56	0.51	0.49	0.46	0.46	0.52	0.56	0.60	0.64	
	ion : nati e air cha			ntermitte	nt extrac	t fans					6.76	(22b)
0.73	0.70	0.70	0.66	0.63	0.62	0.61	0.61	0.64	0.66	0.68	0.70	(25)
L	-1		-1	- 1	-	1		-				

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<i>3. Heat I</i> Element Window air-filled, hard coa	Net are A, m² 29.72	W	value ′m²K 35 (2.00)	A x U W/K 55.0	5			(27)				
Reference Glazing Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door					1.850	0	2.00	3.7	0			(26)
Walls Ground f Pitched r Party wa Internal c	iloors roofs ins Il		etween r	afters	34.08 126.30 66.16 37.20 63.15) 6)	0.35 0.25 0.16 0.00 0.00	11.9 31.5 10.5 0.0 0.0	7 9 0			(29) (28) (30)
Fabric heat loss, W/K112.84(3)Heat capacity13240.29(3)Thermal mass parameter, kJ/m²K250.00(3)Effect of thermal bridges28.39(3)										4 (33) 9 (34) 0 (35) 9 (36)		
81.88 Heat trar	79.11	79.11	74.05	71.03	69.63	68.29	68.29	71.76	74.05	76.50	79.11	(38)
		·		212.26	210.86	209 52	209 52	212 99	215.28	217.73	220.34	
	223.11 220.34 215.28 212.26 210.86 209.52 212.99 215.28 217.73 220.34 Image: Sparameter (HLP), W/m²K										3 (39)	
	1.74	1.74	1.70	1.68	1.67	1.66	1.66	1.69	1.70	1.72	1.74	
HLP (average) 1.71 (40 Number of days in month (Table 1a)										1 (40)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

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SAP 2009 worksheet for notional dwelling -	- calculation of target emissions
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Assume	r heating d occupa	ancy, N	•			(- L					kWh/yea 2.88	(42
						/d,avera					108.12	(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	er usage				-							
118.93	114.60			101.63	97.31	97.31	101.63	105.96	110.28	114.60	118.93	(44
Energy o	content o	of hot wa	ter used									
176.79	154.62	159.56	139.11	133.47	115.18	106.73	122.47	123.94	144.44	157.66	171.21	
Energy o Distribut	content (ion loss	annual)									1705.18	(45
26.52	23.19	23.93	20.87	20.02	17.28	16.01	18.37	18.59	21.67	23.65	25.68	(46
Hot water storage volume (litres)150.00Hot water cylinder loss factor (kWh/day)0.0191Volume factor0.9283Temperature factor0.5400Energy lost from hot water cylinder (kWh/day)1.44Total storage loss1.44												(50 (51 (52 (53 (55
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(56
Net stora	age loss				•				•			
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	(57
Primary Primary	circuit lo loss	ss (annu	ial)		1		1	1	1		610.00	(58
51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(59
Total he	at requir	ed for wa	ater heat	ing calcı	lated for	r each m	onth					
273.13	241.64	255.89	232.33	229.81	208.41	203.07	218.81	217.17	240.77	250.89	267.55	(62
Output f	rom wate	er heater	for each	n month,	kWh/mo	onth		,				
273.13	241.64	255.89	232.33	229.81	208.41	203.07	218.81	217.17	240.77	250.89	267.55	(64
•	ns from										2839.47	(64
135.85	121.02	130.12	120.84	121.45	112.88	112.56	117.79	115.79	125.09	127.01	134.00	(65

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5. Internal gains

			.								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains, Watts											
144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24
Lighting	gains	•				•				•	
44.44	39.47	32.10	24.30	18.16	15.34	16.57	21.54	28.91	36.71	42.84	45.67
Applianc	es gains	5									
293.20	296.25	288.58	272.26	251.65	232.29	219.35	216.31	223.98	240.30	260.90	280.27
Cooking	gains										
37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42
Pumps a	and fans	gains									
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses e	e.g. evap	oration	negative	values)							
-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39
Water h	eating ga	ains									
182.60	180.09	174.89	167.83	163.24	156.78	151.29	158.32	160.82	168.14	176.40	180.10
Total internal gains											
596.51	592.08	571.84	540.65	509.33	480.67	463.48	472.44	489.98	521.41	556.41	582.31

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled, low-E,	0.9 x 29.725 19.87		0.77	206.3192	
En=0.2, hard coat (East/West)					
Reference Glazing Solid door - Double-glazed, air-filled, low-E,	0 0 v 1 950 0 00	0.72 x 0.70	0.77	0.0000	
En=0.2, hard coat (East/West)	0.9 X 1.000 0.00	0.72 x 0.70	0.77	0.0000	
Reference Door					
Total solar gains, January				206.32	(83-1)
Solar gains					
206.32 399.91 639.18 949.03 1154.70 12	204.87 1169.46 1017.	81764.16 487.	01 256.51	170.19	(83)
Total gains					
802.83 991.98 1211.02 1489.68 1664.02 16	85.54 1632.94 1490.	25 1254.14 1008	3.42 812.92	752.51	(84)
Lighting calculations					
	Area	g	FF x Shad	0	
Window - Double-glazed, air-filled, low-E,	0.9 x 29.72	0.80	0.70 x 0.8	3 12.43	
En=0.2, hard coat (East/West)					
Reference Glazing					
GL = 12.43 / 126.30 = 0.098					
C1 = 0.850 C2 = 0.960					
02 = 0.300					

El = 785

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7. Mean internal temperature

Temper Heating	21.00 1.00	(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	•						·	•		•		
39.31	39.81	39.81	40.74	41.32	41.60	41.86	41.86	41.18	40.74	40.28	39.81	
alpha	•							•		•	<u>.</u>	
3.62	3.65	3.65	3.72	3.75	3.77	3.79	3.79	3.75	3.72	3.69	3.65	
Utilisatio	on factor	for gains	for livin	g area		•	·	•	•			
1.00	0.99	0.98	0.94	0.85	0.70	0.50	0.54	0.84	0.97	0.99	1.00	(86
Mean in	ternal ter	mperatu	re in livin	g area T	1		•	•	•			
19.07	19.30	19.70	20.16	20.62	20.88	20.97	20.97	20.74	20.18	19.49	19.12	(87
Temper	ature du	ring heat	ing peric	ds in res	st of dwe	elling Th2	2	•	•	•		
19.50	19.51	19.51	19.54	19.56	19.57	19.58	19.58	19.56	19.54	19.53	19.51	(88)
Utilisatio	on factor	for gains	for rest	of dwell	ing	•	•	•	•	•		
1.00	0.99	0.97	0.92	0.79	0.58	0.34	0.37	0.74	0.95	0.99	1.00	(89
Mean in	ternal ter	mperatu	re in the	rest of d	welling 7	Г2	·	•				
17.80	18.03	18.43	18.89	19.32	19.52	19.57	19.57	19.43	18.92	18.24	17.86	(90
	rea fracti ternal te				dwelling)				•	0.21	(91
18.06	18.29	18.69	19.16	19.59	19.80	19.86	19.86	19.70	19.18	18.49	18.12	(92
Apply ad	djustmen	t to the r	nean inte	ernal ten	nperatur	e, where	appropr	iate	·			
18.06	18.29	18.69	19.16	19.59	19.80	19.86	19.86	19.70	19.18	18.49	18.12	(93

8. Space heating requirement

er epae	e neathig	groqui	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisatic	n factor	for gains	5								
0.99	0.99	0.97	0.91	0.79	0.60	0.37	0.41	0.75	0.95	0.99	0.99
Useful gains											
797.98	979.33	1171.06	1362.94	1318.21	1009.50	610.45	606.56	945.41	953.67	804.17	748.53
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean ii	nternal te	emperati	ure						
	2928.3						619.77	1150.12	1803.96	2502.8	2912.6
Space h	eating re	quireme	nt for ea	ch mont	h, kWh/r	nonth					
1657.21	1309.69	1077.61	639.44	265.18	-	-	-	-	632.61	1223.03	1610.07
	ace heat					ar) (Octo	ober to N	lay)		-	8414.8
Space h	eating re	quireme	nt per m	² (kWh/r	n²/year)						66.6

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9a. Energy requirements

		trom oor		watam					0 1 0 0 0		kWh/year	(201)
		from sec e heat fr			(s)				0.1000 0.9000			(201) (202)
Efficiend	cy of ma	in heatin	g system	1	(-)			7	8.90%			(206)
		ondary h			1	1	1		00.00%	1		(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-		equireme		1	1	1	1	1	1			
		\$ 1077.6 ⁻				-	-	-	632.61	1223.03	1610.07	(98)
		onthly en			heating	system	1)	1	1			
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
•	-	uel (main		-		1	1	1	1			
		5 1229.2 ⁻		302.48		-	-	-	721.61	1395.09	1836.58	(211)
		onthly en			heating	system	2)	1		1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
		uel (main	heating		2)							
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Append	ix Q - m	onthly en	ergy sav	ed (seco	ondary he	eating sy	/stem)					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	neating f	uel (seco	ndary)				•					
165.72	130.97	107.76	63.94	26.52	-	-	-	-	63.26	122.30	161.01	(215)
Water h												
	-	equireme										
		255.89		229.81	208.41	203.07	218.81	217.17	240.77	250.89	267.55	(64)
Efficiend	cy of wat	ter heate	r								68.80	(216)
77.15	76.98	76.55	75.70	73.60	68.80	68.80	68.80	68.80	75.60	76.81	77.14	(217)
Water h	eating fu	lel										
354.03	313.90	334.27	306.90	312.24	302.92	295.15	318.04	315.65	318.48	326.65	346.86	(219)
Annual	totals										kWh/year	
		uel used,	main sy	stem 1							9598.66	(211)
Space h	neating f	uel (seco									841.48	(215)
Water h											3845.09	(219)
		mps, fan	s and ele	ectric ke	ep-hot						100.00	(000 a)
	l heating with a fa	n-assiste	d flue								130.00 45.00	(230c) (230e)
		for the at		h/vear							175.00	(231)
		hting (30									784.77	(232)
		eneration	n technol	ogies								
Append											0.000	$(000 \circ)$
		or gener	ateo ():								0.000 0.000	(236a) (237a)
Energ	y used (0.000	(201a)
Total de	elivered e	energy fo	r all uses	6							15245.01	(238)

10a. Does not apply

11a. Does not apply

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12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	-
Space heating, main system 1	9598.66	0.194	1862.14	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	841.48	0.422	355.11	(263)
Water heating	3845.09	0.194	745.95	(264)
Space and water heating			2963.19	(265)
Electricity for pumps and fans	175.00	0.422	73.85	(267)
Electricity for lighting	784.77	0.422	331.17	(268)
Electricity generated - PVs	0.00	0.529	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				. ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			3368.22	(272)
			kg/m²/yea	r
Emissions per m ² for space and water heating			24.05	(272a)
Emissions per m ² for lighting			2.62	(272b)
Emissions per m ² for pumps and fans			0.58	(272c)

16.65

(273)

Target Carbon Dioxide Emission Rate (TER) = [(24.0463 × 1.0000 × 1.0206) + (2.6221 × 1.2251)] × 0.6000

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Project Information

Building type	I op-floor flat		
Plot number Reference	12		
Date	4 July 2016		
Client	Investland	Project	252 Finchley Road
			London
			NW3 7AA

SAP 2009 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

-	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	126.30	2.70	341.01	(3a)
Total floor area	126.30			(4)
Dwelling volume (m ³)			341.01	(5)

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2. Ventilation rate

	nation i	aic									m ³ per h	our
							main + s heating	eondar	y + othe	r	•	
Numbe Numbe	r of chim r of open r of inter	n flues mittent fa					0 + 0 + 0 0 + 0 + 0 0		x 40 x 20 x 10		0.00 0.00 0.00	(6a) (6b) (7a)
	r of pass r of fluele						0 0		x 10 x 40		0.00 0.00	(7b) (7c)
	on due to			and flue	S				4.00		Air chan 0.00	ges per hour
Air perr Numbe Shelter Infiltration	re test, re neability r of sides factor on rate ir on rate n	s on whic	ch shelte ting she	lter facto					4.00		0.20 2.00 0.85 0.17	(17) (18) (19) (20) (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly	vaverage	e wind sp	beed from	n Table	7	•	ŀ	•		•		
5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
Wind Fa	actor										54.10	(22)
1.35	1.27	1.27	1.13	1.02	0.97	0.93	0.93	1.05	1.13	1.20	1.27	
Adjuste	d infiltrat	ion rate	(allowing	g for she	lter and	wind sp	eed)				13.53	(22a)
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
	ion : Meo e air cha			ouse ext	ract ven	tilation					2.30	(22b)
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	(25)

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<i>3. Heat losses and heat los</i> Element Gross	Ópenings	Net area	U-value	AxU	kappa-valu		
area, m ² Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	m²	A, m ² 4.470	W/m²K 1.42 (1.50)	W/K 6.33	kJ/m²K	kJ/K	(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window		2.520	1.42 (1.50)	3.57			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window		1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window		1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window		1.940	1.42 (1.50)	2.75			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) Window		1.520	1.42 (1.50)	2.15			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window		1.770	1.42 (1.50)	2.50			(27)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a)		2.060	1.42 (1.50)	2.92			(27)
Roof window Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window		0.950	1.42 (1.50)	1.34			(27)
Walls Ground floors Pitched roofs insulated betwe Party wall Internal ceiling	een rafters	50.40 126.30 63.15 37.20 63.15	0.22 0.20 0.18 0.00 0.00	11.09 25.26 11.37 0.00 0.00	17.00 75.00 9.00 70.00 9.00	856.80 9472.50 568.35 2604.00 568.35	(29) (28) (30)

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3. Heat losses and heat loss parameter														
Element	I	Gross	Ópe	enings	Net are	a U-	value	ΑxU	ka	ppa-valu	ie A x K			
		area, m ²	² m²		A, m²	W	′m²K	W/K	kJ	/m²K	kJ/K			
56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	56.27	(38)		
Heat tra	nsfer co	efficient,	W/K											
168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55	168.55			
											168.5	55 (39)		
Heat los	s param	eter (HL	P), W/m²	²K										
1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33			
HLP (av											1.3	33 (40)		
Number of days in month (Table 1a)														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
31	28	31	30	31	30	31	31	30	31	30	31			

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4. Water Assume Annual a	d occupa	ancy, N	-		oer day V	/d,avera	ge				kWh/year 2.88 102.71	(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres	per day f	or each	month							
112.98	108.87	104.77	100.66	96.55	92.44	92.44	96.55	100.66	104.77	108.87	112.98	(44)
Energy content of hot water used												
167.95	146.89	151.58	132.15	126.80	109.42	101.39	116.35	117.74	137.21	149.78	162.65	
Energy content (annual) 1619.92 Distribution loss									(45)			
25.19	22.03	22.74	19.82	19.02	16.41	15.21	17.45	17.66	20.58	22.47	24.40	(46)
Hot water cylinder loss factor (kWh/day)0.0000Volume factor0.0000Temperature factor0.0000									(50) (51) (52) (53) (55)			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net stora	age loss											
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary Primary		ss (annu	ial)			•		•			0.00	(58)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi lo	oss calcu	lated for	r each m	onth			•			•		
50.96	46.03	50.96	49.32	49.20	45.59	47.11	49.20	49.32	50.96	49.32	50.96	(61)
Total he	at requir	ed for wa	ater heat	ing calcu	lated for	r each m	onth					
218.91	192.92	202.54	181.47	176.00	155.01	148.50	165.55	167.06	188.17	199.10	213.61	(62)
Output fi	Output from water heater for each month, kWh/month											
218.91	192.92	202.54	181.47	176.00	155.01	148.50	165.55	167.06	188.17	199.10	213.61	(64)
				A/I= / !							2208.83	(64)
Heat gai 68.58	ns from 60.35	water he	ating, kt 56.27	Vh/mont 54.46	n 47.78	45.49	50.99	51.48	58.36	62.13	66.82	(65)

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5. Internal gains

		_									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains, Watts											
144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24	144.24
Lighting	gains		•			•					
27.65	24.56	19.97	15.12	11.30	9.54	10.31	13.40	17.99	22.84	26.66	28.42
Appliand	ces gains	3									
293.20	296.25	288.58	272.26	251.65	232.29	219.35	216.31	223.98	240.30	260.90	280.27
Cooking gains											
37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42	37.42
Pumps	and fans	gains		•							
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Losses	e.g. evap	oration	negative	values)							
-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39	-115.39
Water heating gains											
92.18	89.80	84.87	78.15	73.20	66.36	61.14	68.53	71.50	78.45	86.29	89.81
Total internal gains											
489.31	486.88	469.69	441.80	412.43	384.46	367.07	374.51	389.73	417.85	450.12	474.77

6. Solar gains (calculation for January)

o. Oolar gams (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 4.470 37.39		0.77	58.3714
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 2.520 37.39	0.72 x 0.70	0.77	32.9073
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.520 37.39	0.72 x 0.70	0.77	19.8489
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.520 37.39	0.72 x 0.70	0.77	19.8489
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthEast) Window	0.9 x 1.940 37.39	0.72 x 0.70	0.77	25.3334
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) Window	0.9 x 1.520 47.32	0.72 x 0.70	0.77	25.1236
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (SouthWest) Window	0.9 x 1.770 37.39	0.72 x 0.70	0.77	23.1135
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window	0.9 x 2.060 26.00	0.72 x 0.70	1.00	24.2948
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.2, hard coat (n/a) Roof window	0.9 x 0.950 26.00	0.72 x 0.70	1.00	11.2039

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7. Mean internal temperature

	Temperature during heating periods in the living area, Th1 (°C) Heating system responsiveness									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
tau	tau									
23.19	23.19 23.19 23.19 23.19 23.19 23.19 23.19 23.19 23.19 23.19 23.19									
a lua la a										

alpha												
2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	
Utilisation factor for gains for living area												
0.98	0.96	0.93	0.88	0.79	0.66	0.50	0.52	0.74	0.90	0.96	0.98	(86)
Mean in	ternal te	mperatu	re in livin	g area T	1				•			
18.96	19.18	19.57	19.94	20.37	20.67	20.82	20.81	20.57	20.04	19.35	18.97	(87)
Temperature during heating periods in rest of dwelling Th2												
19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	(88)
Utilisation factor for gains for rest of dwelling												
0.97	0.95	0.91	0.85	0.74	0.58	0.38	0.40	0.67	0.87	0.96	0.97	(89)
Mean in	ternal te	mperatu	re in the	rest of d	welling 7	2						
17.96	18.18	18.56	18.92	19.32	19.57	19.68	19.68	19.50	19.03	18.35	17.98	(90)
	rea fracti										0.2	1 (91)
	Mean internal temperature (for the whole dwelling)											
18.16	18.39	18.77	19.13	19.53	19.80	19.92	19.91	19.72	19.24	18.56	18.18	(92)
Apply ac	Apply adjustment to the mean internal temperature, where appropriate											
18.16	18.39	18.77	19.13	19.53	19.80	19.92	19.91	19.72	19.24	18.56	18.18	(93)

21.00

Dec

23.19

Nov

23.19

0.75

(85)

8. Space heating requirement

e. epac	e neathr	grequi	••••••								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.96	0.94	0.90	0.84	0.73	0.58	0.39	0.41	0.67	0.86	0.95	0.97
Useful gains											
702.21	851.88	945.56	1005.15	930.66	731.87	475.82	471.10	699.04	773.50	699.71	655.51
Monthly average external temperature											
4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90
Heat los	s rate fo	r mean i	nternal te	emperati	ure		•				
2303.0	2256.4	2016.8	1757.59	1320.37	876.55	508.78	508.02	913.89	1421.92	1948.08	2238.7
Space h	neating re	quireme	ent for ea	ch mont	h, kWh/r	nonth	•				
1190.96	943.86	797.00	541.76	289.94	-	-	-	-	482.42	898.83	1177.87
Total space heating requirement per year (kWh/year) (October to May)									6322.6		
Space heating requirement per m ² (kWh/m ² /year)								50.0			

8c. Space cooling requirement - not applicable

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9a. Energy requirements

9a. Enel	<i>9a. Energy requirements</i> kWh/year											
Fraction	of spac	eating sy e heat fro in heating	om main	system((s)				1.0000 3.80%			(202) (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space h	eating re	equireme	ent	1	1	l	1	1		I	L]	
1190.96	943.86	797.00	541.76	289.94	-	-	-	-	482.42	898.83	1177.87	(98)
Appendi	x Q - mo	onthly en	ergy sav	ed (mair	heating	system	1)	•			<u> </u>	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space h	eating fu	uel (main	heating	system	1)	•				•	·	
1269.68	1006.2	849.68	577.57	309.10	-	-	-	-	514.30	958.24	1255.73	(211)
Appendi	x Q - mo	onthly en	ergy sav	ed (mair	heating	system	2)				I	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space h	eating fu	uel (main	heating	system	2)		1				I	
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendi	x Q - mo	onthly en	ergy sav	ed (seco	ndary h	eating sy	vstem)		1	1		
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space h	eating fu	lel (seco	ndary)				1					
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water he	Water heating											
	-	equireme		1	1	1	1	1		1		
		202.54		176.00	155.01	148.50	165.55	167.06	188.17	199.10	213.61	(64)
	-	er heate									81.50	(216)
	91.46	91.02	90.38	88.74	81.50	81.50	81.50	81.50	89.99	91.30	91.68	(217)
Water he	eating fu	lel						_	-			
238.85	210.94	222.53	200.79	198.33	190.19	182.21	203.13	204.98	209.11	218.06	233.01	(219)
Space h Water he	eating fu eating fu eating fu		ndary)		an-hot						kWh/year 6740.56 0.00 2512.12	(211) (215) (219)
mechai central boiler w Total ele Electricit	central heating pump130.00boiler with a fan-assisted flue45.00Total electricity for the above, kWh/year268.19Electricity for lighting (100.00% fixed LEL)488.30									(230a) (230c) (230e) (231) (232)		
PVs 0. PVs 0. PVs 0.	Energy saving/generation technologies PVs 0.80 x 1.070 x 1073.000 x 1.000 PVs 0.80 x 0.000 x 0.000 x 0.500 PVs 0.80 x 0.000 x 0.000 x 0.500										918.488 0.000 0.000 918.488	(233)
		or genera):	ated ():								0.000 0.000	(236a) (237a)
Total de	livered e	energy fo	r all uses	6							9090.68	(238)

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10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	
Space heating, main system 1	6740.56	0.198	1334.63	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.517	0.00	(263)
Water heating	2512.12	0.198	497.40	(264)
Space and water heating			1832.03	(265)
Electricity for pumps and fans	268.19	0.517	138.65	(267)
Electricity for lighting	488.30	0.517	252.45	(268)
Electricity generated - PVs	-918.49	0.529	-485.88	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				, ,
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1737.26	(272)

Dwelling Carbon Dioxide Emission Rate (DER)

kg/m²/year 13.76 (273)

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Apartment	Target Emissions Rate	Building Emissions	% Reduction
	(TER)	Rate (BER)	
Flat 1	17.88	10.63	40.6
Flat 2	21.59	16.93	24.8
Flat 3	20.16	16.90	19.7
Flat 4	23.17	12.32	46.8
Flat 5	17.88	11.95	40.7
Flat 6	21.59	16.96	24.8
Flat 7	20.16	16.90	19.7
Flat 8	23.17	13.62	48.6
Flat 9	25.52	22.37	17.7
Flat 10	22.01	19.73	11.0
Flat 11	24.67	22.29	11.5
Flat 12	16.65	13.76	21.0
			27.2% Average

252 Finchley Road SAP Calculation Review Table