Project Information

Building type	Ground-floor flat		
Plot number	1		
Reference			
Date	16 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	65.80	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, 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			**1.670**	**1.42 (1.50)**	2.36			(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)
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	
Party 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

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)

Heat transfer coefficient, W/K

58.29	57.60	57.60	56.21	55.28	54.82	54.36	54.36	55.51	56.21	56.90	57.60	
											56.23	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											0.92	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
478.90	474.53	456.29	428.47	400.25	374.80	360.19	368.00	384.20	412.21	443.22	466.57	(73)

6. Solar gains (calculation for January)

	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 5.290 37.39	0.63 x 0.70	1.00	78.4992	
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	1.00	24.7814	
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	
Total solar gains, January				105.80	(83-1)

Solar gains

105.80	181.21	241.63	300.70	332.71	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	732.96	713.91	692.10	675.49	652.03	618.58	570.22	556.88	(84)

Lighting calculations

	Area	g	FF x Shading	
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 0.83	2.21
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 1.67	0.80	0.70 x 0.83	0.70

Lighting calculations

	Area	g	FF x Shading	
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

GL = 3.85 / 61.20 = 0.063
C1 = 0.500
C2 = 1.014
El = 293

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
20.36	20.49	20.65	20.79	20.90	20.94	20.95	20.95	20.93	20.83	20.55	20.37	(87)
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	20.13	(88)
Utilisation factor for gains for rest of dwelling												
0.95	0.92	0.86	0.77	0.61	0.42	0.26	0.26	0.49	0.76	0.92	0.96	(89)
Mean internal temperature in the rest of dwelling T2												
19.55	19.68	19.84	19.98	20.08	20.11	20.12	20.12	20.10	20.01	19.76	19.57	(90)

Living area fraction (24.90 / 61.20) 0.41 (91)
Mean internal temperature (for the 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	(92)
Apply adjustment to the mean internal temperature, where appropriate												
19.88	20.01	20.17	20.31	20.42	20.45	20.46	20.46	20.44	20.34	20.08	19.89	(93)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.95	0.92	0.87	0.78	0.63	0.44	0.28	0.29	0.51	0.77	0.92	0.95	(94)
Useful gains												
555.54	603.16	604.08	569.68	459.34	317.38	193.20	193.17	334.00	474.00	523.79	530.76	(95)
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	(96)
Heat loss rate for mean internal temperature												
896.40	864.67	769.92	652.67	481.79	320.66	193.43	193.42	340.72	536.43	744.43	863.68	(97)
Space heating requirement for each month, kWh/month												
253.59	175.73	123.39	59.76	16.71	-	-	-	-	46.45	158.86	247.69	

Total space heating requirement per year (kWh/year) (October to May) 1082.18 (98)

Space heating requirement per m² (kWh/m²/year) 17.68 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
253.59	175.73	123.39	59.76	16.71	-	-	-	-	46.45	158.86	247.69	(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)												
271.81	188.35	132.25	64.05	17.91	-	-	-	-	49.78	170.27	265.48	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1159.89	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2153.01	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	292.67	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	3073.67	(238)

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

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	0.000	0.000	0.00	(241)
Water heating				
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	292.667	11.460	33.54	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			181.28	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	0.80	(257)
SAP value	88.81	
SAP rating	**89**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**8.54**	(273)
EI value	93.41	(273a)
EI rating	**93**	(274)
EI band	**A**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Ground-floor flat		
Plot number	1		
Reference			
Date	16 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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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)

			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			0.53	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67

7.14 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**13.450**	**1.85 (2.00)**	24.91	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			33.90	0.35	11.87	(29)
Ground floors			24.90	0.25	6.22	(28)
Party wall			42.40	0.00	0.00	
Party ceiling			24.90	0.00	0.00	

Total area of external elements Sigma A, m²	74.10	(31)
Fabric heat loss, W/K	46.70	(33)
Heat capacity	11118.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	8.15	(36)
Total fabric heat loss	54.85	(37)

Ventilation heat loss calculated monthly

41.11	39.62	39.62	36.88	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	
											91.92	(39)

Heat loss parameter (HLP), W/m²K

1.57	1.54	1.54	1.50	1.47	1.46	1.45	1.45	1.48	1.50	1.52	1.54	
HLP (average)											1.50	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 86.38 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02	(44)
Energy content of hot water 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	

Energy content (annual) 1362.41 (45)

Distribution loss												
21.19	18.53	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(62)
Output from water heater for each month, kWh/month												
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)

2496.69 (64)

Heat gains from water heating, kWh/month												
124.04	110.69	119.46	111.54	112.53	105.18	105.42	109.61	107.51	115.44	116.47	122.55	(65)

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72	(72)
Total internal gains												
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57	(73)

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	19.87	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	0.9 x 1.850	0.00	0.72 x 0.70	0.77	0.0000

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 13.45	0.80	0.70 x 0.83	5.63

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.90 / 61.20) 0.41 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.88	0.73	0.53	0.34	0.36	0.67	0.90	0.98	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
1371.13	1322.98	1186.04	1014.16	755.06	501.13	296.23	296.12	529.49	823.33	1133.88	1317.24	(97)
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 (98)

Space heating requirement per m² (kWh/m²/year) 49.98 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									78.90%				(206)
Efficiency of secondary heating system									100.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
634.33	489.10	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45		(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)													
723.57	557.90	440.67	238.67	84.04	-	-	-	-	234.09	511.78	698.61		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
63.43	48.91	38.63	20.92	7.37	-	-	-	-	20.52	44.87	61.24		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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 heating fuel													
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3489.34	(211)
Space heating fuel (secondary)	305.90	(215)
Water heating fuel	3443.05	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	471.15	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7884.43	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**25.29**	(272a)
Emissions per m² for lighting	**3.25**	(272b)
Emissions per m² for pumps and fans	**1.21**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**17.88**	(273)

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

Project Information

Building type	Ground-floor flat		
Plot number	1		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	65.80	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, 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)
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)
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	
Party 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

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)

Heat transfer coefficient, W/K

58.29	57.60	57.60	56.21	55.28	54.82	54.36	54.36	55.51	56.21	56.90	57.60	
											56.23	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											0.92	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
331.81	329.25	317.29	298.55	279.77	261.59	250.13	256.13	266.04	284.97	306.54	322.63	(73)

6. Solar gains (calculation for January)

	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	0.63 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
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 Shading	
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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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
Utilisation factor for gains for living area											
0.99	0.98	0.96	0.92	0.81	0.63	0.43	0.44	0.72	0.92	0.98	0.99 (86)
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	20.15 (87)
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	20.13 (88)
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 (89)
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	19.36 (90)

Living area fraction (24.90 / 61.20) 0.41 (91)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.99	0.97	0.95	0.90	0.78	0.59	0.38	0.39	0.67	0.89	0.97	0.99 (94)
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 (95)
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 (96)
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 (97)
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 (98)

Space heating requirement per m² (kWh/m²/year) 27.41 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
353.96	265.19	208.45	119.28	43.29	-	-	-	-	98.21	243.97	345.15	(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)												
379.38	284.24	223.42	127.85	46.39	-	-	-	-	105.26	261.49	369.94	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1797.96	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2132.45	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	303.57	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	3702.08	(238)

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

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**10.63**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	2		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) Window			**1.280**	**1.42 (1.50)**	1.81			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (NorthEast) Window adjacent door			**3.380**	**1.42 (1.50)**	4.78			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door			**2.020**	**1.50**	3.03			(26)
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, m²	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	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	(38)

Heat transfer coefficient, W/K

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	(39)

Heat loss parameter (HLP), W/m²K

1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (average)											1.55	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 85.58 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 content of hot water used												
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 (45)

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	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1863.10 (64)

Heat gains from water heating, kWh/month												
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)

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

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69	(72)
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	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.280	37.39	0.76 x 0.70	0.77	17.6434
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 0.510	11.51	0.76 x 0.70	0.77	2.1641
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 0.510	11.51	0.76 x 0.70	0.77	2.1641
Window					
Window - Double-glazed, air-filled (SouthEast)	0.9 x 2.480	37.39	0.76 x 0.70	0.77	34.1842
Window					
Window - Double-glazed, air-filled (SouthEast)	0.9 x 0.680	37.39	0.76 x 0.70	0.77	9.3731
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.380	11.51	0.76 x 0.70	0.77	14.3426
Window adjacent door					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 2.480	11.51	0.76 x 0.70	0.77	10.5236
Window					
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					

Lighting calculations

	Area	g	FF x Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.75	19.88	20.14	20.40	20.68	20.85	20.91	20.91	20.78	20.45	20.00	19.76	(87)
Temperature during heating periods in rest of dwelling Th2												
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(88)
Utilisation factor for gains for rest of dwelling												
0.98	0.97	0.94	0.88	0.75	0.54	0.32	0.35	0.67	0.90	0.97	0.98	(89)
Mean internal temperature in the rest of dwelling T2												
18.55	18.68	18.93	19.18	19.43	19.55	19.58	19.58	19.51	19.23	18.80	18.57	(90)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the 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	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.12	19.24	19.50	19.75	20.02	20.16	20.21	20.20	20.11	19.81	19.37	19.13	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.94	0.89	0.77	0.58	0.38	0.41	0.70	0.90	0.97	0.98	(94)
Useful gains												
594.48	662.86	711.39	749.92	692.46	529.44	334.44	332.55	512.75	587.34	572.07	566.73	(95)
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	(96)
Heat loss rate for mean internal temperature												
1507.82	1469.60	1309.94	1140.04	858.30	573.78	341.07	340.84	599.48	929.06	1275.91	1468.02	(97)
Space heating requirement for each month, kWh/month												
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	

Total space heating requirement per year (kWh/year) (October to May) 3502.81 (98)

Space heating requirement per m² (kWh/m²/year) 52.52 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	94.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	(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)												
716.80	571.87	469.75	296.29	130.15	-	-	-	-	268.19	534.56	707.34	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of 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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3694.95	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2193.23	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	49.21	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	224.21	(231)
Electricity for lighting (100.00% fixed LEL)	307.77	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.075 x 961.000 x 1.000	826.460	
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	
	826.460	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	5593.70	(238)

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

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	0.000	0.000	0.00	(241)
Water heating				
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	307.767	11.460	35.27	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	826.460	11.460	-94.71	(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			254.79	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.07	(257)
SAP value	85.04	
SAP rating	**85**	(258)
SAP band	**B**	

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	-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/year	
CO2 emissions per m²	**15.05**	(273)
EI value	87.96	(273a)
EI rating	**88**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Ground-floor flat		
Plot number	2		
Reference			
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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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)

			Air changes per hour	
Infiltration due to chimneys, fans and flues			0.11	(8)
Pressure test, result q50		10.00		(17)
Air permeability			0.61	(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

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.70	0.66	0.66	0.58	0.53	0.51	0.48	0.48	0.55	0.58	0.62	0.66

7.02 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**14.825**	**1.85 (2.00)**	27.45	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			74.57	0.35	26.10	(29)
Ground floors			66.70	0.25	16.68	(28)
Party wall			23.80	0.00	0.00	
Party ceiling			66.70	0.00	0.00	

Total area of external elements Sigma A, m²	157.94	(31)
Fabric heat loss, W/K	73.93	(33)
Heat capacity	13622.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	17.37	(36)
Total fabric heat loss	91.30	(37)

Ventilation heat loss calculated monthly

44.32	42.75	42.75	39.86	38.14	37.34	36.57	36.57	38.55	39.86	41.26	42.75	(38)

Heat transfer coefficient, W/K

135.62	134.05	134.05	131.16	129.44	128.64	127.87	127.87	129.85	131.16	132.56	134.05	
											131.36	(39)

Heat loss parameter (HLP), W/m²K

2.03	2.01	2.01	1.97	1.94	1.93	1.92	1.92	1.95	1.97	1.99	2.01	
HLP (average)											1.97	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 90.09 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
99.09	95.49	91.89	88.28	84.68	81.08	81.08	84.68	88.28	91.89	95.49	99.09	(44)
Energy content of hot water used												
147.31	128.83	132.95	115.90	111.21	95.97	88.93	102.05	103.27	120.35	131.37	142.66	

Energy content (annual) 1420.79 (45)

Distribution loss

22.10	19.33	19.94	17.39	16.68	14.40	13.34	15.31	15.49	18.05	19.71	21.40	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)

Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss

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 heat required for water heating calculated for each month

243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(62)

Output from water heater for each month, kWh/month

243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(64)

2555.07 (64)

Heat gains from water heating, kWh/month

126.05	112.45	121.27	113.12	114.05	106.49	106.64	111.00	108.92	117.08	118.26	124.50	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
169.42	167.33	163.00	157.11	153.29	147.91	143.33	149.19	151.28	157.37	164.25	167.34	(72)
Total internal gains												
453.06	449.73	435.68	414.21	393.11	373.38	361.24	368.35	380.15	401.83	425.99	443.43	(73)

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 14.825 19.87	0.72 x 0.70	0.77	102.8993	
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	
Total solar gains, January				102.90	(83-1)

Solar gains

102.90	199.45	318.78	473.32	575.89	600.91	583.25	507.62	381.12	242.89	127.93	84.88	(83)

Total gains

555.96	649.18	754.47	887.52	969.00	974.29	944.50	875.97	761.27	644.72	553.93	528.31	(84)

Lighting calculations

	Area	g	FF x Shading	
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 0.83	6.20

GL = 6.20 / 66.70 = 0.093
C1 = 0.850
C2 = 0.960
EI = 507

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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												
3.28	3.30	3.30	3.35	3.39	3.40	3.41	3.41	3.38	3.35	3.33	3.30	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	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	0.98	0.99	(94)
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	(95)
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	(96)
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	1546.48	1792.50	(97)
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) 5104.29 (98)

Space heating requirement per m² (kWh/m²/year) 76.53 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

													kWh/year	
Fraction of heat from secondary system									0.1000					(201)
Fraction of space heat from main system(s)									0.9000					(202)
Efficiency of main heating system									78.90%					(206)
Efficiency of secondary heating system									100.00%					(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement														
975.35	783.10	663.78	421.44	200.15	-	-	-	-	391.86	723.13	945.48			(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)														
1112.57	893.27	757.17	480.73	228.31	-	-	-	-	446.99	824.86	1078.49			(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			(212)
Space heating 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 energy saved (secondary heating system)														
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00			(214)
Space heating fuel (secondary)														
97.54	78.31	66.38	42.14	20.01	-	-	-	-	39.19	72.31	94.55			(215)
Water heating														
Water heating requirement														
243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99			(64)
Efficiency of water heater													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)
Water heating fuel														
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5822.38	(211)
Space heating fuel (secondary)	510.43	(215)
Water heating fuel	3482.93	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	507.17	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	10497.91	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**31.40**	(272a)
Emissions per m² for lighting	**3.21**	(272b)
Emissions per m² 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

Project Information

Building type	Ground-floor flat		
Plot number	2		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (NorthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (NorthEast) Window adjacent door			**3.380**	**1.42 (1.50)**	4.78			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**1.280**	**1.42 (1.50)**	1.81			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door			**2.020**	**1.50**	3.03			(26)
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, m²	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	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	(38)

Heat transfer coefficient, W/K

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	(39)

Heat loss parameter (HLP), W/m²K

1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (average)											1.55	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 85.58 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 content of hot water used												
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 (45)

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	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1863.10 (64)

Heat gains from water heating, kWh/month												
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)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69	(72)
Total internal gains												
351.01	348.46	335.92	316.13	296.19	276.87	264.65	270.78	281.19	301.18	324.02	341.17	(73)

6. Solar gains (calculation for January)

	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 Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.59	19.73	20.00	20.29	20.62	20.82	20.90	20.89	20.73	20.33	19.86	19.61	(87)
Temperature during heating periods in rest of dwelling Th2												
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.99	0.97	0.92	0.81	0.61	0.37	0.40	0.75	0.94	0.99	0.99	(89)
Mean internal temperature in the rest of dwelling T2												
18.39	18.53	18.80	19.08	19.38	19.53	19.58	19.58	19.48	19.13	18.66	18.41	(90)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the whole dwelling)

18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(92)

Apply adjustment to the mean internal temperature, where appropriate

18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.97	0.92	0.82	0.65	0.44	0.47	0.78	0.94	0.99	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
1491.32	1453.83	1296.06	1129.27	852.18	571.53	340.56	340.14	594.75	917.78	1261.02	1451.80	(97)
Space heating requirement for each month, kWh/month												
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	

Total space heating requirement per year (kWh/year) (October to May) 4110.92 (98)

Space heating requirement per m² (kWh/m²/year) 61.63 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	94.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	(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)												
820.25	660.67	555.57	360.44	168.31	-	-	-	-	337.66	624.47	809.03	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4336.41	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2186.70	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	49.21	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	224.21	(231)
Electricity for lighting (100.00% fixed LEL)	307.77	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.075 x 961.000 x 1.000	826.460	
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	
	826.460	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6228.64	(238)

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**16.93**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	3		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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	
												13.53 (22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
												2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (NorthWest) Window			**1.200**	**1.42 (1.50)**	1.70			(27)
Window - Double-glazed, air-filled (NorthWest) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (NorthWest) Window			**1.370**	**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			80.12	0.22	17.87	190.00	15222.80	(29)
Ground floors			83.30	0.20	16.66	110.00	9163.00	(28)
Party wall			7.30	0.00	0.00	70.00	511.00	
Party ceiling			83.30	0.00	0.00	30.00	2499.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	71.36	(33)
Heat capacity	27395.80	(34)
Thermal mass parameter, kJ/m²K	328.88	(35)
Effect of thermal bridges	28.40	(36)
Total fabric heat loss	99.76	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											136.87	(39)

Heat loss parameter (HLP), W/m²K

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)

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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 94.11 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(44)
Energy content of hot water 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 content (annual) 1484.25 (45)

Distribution loss												
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(61)
Total heat required for water heating calculated for each month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(62)
Output from water heater for each month, kWh/month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)

2045.16 (64)

Heat gains from water heating, kWh/month												
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
337.61	341.11	332.29	313.49	289.77	267.47	252.57	249.07	257.90	276.69	300.42	322.71	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
Total internal gains												
587.03	582.67	560.31	525.88	490.55	458.78	440.50	449.40	469.41	504.07	542.59	571.36	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.200	11.51	0.76 x 0.70	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

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
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 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	
Total solar gains, January					206.77	(83-1)

Solar gains

206.77	373.30	546.21	762.58	917.29	964.90	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	1423.68	1372.68	1259.55	1103.05	943.02	794.33	745.54	(84)

Lighting calculations

	Area	g	FF x Shading	
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) 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 3.78	0.80	0.70 x 0.83	1.58
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.19	0.80	0.70 x 0.83	1.33
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.09	0.80	0.70 x 0.83	1.29
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.20	0.80	0.70 x 0.83	0.50
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.08	0.80	0.70 x 0.83	0.45
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.68	0.80	0.70 x 0.83	0.70

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.32	0.80	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
EI = 356

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (27.50 / 83.30) 0.33 (91)
Mean internal temperature (for the 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 adjustment to the mean internal temperature, where appropriate												
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)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.88	0.72	0.51	0.31	0.33	0.66	0.91	0.98	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
2005.1	1955.80	1741.02	1510.94	1125.12	736.79	423.51	423.44	774.53	1224.11	1692.10	1951.01	(97)
Space heating requirement for each month, kWh/month												
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	

Total space heating requirement per year (kWh/year) (October to May) 4274.87 (98)
Space heating requirement per m² (kWh/m²/year) 51.32 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	(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)												
970.85	732.46	547.16	287.56	86.91	-	-	-	-	289.47	702.20	965.26	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiency of water heater											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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4581.86	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2408.01	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	61.46	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	236.46	(231)
Electricity for lighting (100.00% fixed LEL)	356.13	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6759.85	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	356.134	11.460	40.81	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			296.33	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.09	(257)
SAP value	84.86	
SAP rating	**85**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**15.07**	(273)
EI value	86.89	(273a)
EI rating	**87**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year)	
Space heating, main	4581.86	1.020	4673.50	(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 - 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			**6458.01**	(272)
Primary energy kWh/m²/year			**77.53**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	3		
Reference			
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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	3	x 10	30.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.13	(8)
Pressure test, result q50		10.00		(17)
Air permeability			0.63	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.54	(21)

Infiltration rate modified for monthly wind speed

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	(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	
											13.53	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.73	0.69	0.69	0.61	0.55	0.52	0.50	0.50	0.57	0.61	0.65	0.69	
											7.28	(22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**18.975**	**1.85 (2.00)**	35.14	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			85.20	0.35	29.82	(29)
Ground floors			83.30	0.25	20.82	(28)
Party wall			7.30	0.00	0.00	
Party ceiling			83.30	0.00	0.00	

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	89.49	(33)
Heat capacity	12173.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	20.83	(36)
Total fabric heat loss	110.31	(37)

Ventilation heat loss calculated monthly

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/K

167.03	164.91	164.91	161.04	158.72	157.65	156.63	156.63	159.28	161.04	162.91	164.91	
											161.30	(39)

Heat loss parameter (HLP), W/m²K

2.01	1.98	1.98	1.93	1.91	1.89	1.88	1.88	1.91	1.93	1.96	1.98	
HLP (average)											1.94	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 99.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1562.37 (45)

Distribution loss												
24.30	21.25	21.93	19.12	18.34	15.83	14.67	16.83	17.03	19.85	21.67	23.53	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
258.32	228.69	242.53	220.68	218.63	198.76	194.13	208.55	206.79	228.68	237.69	253.21	(62)
Output from water heater for each month, kWh/month												
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)

2696.65 (64)

Heat gains from water heating, kWh/month												
130.93	116.72	125.68	116.96	117.73	109.67	109.58	114.38	112.34	121.07	122.62	129.23	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
175.98	173.69	168.92	162.45	158.24	152.32	147.29	153.74	156.03	162.73	170.30	173.70	(72)
Total internal gains												
507.30	503.52	487.15	462.07	437.24	414.20	400.14	408.07	421.96	447.27	475.47	495.99	(73)

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 18.975	19.87	0.72 x 0.70	0.77	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

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 18.97	0.80	0.70 x 0.83	7.94

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
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												
3.31	3.34	3.34	3.39	3.43	3.45	3.46	3.46	3.42	3.39	3.37	3.34	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (27.50 / 83.30) 0.33 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.96	0.91	0.80	0.62	0.40	0.43	0.75	0.93	0.98	0.99	(94)
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	(95)
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	(96)
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	(97)
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) 6266.27 (98)

Space heating requirement per m² (kWh/m²/year) 75.23 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									78.90%				(206)
Efficiency of secondary heating system									100.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1207.15	965.42	813.15	507.90	233.27	-	-	-	-	477.37	892.33	1169.69		(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)													
1376.98	1101.24	927.55	579.35	266.08	-	-	-	-	544.52	1017.86	1334.25		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
120.72	96.54	81.32	50.79	23.33	-	-	-	-	47.74	89.23	116.97		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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	kWh/year	
Space heating fuel used, main system 1	7147.83	(211)
Space heating fuel (secondary)	626.63	(215)
Water heating fuel	3665.65	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	605.43	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	12220.54	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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 m² for space and water heating	**29.24**	(272a)
Emissions per m² for lighting	**3.07**	(272b)
Emissions per m² for pumps and fans	**0.89**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**20.16**	(273)

= [(29.2449 x 1.0000 x 1.0206) + (3.0671 x 1.2251)] x 0.6000

Project Information

Building type	Ground-floor flat		
Plot number	3		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) 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)
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			80.12	0.22	17.87	190.00	15222.80	(29)
Ground floors			83.30	0.20	16.66	110.00	9163.00	(28)
Party wall			7.30	0.00	0.00	70.00	511.00	
Party ceiling			83.30	0.00	0.00	30.00	2499.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	71.36	(33)
Heat capacity	27395.80	(34)
Thermal mass parameter, kJ/m²K	328.88	(35)
Effect of thermal bridges	28.40	(36)
Total fabric heat loss	99.76	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											136.87	(39)

Heat loss parameter (HLP), W/m²K

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)

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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 94.11 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(44)
Energy content of hot water 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 content (annual) 1484.25 (45)

Distribution loss												
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(61)
Total heat required for water heating calculated for each month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(62)
Output from water heater for each month, kWh/month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)

2045.16 (64)

Heat gains from water heating, kWh/month												
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
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	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
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
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

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
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 (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 0.680 11.51	0.76 x 0.70	0.54	2.0236
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

	Area	g	FF x Shading	
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
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 1.32	0.80	0.70 x 0.83	0.55
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.68	0.80	0.70 x 0.83	0.70
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.08	0.80	0.70 x 0.83	0.45
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.20	0.80	0.70 x 0.83	0.50
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.09	0.80	0.70 x 0.83	1.29
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.19	0.80	0.70 x 0.83	1.33
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 3.78	0.80	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

Lighting calculations

	Area	g	FF x Shading	
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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.90	20.05	20.29	20.55	20.80	20.91	20.94	20.94	20.85	20.54	20.12	19.91	(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)
Utilisation factor for gains for rest of dwelling												
1.00	0.99	0.98	0.92	0.76	0.52	0.30	0.33	0.69	0.95	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
18.61	18.75	19.00	19.24	19.45	19.52	19.53	19.53	19.49	19.24	18.83	18.62	(90)

Living area fraction (27.50 / 83.30) 0.33 (91)

Mean internal temperature (for the 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	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.97	0.92	0.77	0.56	0.34	0.38	0.73	0.95	0.99	1.00	(94)
Useful gains												
608.24	768.08	908.47	1036.10	973.94	712.05	421.61	420.58	694.88	745.70	620.02	564.46	(95)
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	(96)
Heat loss rate for mean internal temperature												
1989.54	1940.90	1728.16	1501.95	1121.46	736.03	423.42	423.29	771.96	1213.96	1677.98	1935.73	(97)
Space heating requirement for each month, kWh/month												
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) 5001.16 (98)

Space heating requirement per m² (kWh/m²/year) 60.04 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1027.68	788.14	609.85	335.41	109.76	-	-	-	-	348.38	761.73	1020.22	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1101.48	844.73	653.64	359.49	117.64	-	-	-	-	373.40	816.43	1093.49	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiency of water heater												80.20 (216)
88.45	88.23	87.70	86.68	84.01	80.20	80.20	80.20	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	226.04	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5360.30	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2400.69	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	61.46	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	236.46	(231)
Electricity for lighting (100.00% fixed LEL)	356.13	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7530.97	(238)

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

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	5360.30	0.198	1061.34	(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	2400.69	0.198	475.34	(264)
Space and water heating			1536.68	(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			1407.89	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**16.90**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	4		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	64.40	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) Window			**0.340**	**1.42 (1.50)**	0.48			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.140**	**1.42 (1.50)**	3.03			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.460**	**1.42 (1.50)**	3.48			(27)
Full glazed door - Double-glazed, air-filled (SouthWest) Door			**2.020**	**1.50**	3.03			(26)
Walls			36.60	0.22	8.16	190.00	6954.00	(29)
Ground floors			41.74	0.20	8.35	110.00	4591.40	(28)
Party wall			30.50	0.00	0.00	70.00	2135.00	
Party ceiling			41.74	0.00	0.00	100.00	4174.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	28.26	(33)
Heat capacity	17854.40	(34)
Thermal mass parameter, kJ/m²K	427.75	(35)
Effect of thermal bridges	12.98	(36)
Total fabric heat loss	41.23	(37)

Ventilation heat loss calculated monthly

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)

Heat transfer coefficient, W/K

56.39	55.92	55.92	54.97	54.34	54.02	53.70	53.70	54.49	54.97	55.44	55.92	
											54.98	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.32	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 68.72 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 of hot water used												
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 content (annual) 1083.76 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1495.94 (64)

Heat gains from water heating, kWh/month												
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
187.96	189.91	185.00	174.53	161.32	148.91	140.62	138.67	143.58	154.04	167.25	179.67	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57	(72)
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	(73)

6. Solar gains (calculation for January)

	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	(83-1)

Solar gains

112.75	192.21	253.98	312.10	341.80	346.95	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	634.77	617.01	600.87	575.25	534.13	474.13	452.43	(84)

Lighting calculations

	Area	g	FF x Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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 factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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 factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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 area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.87	19.99	20.12	20.24	20.32	20.34	20.34	20.34	20.33	20.26	20.03	19.88	(92)

Apply adjustment to the mean internal temperature, where appropriate

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.87	0.70	0.49	0.30	0.31	0.57	0.86	0.98	0.99	(94)
Useful gains												
474.25	542.75	569.51	557.50	454.39	309.02	184.88	184.88	325.93	461.12	465.15	449.47	(95)
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	(96)
Heat loss rate for mean internal temperature												
866.82	837.99	744.92	634.48	468.37	309.98	184.90	184.90	328.66	520.13	722.61	837.70	(97)
Space heating requirement for each month, kWh/month												
292.08	198.40	130.50	55.43	10.40	-	-	-	-	43.90	185.37	288.84	

Total space heating requirement per year (kWh/year) (October to May) 1204.92 (98)

Space heating requirement per m² (kWh/m²/year) 28.87 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(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	185.37	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	0.00	(210)
Space heating fuel (main heating system 1)												
313.05	212.65	139.87	59.41	11.15	-	-	-	-	47.05	198.68	309.59	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	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	(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	(214)
Space heating fuel (secondary)												
0.00	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	136.13	147.34	(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	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	158.79	170.10	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1291.45	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	1795.27	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840)	107.79	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	282.79	(231)
Electricity for lighting (100.00% fixed LEL)	210.31	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.075 x 961.000 x 1.000	826.460	
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	
	826.460	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	2753.37	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	210.313	11.460	24.10	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	826.460	11.460	-94.71	(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			163.49	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	0.89	(257)
SAP value	87.64	
SAP rating	**88**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**10.28**	(273)
EI value	93.37	(273a)
EI rating	**93**	(274)
EI band	**A**	

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

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/m²/year			**52.11**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	4		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.18	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.68	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.58	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.78	0.73	0.73	0.65	0.59	0.56	0.53	0.53	0.60	0.65	0.69	0.73

7.79 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**8.585**	**1.85 (2.00)**	15.90	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			34.34	0.35	12.02	(29)
Ground floors			41.74	0.25	10.44	(28)
Party wall			30.50	0.00	0.00	
Party ceiling			41.74	0.00	0.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	42.05	(33)
Heat capacity	10900.40	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	9.52	(36)
Total fabric heat loss	51.57	(37)

Ventilation heat loss calculated monthly

29.83	28.62	28.62	26.40	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	77.97	76.64	76.03	75.44	75.44	76.96	77.97	79.05	80.19	
											78.12	(39)

Heat loss parameter (HLP), W/m²K

1.95	1.92	1.92	1.87	1.84	1.82	1.81	1.81	1.84	1.87	1.89	1.92	
HLP (average)											1.87	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 72.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water 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	(44)
Energy content of hot water used												
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 content (annual) 1140.80 (45)

Distribution loss												
17.74	15.52	16.01	13.96	13.39	11.56	10.71	12.29	12.44	14.49	15.82	17.18	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(62)
Output from water heater for each month, kWh/month												
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(64)

2275.08 (64)

Heat gains from water heating, kWh/month												
116.40	104.01	112.56	105.53	106.76	100.20	100.81	104.31	102.15	109.20	109.66	115.16	(65)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
156.45	154.77	151.29	146.57	143.50	139.17	135.50	140.21	141.88	146.77	152.30	154.78	(72)
Total internal gains												
356.35	353.84	343.89	328.78	314.22	300.36	291.66	297.20	305.35	320.62	337.64	349.66	(73)

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 8.585 19.87	0.72 x 0.70	0.77	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

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 8.59	0.80	0.70 x 0.83	3.59

GL = 3.59 / 41.74 = 0.086
C1 = 0.850
C2 = 0.964
El = 339

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.94	0.88	0.77	0.59	0.38	0.40	0.70	0.90	0.97	0.98	(94)
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	(95)
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	(96)
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	(97)
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) 2755.31 (98)

Space heating requirement per m² (kWh/m²/year) 66.01 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system												0.1000	(201)
Fraction of space heat from main system(s)												0.9000	(202)
Efficiency of main heating system												78.90%	(206)
Efficiency of secondary heating system												100.00%	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67		(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)													
616.91	490.48	409.72	250.66	110.71	-	-	-	-	226.16	444.38	593.93		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
54.08	43.00	35.92	21.97	9.71	-	-	-	-	19.83	38.96	52.07		(215)
Water heating													
Water heating requirement													
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88		(64)
Efficiency of water heater												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)
Water heating fuel													
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3142.94	(211)
Space heating fuel (secondary)	275.53	(215)
Water heating fuel	3135.33	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	338.54	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7067.34	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**33.74**	(272a)
Emissions per m² for lighting	**3.42**	(272b)
Emissions per m² for pumps and fans	**1.77**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**23.17**	(273)

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

Project Information

Building type	Ground-floor flat		
Plot number	4		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	64.40	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (SouthWest) Window			**2.460**	**1.42 (1.50)**	3.48			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.140**	**1.42 (1.50)**	3.03			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.340**	**1.42 (1.50)**	0.48			(27)
Full glazed door - Double-glazed, air-filled (SouthWest) Door			**2.020**	**1.50**	3.03			(26)
Walls			36.60	0.22	8.16	190.00	6954.00	(29)
Ground floors			41.74	0.20	8.35	110.00	4591.40	(28)
Party wall			30.50	0.00	0.00	70.00	2135.00	
Party ceiling			41.74	0.00	0.00	100.00	4174.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	28.26	(33)
Heat capacity	17854.40	(34)
Thermal mass parameter, kJ/m²K	427.75	(35)
Effect of thermal bridges	12.98	(36)
Total fabric heat loss	41.23	(37)

Ventilation heat loss calculated monthly

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)

Heat transfer coefficient, W/K

56.39	55.92	55.92	54.97	54.34	54.02	53.70	53.70	54.49	54.97	55.44	55.92	
											54.98	(39)

Heat loss parameter (HLP), W/m²K

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 (average) 1.32 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 68.72 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 of hot water used												
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 content (annual) 1083.76 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1495.94 (64)

Heat gains from water heating, kWh/month												
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57	(72)
Total internal gains												
255.80	253.71	244.67	230.61	216.73	203.07	194.36	199.33	206.65	220.87	237.09	248.99	(73)

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

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.46	0.80	0.70 x 0.83	1.03
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.14	0.80	0.70 x 0.83	0.90

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.61	0.80	0.70 x 0.83	0.26
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.61	0.80	0.70 x 0.83	0.26
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.34	0.80	0.70 x 0.83	0.14

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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 factor for gains for living area												
1.00	1.00	0.98	0.95	0.83	0.62	0.41	0.43	0.72	0.95	1.00	1.00	(86)
Mean internal temperature in living area T1												
20.37	20.48	20.64	20.79	20.92	20.96	20.96	20.96	20.95	20.81	20.53	20.37	(87)
Temperature during heating periods in rest of dwelling Th2												
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 factor for gains for rest of dwelling												
1.00	0.99	0.98	0.92	0.75	0.51	0.30	0.31	0.61	0.92	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
19.24	19.37	19.52	19.67	19.78	19.81	19.82	19.82	19.80	19.69	19.42	19.26	(90)

Living area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.76	19.88	20.03	20.19	20.30	20.34	20.34	20.34	20.33	20.21	19.93	19.77	(92)

Apply adjustment to the mean internal temperature, where appropriate

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)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation 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	(94)
Useful gains												
367.93	443.13	487.54	505.20	439.16	307.59	184.84	184.82	321.47	410.31	370.40	344.88	(95)
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	(96)
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	(97)
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) 1618.70 (98)
Space heating requirement per m² (kWh/m²/year) 38.78 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
366.45	261.36	187.85	90.87	21.07	-	-	-	-	79.48	249.56	362.04	(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)												
392.77	280.13	201.34	97.40	22.58	-	-	-	-	85.19	267.48	388.04	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	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	136.13	147.34	(64)
Efficiency of water heater												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 heating fuel												
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	kWh/year	
Space heating fuel used, main system 1	1734.94	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	1783.62	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840)	107.79	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	282.79	(231)
Electricity for lighting (100.00% fixed LEL)	210.31	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.075 x 961.000 x 1.000	826.460	
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	
	826.460	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	3185.21	(238)

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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**12.32**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	5		
Reference			
Date	16 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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	
												13.53 (22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
												2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, 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)
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)
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	
Party 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

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 transfer coefficient, 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	
											63.72	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.04	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
478.90	474.53	456.29	428.47	400.25	374.80	360.19	368.00	384.20	412.21	443.22	466.57	(73)

6. Solar gains (calculation for January)

	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	0.63 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	
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	1.00	24.7814	
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	1.00	78.4992	
Total solar gains, January				105.80	(83-1)

Solar gains

105.80	181.21	241.63	300.70	332.71	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	732.96	713.91	692.10	675.49	652.03	618.58	570.22	556.88	(84)

Lighting calculations

	Area	g	FF x Shading	
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

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window	0.9 x 1.67	0.80	0.70 x 0.83	0.70
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 0.83	2.21

GL = 3.85 / 61.20 = 0.063
C1 = 0.500
C2 = 1.014
El = 293

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.90 / 61.20) 0.41 (91)
Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.96	0.93	0.88	0.82	0.68	0.50	0.32	0.33	0.57	0.80	0.93	0.96	(94)
Useful gains												
558.42	609.87	616.79	595.60	500.12	357.48	220.42	220.31	369.26	496.91	530.37	533.62	(95)
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	(96)
Heat loss rate for mean internal temperature												
970.07	945.97	842.52	730.62	548.11	367.07	221.38	221.37	385.52	599.94	822.86	944.61	(97)
Space heating requirement for each month, kWh/month												
306.26	225.86	167.94	97.22	35.70	-	-	-	-	76.66	210.60	305.78	

Total space heating requirement per year (kWh/year) (October to May) 1426.02 (98)

Space heating requirement per m² (kWh/m²/year) 23.30 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main heating system 93.30% (206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
306.26	225.86	167.94	97.22	35.70	-	-	-	-	76.66	210.60	305.78	(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)												
328.26	242.08	180.00	104.20	38.27	-	-	-	-	82.16	225.72	327.74	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1528.42	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2139.71	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	292.67	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	3428.90	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	292.667	11.460	33.54	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			192.30	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	0.85	(257)
SAP value	88.13	
SAP rating	**88**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**9.69**	(273)
EI value	92.52	(273a)
EI rating	**93**	(274)
EI band	**A**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Ground-floor flat		
Plot number	5		
Reference			
Date	16 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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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)

			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			0.53	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67

7.14 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**13.450**	**1.85 (2.00)**	24.91	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			33.90	0.35	11.86	(29)
Ground floors			24.90	0.25	6.22	(28)
Party wall			42.40	0.00	0.00	
Party ceiling			24.90	0.00	0.00	

Total area of external elements Sigma A, m²	74.10	(31)
Fabric heat loss, W/K	46.70	(33)
Heat capacity	11118.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	8.15	(36)
Total fabric heat loss	54.85	(37)

Ventilation heat loss calculated monthly

41.11	39.62	39.62	36.88	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	
											91.92	(39)

Heat loss parameter (HLP), W/m²K

1.57	1.54	1.54	1.50	1.47	1.46	1.45	1.45	1.48	1.50	1.52	1.54	
HLP (average)											1.50	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 86.38 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02	(44)
Energy content of hot water 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	

Energy content (annual) 1362.41 (45)

Distribution loss												
21.19	18.53	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(62)
Output from water heater for each month, kWh/month												
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)

2496.69 (64)

Heat gains from water heating, kWh/month												
124.04	110.69	119.46	111.54	112.53	105.18	105.42	109.61	107.51	115.44	116.47	122.55	(65)

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72	(72)
Total internal gains												
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57	(73)

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	19.87	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	0.9 x 1.850	0.00	0.72 x 0.70	0.77	0.0000

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 13.45	0.80	0.70 x 0.83	5.63

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.90 / 61.20) 0.41 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.88	0.73	0.53	0.34	0.36	0.67	0.90	0.98	0.99	(94)
Useful gains												
518.53	595.16	666.79	723.56	656.03	481.06	294.15	293.40	478.01	547.50	510.75	494.05	(95)
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	(96)
Heat loss rate for mean internal temperature												
1371.13	1322.97	1186.03	1014.16	755.06	501.13	296.23	296.12	529.49	823.33	1133.88	1317.23	(97)
Space heating requirement for each month, kWh/month												
634.33	489.09	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45	

Total space heating requirement per year (kWh/year) (October to May) 3058.97 (98)

Space heating requirement per m² (kWh/m²/year) 49.98 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system												0.1000	(201)
Fraction of space heat from main system(s)												0.9000	(202)
Efficiency of main heating system												78.90%	(206)
Efficiency of secondary heating system												100.00%	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
634.33	489.09	386.32	209.23	73.68	-	-	-	-	205.22	448.66	612.45		(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)													
723.57	557.90	440.66	238.67	84.04	-	-	-	-	234.09	511.78	698.61		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
63.43	48.91	38.63	20.92	7.37	-	-	-	-	20.52	44.87	61.24		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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 heating fuel													
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3489.31	(211)
Space heating fuel (secondary)	305.90	(215)
Water heating fuel	3443.05	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	471.15	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7884.41	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**25.29**	(272a)
Emissions per m² for lighting	**3.25**	(272b)
Emissions per m² for pumps and fans	**1.21**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**17.88**	(273)

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

Project Information

Building type	Ground-floor flat		
Plot number	5		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, 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			**1.670**	**1.42 (1.50)**	2.36			(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)
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	
Party 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

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 transfer coefficient, 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	
											63.72	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.04	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
331.81	329.25	317.29	298.55	279.77	261.59	250.13	256.13	266.04	284.97	306.54	322.63	(73)

6. Solar gains (calculation for January)

	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 5.290 37.39	0.63 x 0.70	0.77	60.4444
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 (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

Lighting calculations

	Area	g	FF x Shading	
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
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 (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

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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.90 / 61.20) 0.41 (91)

Mean internal temperature (for the whole dwelling)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.91	0.82	0.64	0.43	0.44	0.72	0.91	0.98	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
956.07	931.82	829.89	720.60	542.76	365.46	221.14	221.10	382.98	591.42	810.26	931.03	(97)
Space heating requirement for each month, kWh/month												
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) 2068.23 (98)

Space heating requirement per m² (kWh/m²/year) 33.79 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
407.71	318.07	258.89	167.38	75.00	-	-	-	-	138.26	298.64	404.27	(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)												
436.99	340.91	277.48	179.40	80.39	-	-	-	-	148.19	320.08	433.30	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
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)
Efficiency of water heater											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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	2216.75	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2121.95	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	303.57	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	4110.37	(238)

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**11.95**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	6		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (NorthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (NorthEast) Window adjacent door			**3.380**	**1.42 (1.50)**	4.78			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**1.280**	**1.42 (1.50)**	1.81			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door			**2.020**	**1.50**	3.03			(26)
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, m²	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	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	(38)

Heat transfer coefficient, W/K

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	(39)

Heat loss parameter (HLP), W/m²K

1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (average)											1.55	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 85.58 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 content of hot water used												
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 (45)

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	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1863.10 (64)

Heat gains from water heating, kWh/month												
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)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69	(72)
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	(73)

6. Solar gains (calculation for January)

	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 Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.75	19.88	20.14	20.40	20.68	20.85	20.91	20.91	20.78	20.45	20.00	19.76	(87)
Temperature during heating periods in rest of dwelling Th2												
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(88)
Utilisation factor for gains for rest of dwelling												
0.98	0.97	0.94	0.88	0.75	0.54	0.32	0.35	0.67	0.90	0.97	0.98	(89)
Mean internal temperature in the rest of dwelling T2												
18.55	18.68	18.93	19.18	19.43	19.55	19.58	19.58	19.51	19.23	18.80	18.57	(90)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the 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	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.12	19.24	19.50	19.75	20.02	20.16	20.21	20.20	20.11	19.81	19.37	19.13	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.94	0.89	0.77	0.58	0.38	0.41	0.70	0.90	0.97	0.98	(94)
Useful gains												
594.48	662.86	711.39	749.92	692.46	529.44	334.44	332.55	512.75	587.34	572.07	566.73	(95)
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	(96)
Heat loss rate for mean internal temperature												
1507.82	1469.60	1309.94	1140.04	858.30	573.78	341.07	340.84	599.48	929.06	1275.91	1468.02	(97)
Space heating requirement for each month, kWh/month												
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	

Total space heating requirement per year (kWh/year) (October to May) 3502.81 (98)

Space heating requirement per m² (kWh/m²/year) 52.52 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main heating system 94.80% (206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
679.53	542.13	445.32	280.89	123.38	-	-	-	-	254.24	506.77	670.55	(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)												
716.80	571.87	469.75	296.29	130.15	-	-	-	-	268.19	534.56	707.34	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of 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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3694.95	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2193.23	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	49.21	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	224.21	(231)
Electricity for lighting (100.00% fixed LEL)	307.77	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	5597.55	(238)

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

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	0.000	0.000	0.00	(241)
Water heating				
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	307.767	11.460	35.27	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			255.23	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.07	(257)
SAP value	85.02	
SAP rating	**85**	(258)
SAP band	**B**	

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/year	
CO2 emissions per m²	**15.08**	(273)
EI value	87.93	(273a)
EI rating	**88**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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	-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)

Project Information

Building type	Ground-floor flat		
Plot number	6		
Reference			
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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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)

			Air changes per hour	
Infiltration due to chimneys, fans and flues			0.11	(8)
Pressure test, result q50		10.00		(17)
Air permeability			0.61	(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

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.70	0.66	0.66	0.58	0.53	0.51	0.48	0.48	0.55	0.58	0.62	0.66

7.02 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**14.825**	**1.85 (2.00)**	27.45	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			74.57	0.35	26.10	(29)
Ground floors			66.70	0.25	16.68	(28)
Party wall			23.80	0.00	0.00	
Party ceiling			66.70	0.00	0.00	

Total area of external elements Sigma A, m²	157.94	(31)
Fabric heat loss, W/K	73.93	(33)
Heat capacity	13622.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	17.37	(36)
Total fabric heat loss	91.30	(37)

Ventilation heat loss calculated monthly

44.32	42.75	42.75	39.86	38.14	37.34	36.57	36.57	38.55	39.86	41.26	42.75	(38)

Heat transfer coefficient, W/K

135.62	134.05	134.05	131.16	129.44	128.64	127.87	127.87	129.85	131.16	132.56	134.05	
											131.36	(39)

Heat loss parameter (HLP), W/m²K

2.03	2.01	2.01	1.97	1.94	1.93	1.92	1.92	1.95	1.97	1.99	2.01	
HLP (average)											1.97	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 90.09 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
99.09	95.49	91.89	88.28	84.68	81.08	81.08	84.68	88.28	91.89	95.49	99.09	(44)
Energy content of hot water used												
147.31	128.83	132.95	115.90	111.21	95.97	88.93	102.05	103.27	120.35	131.37	142.66	

Energy content (annual) 1420.79 (45)

Distribution loss

22.10	19.33	19.94	17.39	16.68	14.40	13.34	15.31	15.49	18.05	19.71	21.40	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)

Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss

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 heat required for water heating calculated for each month

243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(62)

Output from water heater for each month, kWh/month

243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99	(64)

2555.07 (64)

Heat gains from water heating, kWh/month

126.05	112.45	121.27	113.12	114.05	106.49	106.64	111.00	108.92	117.08	118.26	124.50	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
169.42	167.33	163.00	157.11	153.29	147.91	143.33	149.19	151.28	157.37	164.25	167.34	(72)
Total internal gains												
453.06	449.73	435.68	414.21	393.11	373.38	361.24	368.35	380.15	401.83	425.99	443.43	(73)

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 14.825 19.87	0.72 x 0.70	0.77	102.8993	
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	
Total solar gains, January				102.90	(83-1)

Solar gains

102.90	199.45	318.78	473.32	575.89	600.91	583.25	507.62	381.12	242.89	127.93	84.88	(83)

Total gains

555.96	649.18	754.47	887.52	969.00	974.29	944.50	875.97	761.27	644.72	553.93	528.31	(84)

Lighting calculations

	Area	g	FF x Shading	
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 0.83	6.20

GL = 6.20 / 66.70 = 0.093
C1 = 0.850
C2 = 0.960
EI = 507

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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												
3.28	3.30	3.30	3.35	3.39	3.40	3.41	3.41	3.38	3.35	3.33	3.30	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	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	0.98	0.99	(94)
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	(95)
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	(96)
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	1546.48	1792.50	(97)
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) 5104.29 (98)

Space heating requirement per m² (kWh/m²/year) 76.53 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

													kWh/year	
Fraction of heat from secondary system									0.1000					(201)
Fraction of space heat from main system(s)									0.9000					(202)
Efficiency of main heating system									78.90%					(206)
Efficiency of secondary heating system									100.00%					(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement														
975.35	783.10	663.78	421.44	200.15	-	-	-	-	391.86	723.13	945.48			(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)														
1112.57	893.27	757.17	480.73	228.31	-	-	-	-	446.99	824.86	1078.49			(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			(212)
Space heating 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 energy saved (secondary heating system)														
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00			(214)
Space heating fuel (secondary)														
97.54	78.31	66.38	42.14	20.01	-	-	-	-	39.19	72.31	94.55			(215)
Water heating														
Water heating requirement														
243.64	215.85	229.28	209.13	207.55	189.20	185.27	198.38	196.50	216.68	224.60	238.99			(64)
Efficiency of water heater													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)
Water heating fuel														
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5822.38	(211)
Space heating fuel (secondary)	510.43	(215)
Water heating fuel	3482.93	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	507.17	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	10497.91	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**31.40**	(272a)
Emissions per m² for lighting	**3.21**	(272b)
Emissions per m² 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

Project Information

Building type	Ground-floor flat		
Plot number	6		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) Window			**1.280**	**1.42 (1.50)**	1.81			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (NorthEast) Window adjacent door			**3.380**	**1.42 (1.50)**	4.78			(27)
Window - Double-glazed, air-filled (NorthEast) Window			**2.480**	**1.42 (1.50)**	3.51			(27)
Full glazed door - Double-glazed, air-filled (NorthEast) Door			**2.020**	**1.50**	3.03			(26)
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, m²	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	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	(38)

Heat transfer coefficient, W/K

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	(39)

Heat loss parameter (HLP), W/m²K

1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
HLP (average)											1.55	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.16 (42)

Annual average hot water usage in litres per day Vd,average 85.58 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 content of hot water used												
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 (45)

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	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1863.10 (64)

Heat gains from water heating, kWh/month												
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)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
189.48	191.44	186.49	175.94	162.62	150.11	141.75	139.78	144.74	155.29	168.60	181.12	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
78.66	76.09	71.39	65.21	60.99	55.29	50.94	57.10	59.67	66.04	73.17	76.69	(72)
Total internal gains												
351.01	348.46	335.92	316.13	296.19	276.87	264.65	270.78	281.19	301.18	324.02	341.17	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (SouthEast)	0.9 x 1.280	37.39	0.76 x 0.70	0.77	17.6434
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 0.510	11.51	0.76 x 0.70	0.77	2.1641
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 0.510	11.51	0.76 x 0.70	0.77	2.1641
Window					
Window - Double-glazed, air-filled (SouthEast)	0.9 x 2.480	37.39	0.76 x 0.70	0.77	34.1842
Window					
Window - Double-glazed, air-filled (SouthEast)	0.9 x 0.680	37.39	0.76 x 0.70	0.77	9.3731
Window					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 3.380	11.51	0.76 x 0.70	0.77	14.3426
Window adjacent door					
Window - Double-glazed, air-filled (NorthEast)	0.9 x 2.480	11.51	0.76 x 0.70	0.77	10.5236
Window					
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					

Lighting calculations

	Area	g	FF x Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.59	19.73	20.00	20.29	20.62	20.82	20.90	20.89	20.73	20.33	19.86	19.61	(87)
Temperature during heating periods in rest of dwelling Th2												
19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	19.66	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.99	0.97	0.92	0.81	0.61	0.37	0.40	0.75	0.94	0.99	0.99	(89)
Mean internal temperature in the rest of dwelling T2												
18.39	18.53	18.80	19.08	19.38	19.53	19.58	19.58	19.48	19.13	18.66	18.41	(90)

Living area fraction (31.40 / 66.70) 0.47 (91)

Mean internal temperature (for the whole dwelling)

18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(92)

Apply adjustment to the mean internal temperature, where appropriate

18.96	19.09	19.36	19.65	19.96	20.14	20.20	20.20	20.06	19.70	19.22	18.97	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.97	0.92	0.82	0.65	0.44	0.47	0.78	0.94	0.99	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
1491.32	1453.83	1296.06	1129.27	852.18	571.53	340.56	340.14	594.75	917.78	1261.02	1451.80	(97)
Space heating requirement for each month, kWh/month												
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	

Total space heating requirement per year (kWh/year) (October to May) 4110.92 (98)

Space heating requirement per m² (kWh/m²/year) 61.63 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	94.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
777.60	626.32	526.68	341.70	159.56	-	-	-	-	320.10	592.00	766.96	(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)												
820.25	660.67	555.57	360.44	168.31	-	-	-	-	337.66	624.47	809.03	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4336.41	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2186.70	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	49.21	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	224.21	(231)
Electricity for lighting (100.00% fixed LEL)	307.77	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6232.48	(238)

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

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	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	-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			1131.45	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**16.96**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	7		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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	
												13.53 (22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
												2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) 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)
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			80.12	0.22	17.87	190.00	15222.80	(29)
Ground floors			83.30	0.20	16.66	110.00	9163.00	(28)
Party wall			7.30	0.00	0.00	70.00	511.00	
Party ceiling			83.30	0.00	0.00	30.00	2499.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	71.36	(33)
Heat capacity	27395.80	(34)
Thermal mass parameter, kJ/m²K	328.88	(35)
Effect of thermal bridges	28.40	(36)
Total fabric heat loss	99.76	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											136.87	(39)

Heat loss parameter (HLP), W/m²K

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)

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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 94.11 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(44)
Energy content of hot water 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 content (annual) 1484.25 (45)

Distribution loss												
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(61)
Total heat required for water heating calculated for each month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(62)
Output from water heater for each month, kWh/month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)

2045.16 (64)

Heat gains from water heating, kWh/month												
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
337.61	341.11	332.29	313.49	289.77	267.47	252.57	249.07	257.90	276.69	300.42	322.71	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
Total internal gains												
587.03	582.67	560.31	525.88	490.55	458.78	440.50	449.40	469.41	504.07	542.59	571.36	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
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
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

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
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 (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 0.680	11.51	0.76 x 0.70	0.54	2.0236	
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	
Total solar gains, January					206.77	(83-1)

Solar gains

206.77	373.30	546.21	762.58	917.29	964.90	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	1423.68	1372.68	1259.55	1103.05	943.02	794.33	745.54	(84)

Lighting calculations

	Area	g	FF x Shading	
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
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 1.32	0.80	0.70 x 0.83	0.55
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.68	0.80	0.70 x 0.83	0.70
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.08	0.80	0.70 x 0.83	0.45
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.20	0.80	0.70 x 0.83	0.50
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.09	0.80	0.70 x 0.83	1.29
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.19	0.80	0.70 x 0.83	1.33

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 3.78	0.80	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) 21.00 (85)
Heating system responsiveness 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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (27.50 / 83.30) 0.33 (91)
Mean internal temperature (for the 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 adjustment to the mean internal temperature, where appropriate												
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)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.88	0.72	0.51	0.31	0.33	0.66	0.91	0.98	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
2005.1	1955.80	1741.02	1510.94	1125.12	736.79	423.51	423.44	774.53	1224.11	1692.10	1951.01	(97)
Space heating requirement for each month, kWh/month												
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	

Total space heating requirement per year (kWh/year) (October to May) 4274.87 (98)
Space heating requirement per m² (kWh/m²/year) 51.32 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
905.80	683.38	510.50	268.29	81.09	-	-	-	-	270.08	655.15	900.59	(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)												
970.85	732.46	547.16	287.56	86.91	-	-	-	-	289.47	702.20	965.26	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiency of water heater											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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4581.86	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2408.01	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	61.46	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	236.46	(231)
Electricity for lighting (100.00% fixed LEL)	356.13	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6759.85	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	356.134	11.460	40.81	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			296.33	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.09	(257)
SAP value	84.86	
SAP rating	**85**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**15.07**	(273)
EI value	86.89	(273a)
EI rating	**87**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year)	
Space heating, main	4581.86	1.020	4673.50	(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 - 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			**6458.01**	(272)
Primary energy kWh/m²/year			**77.53**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	7		
Reference			
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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	3	x 10	30.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.13	(8)
Pressure test, result q50		10.00		(17)
Air permeability			0.63	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.54	(21)

Infiltration rate modified for monthly wind speed

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	(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	
											13.53	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.73	0.69	0.69	0.61	0.55	0.52	0.50	0.50	0.57	0.61	0.65	0.69	
											7.28	(22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**18.975**	**1.85 (2.00)**	35.14	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			85.20	0.35	29.82	(29)
Ground floors			83.30	0.25	20.82	(28)
Party wall			7.30	0.00	0.00	
Party ceiling			83.30	0.00	0.00	

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	89.49	(33)
Heat capacity	12173.00	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	20.83	(36)
Total fabric heat loss	110.31	(37)

Ventilation heat loss calculated monthly

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/K

167.03	164.91	164.91	161.04	158.72	157.65	156.63	156.63	159.28	161.04	162.91	164.91	
											161.30	(39)

Heat loss parameter (HLP), W/m²K

2.01	1.98	1.98	1.93	1.91	1.89	1.88	1.88	1.91	1.93	1.96	1.98	
HLP (average)											1.94	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 99.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1562.37 (45)

Distribution loss												
24.30	21.25	21.93	19.12	18.34	15.83	14.67	16.83	17.03	19.85	21.67	23.53	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
258.32	228.69	242.53	220.68	218.63	198.76	194.13	208.55	206.79	228.68	237.69	253.21	(62)
Output from water heater for each month, kWh/month												
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)

2696.65 (64)

Heat gains from water heating, kWh/month												
130.93	116.72	125.68	116.96	117.73	109.67	109.58	114.38	112.34	121.07	122.62	129.23	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
175.98	173.69	168.92	162.45	158.24	152.32	147.29	153.74	156.03	162.73	170.30	173.70	(72)
Total internal gains												
507.30	503.52	487.15	462.07	437.24	414.20	400.14	408.07	421.96	447.27	475.47	495.99	(73)

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 18.975	19.87	0.72 x 0.70	0.77	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

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 18.97	0.80	0.70 x 0.83	7.94

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
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												
3.31	3.34	3.34	3.39	3.43	3.45	3.46	3.46	3.42	3.39	3.37	3.34	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (27.50 / 83.30) 0.33 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.96	0.91	0.80	0.62	0.40	0.43	0.75	0.93	0.98	0.99	(94)
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	(95)
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	(96)
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	(97)
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) 6266.27 (98)

Space heating requirement per m² (kWh/m²/year) 75.23 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									78.90%				(206)
Efficiency of secondary heating system									100.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1207.15	965.42	813.15	507.90	233.27	-	-	-	-	477.37	892.33	1169.69		(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)													
1376.98	1101.24	927.55	579.35	266.08	-	-	-	-	544.52	1017.86	1334.25		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
120.72	96.54	81.32	50.79	23.33	-	-	-	-	47.74	89.23	116.97		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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	kWh/year	
Space heating fuel used, main system 1	7147.83	(211)
Space heating fuel (secondary)	626.63	(215)
Water heating fuel	3665.65	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	605.43	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	12220.54	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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 m² for space and water heating	**29.24**	(272a)
Emissions per m² for lighting	**3.07**	(272b)
Emissions per m² for pumps and fans	**0.89**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**20.16**	(273)

= [(29.2449 x 1.0000 x 1.0206) + (3.0671 x 1.2251)] x 0.6000

Project Information

Building type	Ground-floor flat		
Plot number	7		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (NorthWest) Window			**1.200**	**1.42 (1.50)**	1.70			(27)
Window - Double-glazed, air-filled (NorthWest) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Window - Double-glazed, air-filled (NorthWest) Window			**1.370**	**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			80.12	0.22	17.87	190.00	15222.80	(29)
Ground floors			83.30	0.20	16.66	110.00	9163.00	(28)
Party wall			7.30	0.00	0.00	70.00	511.00	
Party ceiling			83.30	0.00	0.00	30.00	2499.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	189.33	(31)
Fabric heat loss, W/K	71.36	(33)
Heat capacity	27395.80	(34)
Thermal mass parameter, kJ/m²K	328.88	(35)
Effect of thermal bridges	28.40	(36)
Total fabric heat loss	99.76	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											136.87	(39)

Heat loss parameter (HLP), W/m²K

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)

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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.52 (42)

Annual average hot water usage in litres per day Vd,average 94.11 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(44)
Energy content of hot water 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 content (annual) 1484.25 (45)

Distribution loss												
23.08	20.19	20.83	18.16	17.43	15.04	13.94	15.99	16.18	18.86	20.59	22.35	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
50.96	45.92	48.92	45.48	45.08	41.77	43.16	45.08	45.48	48.92	49.19	50.96	(61)
Total heat required for water heating calculated for each month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(62)
Output from water heater for each month, kWh/month												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)

2045.16 (64)

Heat gains from water heating, kWh/month												
63.91	56.23	58.41	51.63	49.90	43.78	41.68	46.72	47.24	54.03	57.93	62.29	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
226.20	228.55	222.63	210.04	194.14	179.20	169.22	166.88	172.79	185.38	201.28	216.22	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
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	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled (NorthWest) Window	0.9 x 1.200 11.51	0.76 x 0.70	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

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
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 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 Shading	
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) 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 3.78	0.80	0.70 x 0.83	1.58
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.19	0.80	0.70 x 0.83	1.33
Window - Double-glazed, air-filled (NorthEast) Window	0.9 x 3.09	0.80	0.70 x 0.83	1.29
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.20	0.80	0.70 x 0.83	0.50
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.08	0.80	0.70 x 0.83	0.45
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.68	0.80	0.70 x 0.83	0.70
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 1.32	0.80	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

Lighting calculations

	Area	g	FF x Shading	
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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
19.90	20.05	20.29	20.55	20.80	20.91	20.94	20.94	20.85	20.54	20.12	19.91	(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)
Utilisation factor for gains for rest of dwelling												
1.00	0.99	0.98	0.92	0.76	0.52	0.30	0.33	0.69	0.95	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
18.61	18.75	19.00	19.24	19.45	19.52	19.53	19.53	19.49	19.24	18.83	18.62	(90)

Living area fraction (27.50 / 83.30) 0.33 (91)

Mean internal temperature (for the 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	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.04	19.18	19.43	19.67	19.89	19.98	19.99	19.99	19.94	19.67	19.26	19.04	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.97	0.92	0.77	0.56	0.34	0.38	0.73	0.95	0.99	1.00	(94)
Useful gains												
608.24	768.08	908.47	1036.10	973.94	712.05	421.61	420.58	694.88	745.70	620.02	564.46	(95)
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	(96)
Heat loss rate for mean internal temperature												
1989.54	1940.90	1728.16	1501.95	1121.46	736.03	423.42	423.29	771.96	1213.96	1677.98	1935.73	(97)
Space heating requirement for each month, kWh/month												
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) 5001.16 (98)

Space heating requirement per m² (kWh/m²/year) 60.04 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1027.68	788.14	609.85	335.41	109.76	-	-	-	-	348.38	761.73	1020.22	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1101.48	844.73	653.64	359.49	117.64	-	-	-	-	373.40	816.43	1093.49	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
204.84	180.50	187.80	166.56	161.26	142.02	136.06	151.69	153.36	174.64	186.43	199.99	(64)
Efficiency of water heater												80.20 (216)
88.45	88.23	87.70	86.68	84.01	80.20	80.20	80.20	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	226.04	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5360.30	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2400.69	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	61.46	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	236.46	(231)
Electricity for lighting (100.00% fixed LEL)	356.13	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7530.97	(238)

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

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	5360.30	0.198	1061.34	(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	2400.69	0.198	475.34	(264)
Space and water heating			1536.68	(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			1407.89	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**16.90**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	8		
Reference			
Date	17 June 2016		
Client	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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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	
												13.53 (22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22	
												2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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 (SouthWest) Window			**2.460**	**1.42 (1.50)**	3.48			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.140**	**1.42 (1.50)**	3.03			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.340**	**1.42 (1.50)**	0.48			(27)
Full glazed door - Double-glazed, air-filled (SouthWest) Door			**2.020**	**1.50**	3.03			(26)
Walls			36.60	0.22	8.16	190.00	6954.00	(29)
Ground floors			41.74	0.20	8.35	110.00	4591.40	(28)
Party wall			30.50	0.00	0.00	70.00	2135.00	
Party ceiling			41.74	0.00	0.00	100.00	4174.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	28.26	(33)
Heat capacity	17854.40	(34)
Thermal mass parameter, kJ/m²K	427.75	(35)
Effect of thermal bridges	12.98	(36)
Total fabric heat loss	41.23	(37)

Ventilation heat loss calculated monthly

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)

Heat transfer coefficient, W/K

59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	
											59.83	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.43	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 68.72 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 of hot water used												
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 content (annual) 1083.76 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1495.94 (64)

Heat gains from water heating, kWh/month												
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
187.96	189.91	185.00	174.53	161.32	148.91	140.62	138.67	143.58	154.04	167.25	179.67	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57	(72)
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	(73)

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	346.95	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	634.77	617.01	600.87	575.25	534.13	474.13	452.43	(84)

Lighting calculations

	Area	g	FF x Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
alpha												
6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	
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	(86)
Mean internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(88)
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	(89)
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	19.70	19.62	19.39	19.24	(90)

Living area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

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	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.90	0.75	0.53	0.33	0.34	0.61	0.89	0.98	0.99	(94)
Useful gains												
474.56	544.21	574.40	572.42	483.82	336.85	202.03	202.02	351.01	474.09	466.43	449.74	(95)
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	(96)
Heat loss rate for mean internal temperature												
914.53	890.88	791.87	685.20	511.36	339.53	202.13	202.13	357.22	561.23	773.83	890.54	(97)
Space heating requirement for each month, kWh/month												
327.34	232.97	161.80	81.21	20.50	-	-	-	-	64.83	221.33	327.96	

Total space heating requirement per year (kWh/year) (October to May) 1437.93 (98)

Space heating requirement per m² (kWh/m²/year) 34.45 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main heating system 93.30% (206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
327.34	232.97	161.80	81.21	20.50	-	-	-	-	64.83	221.33	327.96	(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)												
350.85	249.70	173.42	87.04	21.97	-	-	-	-	69.49	237.22	351.51	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	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	136.13	147.34	(64)
Efficiency of water heater												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 heating fuel												
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 totals	kWh/year	
Space heating fuel used, main system 1	1541.19	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	1787.62	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840)	107.79	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	282.79	(231)
Electricity for lighting (100.00% fixed LEL)	210.31	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	2999.30	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	210.313	11.460	24.10	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			171.43	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	0.93	(257)
SAP value	87.04	
SAP rating	**87**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**11.47**	(273)
EI value	92.60	(273a)
EI rating	**93**	(274)
EI band	**A**	

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

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)

Project Information

Building type	Ground-floor flat		
Plot number	8		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.18	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.68	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.58	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.78	0.73	0.73	0.65	0.59	0.56	0.53	0.53	0.60	0.65	0.69	0.73

7.79 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**8.585**	**1.85 (2.00)**	15.90	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			34.34	0.35	12.02	(29)
Ground floors			41.74	0.25	10.44	(28)
Party wall			30.50	0.00	0.00	
Party ceiling			41.74	0.00	0.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	42.05	(33)
Heat capacity	10900.40	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	9.52	(36)
Total fabric heat loss	51.57	(37)

Ventilation heat loss calculated monthly

29.83	28.62	28.62	26.40	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	77.97	76.64	76.03	75.44	75.44	76.96	77.97	79.05	80.19	
											78.12	(39)

Heat loss parameter (HLP), W/m²K

1.95	1.92	1.92	1.87	1.84	1.82	1.81	1.81	1.84	1.87	1.89	1.92	
HLP (average)											1.87	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 72.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water 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	(44)
Energy content of hot water used												
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 content (annual) 1140.80 (45)

Distribution loss												
17.74	15.52	16.01	13.96	13.39	11.56	10.71	12.29	12.44	14.49	15.82	17.18	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(62)
Output from water heater for each month, kWh/month												
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88	(64)

2275.08 (64)

Heat gains from water heating, kWh/month												
116.40	104.01	112.56	105.53	106.76	100.20	100.81	104.31	102.15	109.20	109.66	115.16	(65)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
156.45	154.77	151.29	146.57	143.50	139.17	135.50	140.21	141.88	146.77	152.30	154.78	(72)
Total internal gains												
356.35	353.84	343.89	328.78	314.22	300.36	291.66	297.20	305.35	320.62	337.64	349.66	(73)

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 8.585 19.87	0.72 x 0.70	0.77	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

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 8.59	0.80	0.70 x 0.83	3.59

GL = 3.59 / 41.74 = 0.086
C1 = 0.850
C2 = 0.964
El = 339

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.94	0.88	0.77	0.59	0.38	0.40	0.70	0.90	0.97	0.98	(94)
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	(95)
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	(96)
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	(97)
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) 2755.31 (98)

Space heating requirement per m² (kWh/m²/year) 66.01 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system												0.1000	(201)
Fraction of space heat from main system(s)												0.9000	(202)
Efficiency of main heating system												78.90%	(206)
Efficiency of secondary heating system												100.00%	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
540.82	429.99	359.19	219.74	97.06	-	-	-	-	198.27	389.57	520.67		(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)													
616.91	490.48	409.72	250.66	110.71	-	-	-	-	226.16	444.38	593.93		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
54.08	43.00	35.92	21.97	9.71	-	-	-	-	19.83	38.96	52.07		(215)
Water heating													
Water heating requirement													
214.61	190.46	203.08	186.29	185.63	170.29	167.74	178.27	176.14	192.97	198.71	210.88		(64)
Efficiency of water heater												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)
Water heating fuel													
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3142.94	(211)
Space heating fuel (secondary)	275.53	(215)
Water heating fuel	3135.33	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	338.54	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7067.34	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**33.74**	(272a)
Emissions per m² for lighting	**3.42**	(272b)
Emissions per m² for pumps and fans	**1.77**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**23.17**	(273)

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

Project Information

Building type	Ground-floor flat		
Plot number	8		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	41.74	2.70	112.70	(3a)
Total floor area	41.74			(4)
Dwelling volume (m^3)			112.70	(5)

2. Ventilation rate

			m³ per hour	
	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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.00	(8)
Pressure test, result q50		4.00		(17)
Air permeability			0.20	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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) Window			**0.340**	**1.42 (1.50)**	0.48			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthEast) Window			**0.610**	**1.42 (1.50)**	0.86			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.140**	**1.42 (1.50)**	3.03			(27)
Window - Double-glazed, air-filled (SouthWest) Window			**2.460**	**1.42 (1.50)**	3.48			(27)
Full glazed door - Double-glazed, air-filled (SouthWest) Door			**2.020**	**1.50**	3.03			(26)
Walls			36.60	0.22	8.16	190.00	6954.00	(29)
Ground floors			41.74	0.20	8.35	110.00	4591.40	(28)
Party wall			30.50	0.00	0.00	70.00	2135.00	
Party ceiling			41.74	0.00	0.00	100.00	4174.00	

Total area of external elements Sigma A, m²	86.52	(31)
Fabric heat loss, W/K	28.26	(33)
Heat capacity	17854.40	(34)
Thermal mass parameter, kJ/m²K	427.75	(35)
Effect of thermal bridges	12.98	(36)
Total fabric heat loss	41.23	(37)

Ventilation heat loss calculated monthly

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)

Heat transfer coefficient, W/K

59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	59.83	
											59.83	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.43	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 1.45 (42)

Annual average hot water usage in litres per day Vd,average 68.72 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
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 of hot water used												
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 content (annual) 1083.76 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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)

1495.94 (64)

Heat gains from water heating, kWh/month												
46.99	41.06	42.65	37.70	36.44	31.96	30.43	34.11	34.49	39.45	42.30	45.81	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
125.93	127.24	123.95	116.94	108.09	99.77	94.21	92.91	96.20	103.21	112.06	120.38	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
63.16	61.10	57.32	52.36	48.97	44.40	40.91	45.85	47.91	53.03	58.75	61.57	(72)
Total internal gains												
255.80	253.71	244.67	230.61	216.73	203.07	194.36	199.33	206.65	220.87	237.09	248.99	(73)

6. Solar gains (calculation for January)

	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

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.34	0.80	0.70 x 0.83	0.14
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.61	0.80	0.70 x 0.83	0.26

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled (SouthEast) Window	0.9 x 0.61	0.80	0.70 x 0.83	0.26
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.14	0.80	0.70 x 0.83	0.90
Window - Double-glazed, air-filled (SouthWest) Window	0.9 x 2.46	0.80	0.70 x 0.83	1.03

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
alpha												
6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	
Utilisation 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	(86)
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	(87)
Temperature during heating periods in rest of dwelling Th2												
19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(88)
Utilisation 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	(89)
Mean internal temperature in the rest of dwelling T2												
19.13	19.24	19.40	19.54	19.66	19.70	19.70	19.70	19.69	19.57	19.29	19.13	(90)

Living area fraction (19.20 / 41.74) 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.67	19.78	19.95	20.09	20.22	20.27	20.28	20.28	20.26	20.12	19.83	19.67	(92)
Apply adjustment to the mean internal temperature, where appropriate												
19.67	19.78	19.95	20.09	20.22	20.27	20.28	20.28	20.26	20.12	19.83	19.67	(93)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.98	0.94	0.82	0.61	0.38	0.39	0.70	0.95	1.00	1.00	(94)
Useful gains												
367.94	443.38	489.01	512.19	460.52	333.60	201.89	201.84	342.82	415.57	370.56	344.89	(95)
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	(96)
Heat loss rate for mean internal temperature												
907.84	884.53	786.47	681.40	509.89	339.31	202.11	202.11	356.67	557.54	767.79	883.96	(97)
Space heating requirement for each month, kWh/month												
401.68	296.45	221.31	121.83	36.73	-	-	-	-	105.62	286.01	401.07	

Total space heating requirement per year (kWh/year) (October to May) 1870.71 (98)

Space heating requirement per m² (kWh/m²/year) 44.82 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
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)
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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	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	136.13	147.34	(64)
Efficiency of water heater												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 heating fuel												
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	kWh/year	
Space heating fuel used, main system 1	2005.05	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	1777.10	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7840)	107.79	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	282.79	(231)
Electricity for lighting (100.00% fixed LEL)	210.31	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	3452.64	(238)

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

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	2005.05	0.198	397.00	(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	1777.10	0.198	351.87	(264)
Space and water heating			748.87	(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			568.64	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**13.62**	(273)

Project Information

Building type	Ground-floor flat		
Plot number	9		
Reference			
Date	16 June 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

			m³ per hour	
	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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.00	(8)
Pressure test, result q50		4.00		(17)
Air permeability			0.20	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, argon filled, low-E, En=0.1, soft coat (SouthWest) Window and Door			**4.710**	**1.42 (1.50)**	6.67			(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 between joists			38.10	0.18	6.86	9.00	342.90	(30)
Walls			82.60	0.22	18.17	17.00	1404.20	(29)
Ground floors			99.40	0.20	19.88	110.00	10934.00	(28)
Party wall			76.70	0.00	0.00	180.00	13806.00	
Party ceiling			61.30	0.00	0.00	30.00	1839.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m² 231.86 (31)
Fabric heat loss, W/K 61.55 (33)
Heat capacity 28326.10 (34)
Thermal mass parameter, kJ/m²K 462.84 (35)
Effect of thermal bridges 34.78 (36)
Total fabric heat loss 96.33 (37)
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

(38)
Heat transfer coefficient, 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

123.60 (39)
Heat loss parameter (HLP), W/m²K

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 (average) 2.02 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
262.63	265.36	258.49	243.87	225.41	208.07	196.48	193.75	200.62	215.24	233.70	251.04	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
476.69	472.56	454.69	427.26	399.34	374.03	359.37	366.93	382.76	410.38	441.08	464.30	(73)

6. Solar gains (calculation for January)

	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	0.63 x 0.70	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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.80 / 61.20) 0.41 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.98	0.94	0.82	0.60	0.36	0.39	0.74	0.96	0.99	1.00	(94)
Useful gains												
625.00	741.46	841.86	929.73	868.75	638.10	375.92	375.38	632.66	701.67	620.79	588.83	(95)
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	(96)
Heat loss rate for mean internal temperature												
1809.67	1761.76	1564.47	1354.87	1008.08	659.51	377.15	377.08	693.12	1097.61	1524.38	1761.26	(97)
Space heating requirement for each month, kWh/month												
881.40	685.64	537.62	306.10	103.67	-	-	-	-	294.58	650.59	872.29	

Total space heating requirement per year (kWh/year) (October to May) 4331.88 (98)

Space heating requirement per m² (kWh/m²/year) 70.78 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
881.40	685.64	537.62	306.10	103.67	-	-	-	-	294.58	650.59	872.29	(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)												
944.69	734.88	576.23	328.08	111.11	-	-	-	-	315.73	697.31	934.93	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4642.96	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2096.76	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	277.00	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6484.82	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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	277.004	11.460	31.74	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	822.616	11.460	-94.27	(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			285.72	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.26	(257)
SAP value	82.36	
SAP rating	**82**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**19.49**	(273)
EI value	84.95	(273a)
EI rating	**85**	(274)
EI band	**B**	

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Ground-floor flat		
Plot number	9		
Reference			
Date	16 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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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)

		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		0.53	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.71	0.67	0.67	0.59	0.54	0.51	0.49	0.49	0.55	0.59	0.63	0.67

7.14 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**13.450**	**1.85 (2.00)**	24.91	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Pitched roofs insulated between joists			42.04	0.16	6.73	(30)
Walls			75.12	0.35	26.29	(29)
Ground floors			99.40	0.25	24.85	(28)
Party wall			76.70	0.00	0.00	
Party ceiling			61.30	0.00	0.00	

Total area of external elements Sigma A, m²	231.86	(31)
Fabric heat loss, W/K	86.48	(33)
Heat capacity	26957.36	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	25.50	(36)
Total fabric heat loss	111.98	(37)

Ventilation heat loss calculated monthly

41.11	39.62	39.62	36.88	35.25	34.49	33.77	33.77	35.64	36.88	38.20	39.62	(38)

Heat transfer coefficient, W/K

153.09	151.60	151.60	148.86	147.23	146.47	145.75	145.75	147.62	148.86	150.19	151.60	
											149.05	(39)

Heat loss parameter (HLP), W/m²K

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)											2.44	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 86.38 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
95.02	91.57	88.11	84.66	81.20	77.75	77.75	81.20	84.66	88.11	91.57	95.02	(44)
Energy content of hot water 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	

Energy content (annual) 1362.41 (45)

Distribution loss												
21.19	18.53	19.12	16.67	16.00	13.80	12.79	14.68	14.85	17.31	18.90	20.52	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
237.59	210.55	223.82	204.37	202.98	185.25	181.61	194.19	192.25	211.74	219.20	233.13	(62)
Output from water heater for each month, kWh/month												
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)

2496.69 (64)

Heat gains from water heating, kWh/month												
124.04	110.69	119.46	111.54	112.53	105.18	105.42	109.61	107.51	115.44	116.47	122.55	(65)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
166.71	164.71	160.56	154.91	151.25	146.09	141.70	147.32	149.32	155.16	161.76	164.72	(72)
Total internal gains												
432.59	429.43	416.25	396.12	376.41	357.93	346.52	353.30	364.32	384.64	407.29	423.57	(73)

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 19.87	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	0.9 x 1.850 0.00	0.72 x 0.70	0.77	0.0000	
Total solar gains, January				93.36	(83-1)

Solar gains

93.36	180.95	289.22	429.42	522.48	545.18	529.16	460.54	345.77	220.36	116.07	77.01	(83)
Total gains												
525.94	610.38	705.46	825.54	898.89	903.11	875.68	813.83	710.09	605.00	523.36	500.58	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 13.45	0.80	0.70 x 0.83	5.63

GL = 5.63 / 61.20 = 0.092
C1 = 0.850
C2 = 0.960
El = 471

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (24.80 / 61.20) 0.41 (91)

Mean internal temperature (for the whole dwelling)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.95	0.91	0.82	0.67	0.45	0.48	0.78	0.93	0.98	0.98	(94)
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	(95)
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	(96)
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	(97)
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) 5997.47 (98)

Space heating requirement per m² (kWh/m²/year) 98.00 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system											0.1000		(201)
Fraction of space heat from main system(s)											0.9000		(202)
Efficiency of main heating system											78.90%		(206)
Efficiency of secondary heating system											100.00%		(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1104.84	903.91	789.31	534.37	284.04	-	-	-	-	477.90	831.67	1071.43		(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)													
1260.28	1031.08	900.36	609.54	324.00	-	-	-	-	545.13	948.68	1222.16		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
110.48	90.39	78.93	53.44	28.40	-	-	-	-	47.79	83.17	107.14		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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)
Water heating fuel													
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	6841.23	(211)
Space heating fuel (secondary)	599.75	(215)
Water heating fuel	3389.82	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	471.15	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	11476.95	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**37.77**	(272a)
Emissions per m² for lighting	**3.25**	(272b)
Emissions per m² 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

Project Information

Building type	Ground-floor flat		
Plot number	9		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, 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)
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 between joists			38.10	0.18	6.86	9.00	342.90	(30)
Walls			82.60	0.22	18.17	17.00	1404.20	(29)
Ground floors			99.40	0.20	19.88	110.00	10934.00	(28)
Party wall			76.70	0.00	0.00	180.00	13806.00	
Party ceiling			61.30	0.00	0.00	30.00	1839.00	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	231.86	(31)
Fabric heat loss, W/K	61.55	(33)
Heat capacity	28326.10	(34)
Thermal mass parameter, kJ/m²K	462.84	(35)
Effect of thermal bridges	34.78	(36)
Total fabric heat loss	96.33	(37)

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	(38)

Heat transfer coefficient, 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	
											123.60	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											2.02	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.02 (42)

Annual average hot water usage in litres per day Vd,average 82.06 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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	

Energy content (annual) 1294.28 (45)

Distribution loss												
20.13	17.60	18.17	15.84	15.20	13.11	12.15	13.94	14.11	16.44	17.95	19.49	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
46.00	40.04	42.66	39.66	39.31	36.42	37.64	39.31	39.66	42.66	42.90	46.00	(61)
Total heat required for water heating calculated for each month												
180.19	157.40	163.76	145.25	140.62	123.85	118.65	132.27	133.73	152.29	162.57	175.96	(62)
Output from water heater for each month, kWh/month												
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)

1786.54 (64)

Heat gains from water heating, kWh/month												
56.12	49.03	50.93	45.02	43.51	38.17	36.35	40.74	41.19	47.12	50.52	54.71	(65)

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	(66)
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	(67)
Appliances 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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
75.43	72.97	68.46	62.53	58.49	53.02	48.85	54.75	57.21	63.33	70.16	73.54	(72)
Total internal gains												
330.40	328.00	316.27	297.78	279.19	261.10	249.61	255.45	265.13	283.81	305.18	321.18	(73)

6. Solar gains (calculation for January)

	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	0.63 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
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

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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living area												
1.00	1.00	1.00	0.98	0.93	0.79	0.58	0.62	0.91	0.99	1.00	1.00	(86)
Mean internal temperature in living area T1												
19.95	20.06	20.26	20.48	20.74	20.89	20.94	20.94	20.82	20.51	20.15	19.97	(87)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
1.00	1.00	0.99	0.97	0.87	0.64	0.35	0.38	0.80	0.98	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
18.41	18.52	18.72	18.94	19.16	19.26	19.27	19.27	19.23	18.96	18.61	18.42	(90)

Living area fraction (24.80 / 61.20) 0.41 (91)

Mean internal temperature (for the 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	(92)

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	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	1.00	0.99	0.97	0.89	0.70	0.44	0.48	0.85	0.98	1.00	1.00	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
1796.59	1747.70	1550.52	1342.63	1001.05	657.54	376.89	376.70	688.43	1086.00	1511.84	1748.67	(97)
Space heating requirement for each month, kWh/month												
996.79	797.39	659.83	409.37	165.43	-	-	-	-	396.21	757.43	983.35	

Total space heating requirement per year (kWh/year) (October to May) 5165.79 (98)

Space heating requirement per m² (kWh/m²/year) 84.41 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.30%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
996.79	797.39	659.83	409.37	165.43	-	-	-	-	396.21	757.43	983.35	(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)												
1068.37	854.65	707.22	438.76	177.31	-	-	-	-	424.66	811.82	1053.97	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	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	(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	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
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)
Efficiency of water heater												80.20 (216)
88.59	88.46	88.09	87.42	85.36	80.20	80.20	80.20	80.20	87.25	88.33	88.61	(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	198.58	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5536.75	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2089.31	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.5740)	115.71	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	290.71	(231)
Electricity for lighting (100.00% fixed LEL)	278.69	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 961.000 x 1.000	822.616	
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	
	822.616	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7372.86	(238)

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**22.37**	(273)

Project Information

Building type	Top-floor flat		
Plot number	10		
Reference			
Date	4 July 2016		
Client	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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	70.70	2.70	190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m^3)			190.89	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.50	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.42	(21)

Infiltration rate modified for monthly wind speed

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 (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	
												13.53 (22a)
Adjusted infiltration rate (allowing for shelter and wind speed)												
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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (NorthEast) Window			**3.150**	**1.42 (1.50)**	4.46			(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) Roof Window			**0.920**	**1.42 (1.50)**	1.30			(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			**0.800**	**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			**0.420**	**1.42 (1.50)**	0.59			(27)
Walls			92.30	0.22	20.31	17.00	1569.10	(29)
Ground floors			70.70	0.20	14.14	18.00	1272.60	(28)
Pitched roofs insulated between rafters			25.40	0.18	4.57	9.00	228.60	(30)
Party wall			44.00	0.00	0.00	70.00	3080.00	
Internal ceiling			70.70	0.00	0.00	9.00	636.30	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m² 198.76 (31)
Fabric heat loss, W/K 53.68 (33)
Heat capacity 6786.60 (34)
Thermal mass parameter, kJ/m²K 95.99 (35)
Effect of thermal bridges 29.81 (36)
Total fabric heat loss 83.49 (37)
Ventilation heat loss calculated monthly

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 transfer coefficient, 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

129.42 (39)
Heat loss parameter (HLP), W/m²K

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 (average) 1.83 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.26 (42)

Annual average hot water usage in litres per day Vd,average 87.95 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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 content (annual) 1387.05 (45)

Distribution loss												
21.57	18.87	19.47	16.97	16.29	14.05	13.02	14.94	15.12	17.62	19.24	20.89	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
49.30	42.91	45.71	42.50	42.13	39.03	40.33	42.13	42.50	45.71	45.97	49.30	(61)
Total heat required for water heating calculated for each month												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(62)
Output from water heater for each month, kWh/month												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(64)

1914.58 (64)

Heat gains from water heating, kWh/month												
60.14	52.55	54.58	48.25	46.63	40.91	38.95	43.66	44.15	50.49	54.14	58.63	(65)

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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
80.83	78.20	73.36	67.01	62.68	56.82	52.35	58.68	61.31	67.87	75.19	78.81	(72)
Total internal gains												
530.41	525.64	505.32	474.27	442.64	414.21	397.94	406.39	424.51	455.77	490.38	516.57	(73)

6. Solar gains (calculation for January)

	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 0.72 x 0.70	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 Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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	(86)
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	(87)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (23.10 / 70.70) 0.33 (91)

Mean internal temperature (for the whole dwelling)

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)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.91	0.90	0.86	0.79	0.68	0.53	0.36	0.39	0.64	0.81	0.89	0.92	(94)
Useful gains												
543.06	588.30	627.91	666.78	623.47	492.58	321.53	315.28	452.41	504.32	510.72	520.53	(95)
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	(96)
Heat loss rate for mean internal temperature												
1753.06	1689.09	1507.34	1284.70	952.02	626.43	358.07	356.79	655.38	1033.68	1443.42	1685.05	(97)
Space heating requirement for each month, kWh/month												
900.24	739.73	654.30	444.90	244.44	-	-	-	-	393.85	671.54	866.40	

Total space heating requirement per year (kWh/year) (October to May) 4915.40 (98)

Space heating requirement per m² (kWh/m²/year) 69.52 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
900.24	739.73	654.30	444.90	244.44	-	-	-	-	393.85	671.54	866.40	(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)												
959.74	788.62	697.54	474.31	260.60	-	-	-	-	419.88	715.93	923.67	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	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	(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	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(64)
Efficiency of water heater												81.50 (216)
91.36	91.24	90.90	90.27	88.69	81.50	81.50	81.50	81.50	89.83	90.97	91.34	(217)
Water heating fuel												
211.36	184.87	193.07	172.44	169.91	162.85	156.01	173.93	175.85	181.68	191.51	206.45	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5240.29	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2179.94	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	52.17	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	227.17	(231)
Electricity for lighting (100.00% fixed LEL)	328.98	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1027.000 x 1.000	879.112	
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	
	879.112	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7097.26	(238)

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

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	0.000	0.000	0.00	(241)
Water heating				
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	879.112	11.460	-100.75	(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			299.02	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.21	(257)
SAP value	83.06	
SAP rating	**83**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**18.27**	(273)
EI value	85.04	(273a)
EI rating	**85**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year)	
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)

Project Information

Building type	Top-floor flat		
Plot number	10		
Reference			
Date	4 July 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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	70.70	2.70	190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m^3)			190.89	(5)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.10	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.60	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.51	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.69	0.66	0.66	0.58	0.53	0.50	0.48	0.48	0.54	0.58	0.62	0.66

6.95 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.74	0.71	0.71	0.67	0.64	0.63	0.61	0.61	0.65	0.67	0.69	0.71

(25)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**15.825**	**1.85 (2.00)**	29.31	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			82.17	0.35	28.76	(29)
Ground floors			70.70	0.25	17.68	(28)
Pitched roofs insulated between rafters			28.21	0.16	4.51	(30)
Party wall			44.00	0.00	0.00	
Internal ceiling			70.70	0.00	0.00	

Total area of external elements Sigma A, m²	198.76	(31)
Fabric heat loss, W/K	83.96	(33)
Heat capacity	5242.79	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	21.86	(36)
Total fabric heat loss	105.82	(37)

Ventilation heat loss calculated monthly

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 coefficient, W/K

152.48	150.85	150.85	147.85	146.06	145.23	144.44	144.44	146.49	147.85	149.30	150.85	
											148.06	(39)

Heat loss parameter (HLP), W/m²K

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)											2.09	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.26 (42)

Annual average hot water usage in litres per day Vd,average 92.57 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
101.83	98.13	94.43	90.72	87.02	83.32	83.32	87.02	90.72	94.43	98.13	101.83	(44)
Energy content of hot water used												
151.38	132.39	136.62	119.11	114.29	98.62	91.39	104.87	106.12	123.67	135.00	146.60	

Energy content (annual) 1460.05 (45)

Distribution loss												
22.71	19.86	20.49	17.87	17.14	14.79	13.71	15.73	15.92	18.55	20.25	21.99	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
247.71	219.41	232.96	212.34	210.62	191.85	187.72	201.20	199.35	220.01	228.23	242.94	(62)
Output from water heater for each month, kWh/month												
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)

2594.33 (64)

Heat gains from water heating, kWh/month												
127.40	113.63	122.49	114.19	115.07	107.37	107.46	111.94	109.87	118.19	119.47	125.81	(65)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
198.93	200.99	195.79	184.71	170.73	157.60	148.82	146.76	151.96	163.03	177.01	190.15	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
171.24	169.10	164.64	158.59	154.66	149.13	144.43	150.45	152.59	158.86	165.93	169.10	(72)
Total internal gains												
467.26	463.81	449.15	426.74	404.67	384.08	371.44	378.77	391.11	413.74	438.95	457.18	(73)

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 15.825 19.87	0.72 x 0.70	0.77	109.8402	
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	
Total solar gains, January				109.84	(83-1)

Solar gains

109.84	212.90	340.29	505.24	614.74	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 Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 15.83	0.80	0.70 x 0.83	6.62

GL = 6.62 / 70.70 = 0.094
C1 = 0.850
C2 = 0.960
El = 532

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
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												
3.15	3.17	3.17	3.21	3.24	3.25	3.27	3.27	3.23	3.21	3.19	3.17	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (23.10 / 70.70) 0.33 (91)

Mean internal temperature (for the whole dwelling)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.91	0.80	0.63	0.41	0.44	0.75	0.93	0.98	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
2033.3	1969.29	1760.28	1515.28	1131.29	745.42	424.53	423.82	779.27	1218.88	1688.31	1960.94	(97)
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) 5741.22 (98)

Space heating requirement per m² (kWh/m²/year) 81.21 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system												0.1000	(201)
Fraction of space heat from main system(s)												0.9000	(202)
Efficiency of main heating system												78.90%	(206)
Efficiency of secondary heating system												100.00%	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1089.30	878.84	748.74	482.17	233.15	-	-	-	-	442.34	810.11	1056.57		(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)													
1242.55	1002.48	854.08	550.00	265.96	-	-	-	-	504.57	924.08	1205.21		(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		(212)
Space heating 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 energy saved (secondary heating system)													
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												68.80	(216)
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/year	
Space heating fuel used, main system 1	6548.92	(211)
Space heating fuel (secondary)	574.12	(215)
Water heating fuel	3529.08	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	532.39	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	11359.52	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**32.13**	(272a)
Emissions per m² for lighting	**3.18**	(272b)
Emissions per m² for pumps and fans	**1.04**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**22.01**	(273)

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

Project Information

Building type	Top-floor flat		
Plot number	10		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	70.70	2.70	190.89	(3a)
Total floor area	70.70			(4)
Dwelling volume (m^3)			190.89	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.50	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.42	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (NorthEast) Window			**0.510**	**1.42 (1.50)**	0.72			(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			92.30	0.22	20.31	17.00	1569.10	(29)
Ground floors			70.70	0.20	14.14	18.00	1272.60	(28)
Pitched roofs insulated between rafters			25.40	0.18	4.57	9.00	228.60	(30)
Party wall			44.00	0.00	0.00	70.00	3080.00	
Internal ceiling			70.70	0.00	0.00	9.00	636.30	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	198.76	(31)
Fabric heat loss, W/K	53.68	(33)
Heat capacity	6786.60	(34)
Thermal mass parameter, kJ/m²K	95.99	(35)
Effect of thermal bridges	29.81	(36)
Total fabric heat loss	83.49	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											129.42	(39)

Heat loss parameter (HLP), W/m²K

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 (average) 1.83 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.26 (42)

Annual average hot water usage in litres per day Vd,average 87.95 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for 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	(44)
Energy content of hot water 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 content (annual) 1387.05 (45)

Distribution loss												
21.57	18.87	19.47	16.97	16.29	14.05	13.02	14.94	15.12	17.62	19.24	20.89	(46)

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
49.30	42.91	45.71	42.50	42.13	39.03	40.33	42.13	42.50	45.71	45.97	49.30	(61)
Total heat required for water heating calculated for each month												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(62)
Output from water heater for each month, kWh/month												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(64)

1914.58 (64)

Heat gains from water heating, kWh/month												
60.14	52.55	54.58	48.25	46.63	40.91	38.95	43.66	44.15	50.49	54.14	58.63	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
198.93	200.99	195.79	184.71	170.73	157.60	148.82	146.76	151.96	163.03	177.01	190.15	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
80.83	78.20	73.36	67.01	62.68	56.82	52.35	58.68	61.31	67.87	75.19	78.81	(72)
Total internal gains												
365.33	362.67	349.55	328.86	307.97	287.79	275.06	281.41	292.34	313.23	337.10	355.04	(73)

6. Solar gains (calculation for January)

	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	0.72 x 0.70	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

	Area	g	FF x Shading

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.95	0.93	0.90	0.83	0.72	0.58	0.40	0.44	0.70	0.87	0.93	0.95	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
1723.64	1661.44	1483.35	1266.39	940.52	620.58	355.88	354.07	645.17	1014.16	1417.57	1656.33	(97)
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) 5407.09 (98)

Space heating requirement per m² (kWh/m²/year) 76.48 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
980.02	807.49	718.56	492.88	276.42	-	-	-	-	446.70	740.00	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	(210)
Space heating fuel (main heating system 1)												
1044.80	860.86	766.06	525.45	294.69	-	-	-	-	476.23	788.91	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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
193.11	168.68	175.50	155.66	150.70	132.72	127.15	141.75	143.32	163.20	174.22	188.57	(64)
Efficiency of water heater												81.50 (216)
91.53	91.42	91.10	90.52	89.06	81.50	81.50	81.50	81.50	90.16	91.18	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	206.08	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5764.49	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2176.14	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	52.17	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	227.17	(231)
Electricity for lighting (100.00% fixed LEL)	328.98	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1027.000 x 1.000	879.112	
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	
	879.112	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7617.66	(238)

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

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**19.73**	(273)

Project Information

Building type	Top-floor flat		
Plot number	11		
Reference			
Date	4 July 2016		
Client	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 (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area	95.40			(4)
Dwelling volume (m^3)			257.58	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (East) Window top floor			**2.500**	**1.42 (1.50)**	3.54			(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 (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 (East) Window Balcony			**4.390**	**1.42 (1.50)**	6.21			(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 (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			**1.220**	**1.42 (1.50)**	1.73			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) Window			**0.680**	**1.42 (1.50)**	0.96			(27)
Walls			218.10	0.22	47.98	17.00	3707.70	(29)
Floors			95.40	0.20	19.08	20.00	1908.00	(28)
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	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	377.89	(31)
Fabric heat loss, W/K	99.27	(33)
Heat capacity	7414.60	(34)
Thermal mass parameter, kJ/m²K	77.72	(35)
Effect of thermal bridges	56.68	(36)
Total fabric heat loss	155.95	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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

198.45 (39)

Heat loss parameter (HLP), W/m²K

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 (average) 2.08 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.69 (42)

Annual average hot water usage in litres per day Vd,average 98.15 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each 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 content of hot water 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 content (annual) 1547.99 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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 gains from water heating, kWh/month												
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)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
88.85	86.58	81.86	74.79	69.95	63.41	58.43	65.49	68.43	75.72	83.22	86.59	(72)
Total internal gains												
634.57	629.79	605.93	568.22	529.45	494.78	475.00	484.57	506.65	544.58	586.02	617.51	(73)

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	0.72 x 0.70	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

6. Solar gains (calculation for January)

	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	0.72 x 0.70	0.77	2.7336	
Total solar gains, January				136.39	(83-1)

Solar gains

136.39	249.66	370.80	519.85	619.69	646.34	626.97	550.92	431.67	295.45	166.75	114.41	(83)

Total gains

770.96	879.46	976.73	1088.08	1149.14	1141.12	1101.97	1035.49	938.32	840.03	752.76	731.92	(84)

Lighting calculations

	Area	g	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 - 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 (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 (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 (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 (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 1.22	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 0.68	0.80	0.70 x 0.83	0.28

GL = 6.98 / 95.40 = 0.073
C1 = 0.500
C2 = 0.985
El = 402

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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
Utilisation factor for gains for living area											
0.93	0.91	0.88	0.84	0.77	0.66	0.53	0.55	0.73	0.85	0.92	0.94 (86)
Mean internal temperature in living area T1											
17.89	18.10	18.59	19.08	19.73	20.25	20.58	20.57	20.10	19.34	18.43	17.94 (87)
Temperature during heating periods in rest of dwelling Th2											
19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29 (88)
Utilisation factor for gains for rest of dwelling											
0.92	0.90	0.86	0.81	0.71	0.56	0.36	0.38	0.65	0.82	0.90	0.92 (89)
Mean internal temperature in the rest of dwelling T2											
16.56	16.77	17.24	17.72	18.34	18.80	19.05	19.04	18.69	17.98	17.10	16.61 (90)

Living area fraction (25.80 / 95.40) 0.27 (91)

Mean internal temperature (for the whole dwelling)

16.92	17.13	17.61	18.09	18.71	19.19	19.47	19.46	19.07	18.35	17.46	16.97 (92)

Apply adjustment to the mean internal temperature, where appropriate

16.92	17.13	17.61	18.09	18.71	19.19	19.47	19.46	19.07	18.35	17.46	16.97 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.90	0.88	0.84	0.78	0.69	0.56	0.39	0.40	0.63	0.79	0.88	0.90 (94)
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 (95)
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 (96)
Heat loss rate for mean internal temperature											
2464.8	2407.4	2144.5	1863.39	1391.71	911.63	509.07	507.21	947.01	1497.64	2075.5	2395.8 (97)
Space heating requirement for each month, kWh/month											
1317.92	1099.92	987.74	729.70	448.01	-	-	-	-	620.00	1018.83	1290.98

Total space heating requirement per year (kWh/year) (October to May) 7513.09 (98)

Space heating requirement per m² (kWh/m²/year) 78.75 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1317.92	1099.92	987.74	729.70	448.01	-	-	-	-	620.00	1018.83	1290.98	(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)												
1405.03	1172.62	1053.02	777.93	477.63	-	-	-	-	660.98	1086.17	1376.31	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												81.50 (216)
91.88	91.79	91.52	91.15	90.09	81.50	81.50	81.50	81.50	90.69	91.60	91.89	(217)
Water heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	8009.69	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2406.10	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	70.39	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	245.39	(231)
Electricity for lighting (100.00% fixed LEL)	401.76	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1073.000 x 0.800	734.790	
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	
	734.790	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	10328.16	(238)

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

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	0.000	0.000	0.00	(241)
Water heating				
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	401.761	11.460	46.04	(250)
Additional standing charges			106.00	(251)
Electricity generated - PVs	734.790	11.460	-84.21	(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			418.85	(255)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	1.40	(257)
SAP value	80.44	
SAP rating	**80**	(258)
SAP band	**C**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**21.05**	(273)
EI value	80.83	(273a)
EI rating	**81**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Top-floor flat		
Plot number	11		
Reference			
Date	4 July 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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area	95.40			(4)
Dwelling volume (m^3)			257.58	(5)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	3	x 10	30.00	(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 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

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.71	0.67	0.67	0.59	0.54	0.51	0.48	0.48	0.55	0.59	0.63	0.67

7.09 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.75	0.72	0.72	0.67	0.64	0.63	0.62	0.62	0.65	0.67	0.70	0.72	(25)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**22.000**	**1.85 (2.00)**	40.74	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			210.94	0.35	73.83	(29)
Floors			95.40	0.25	23.85	(28)
Pitched roofs insulated between rafters			47.70	0.16	7.63	(30)
Party wall			7.30	0.00	0.00	
Internal ceiling			95.40	0.00	0.00	

Total area of external elements Sigma A, m²	377.89	(31)
Fabric heat loss, W/K	149.75	(33)
Heat capacity	3706.90	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	41.57	(36)
Total fabric heat loss	191.32	(37)

Ventilation heat loss calculated monthly

63.77	61.47	61.47	57.27	54.76	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	
											248.88	(39)

Heat loss parameter (HLP), W/m²K

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)											2.61	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.69 (42)

Annual average hot water usage in litres per day Vd,average 103.32 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
113.65	109.52	105.38	101.25	97.12	92.99	92.99	97.12	101.25	105.38	109.52	113.65	(44)
Energy content of hot water used												
168.94	147.76	152.47	132.93	127.55	110.06	101.99	117.04	118.43	138.02	150.66	163.61	

Energy content (annual) 1629.46 (45)

Distribution loss												
25.34	22.16	22.87	19.94	19.13	16.51	15.30	17.56	17.77	20.70	22.60	24.54	(46)

Hot water storage volume (litres) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss												
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 heat required for water heating calculated for each month												
265.28	234.77	248.81	226.16	223.88	203.29	198.33	213.37	211.66	234.36	243.89	259.95	(62)
Output from water heater for each month, kWh/month												
265.28	234.77	248.81	226.16	223.88	203.29	198.33	213.37	211.66	234.36	243.89	259.95	(64)

2763.75 (64)

Heat gains from water heating, kWh/month												
133.24	118.74	127.77	118.78	119.48	111.18	110.98	115.98	113.96	122.96	124.68	131.47	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
179.09	176.70	171.73	164.97	160.59	154.42	149.17	155.89	158.28	165.27	173.16	176.71	(72)
Total internal gains												
538.84	534.81	517.09	489.88	462.82	437.82	422.65	431.00	446.15	473.59	504.16	526.53	(73)

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 22.000	19.87	0.72 x 0.70	0.77	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 Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 22.00	0.80	0.70 x 0.83	9.20

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.96	0.92	0.83	0.68	0.45	0.49	0.80	0.94	0.98	0.99	(94)
Useful gains												
683.30	814.46	951.69	1098.53	1099.02	907.84	584.91	574.52	804.51	784.38	681.38	645.33	(95)
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	(96)
Heat loss rate for mean internal temperature												
3207.6	3109.7	2771.5	2385.7	1772.72	1153.67	631.32	629.28	1199.19	1902.30	2659.3	3096.4	(97)
Space heating requirement for each month, kWh/month												
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) 10281.81 (98)

Space heating requirement per m² (kWh/m²/year) 107.78 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system												0.1000	(201)
Fraction of space heat from main system(s)												0.9000	(202)
Efficiency of main heating system												78.90%	(206)
Efficiency of secondary heating system												100.00%	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1878.05	1542.38	1353.91	926.80	501.23	-	-	-	-	831.74	1424.09	1823.61		(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)													
2142.3	1759.37	1544.39	1057.18	571.75	-	-	-	-	948.75	1624.43	2080.2		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
187.81	154.24	135.39	92.68	50.12	-	-	-	-	83.17	142.41	182.36		(215)
Water heating													
Water heating requirement													
265.28	234.77	248.81	226.16	223.88	203.29	198.33	213.37	211.66	234.36	243.89	259.95		(64)
Efficiency of water heater												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)
Water heating fuel													
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)
Annual totals												kWh/year	
Space heating fuel used, main system 1												11728.30	(211)
Space heating fuel (secondary)												1028.18	(215)
Water heating fuel												3724.58	(219)
Electricity for pumps, fans and electric keep-hot													
central heating pump												130.00	(230c)
boiler with a fan-assisted flue												45.00	(230e)
Total electricity for the above, kWh/year												175.00	(231)
Electricity for lighting (30.00% fixed LEL)												665.57	(232)
Energy saving/generation technologies													
Appendix Q -													
Energy saved or generated ():												0.000	(236a)
Energy used ():												0.000	(237a)
Total delivered energy for all uses												17321.63	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**36.75**	(272a)
Emissions per m² for lighting	**2.94**	(272b)
Emissions per m² for pumps and fans	**0.77**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**24.67**	(273)

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

Project Information

Building type	Top-floor flat		
Plot number	11		
Reference			
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 (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	95.40	2.70	257.58	(3a)
Total floor area	95.40			(4)
Dwelling volume (m^3)			257.58	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (NorthWest) Window			**0.680**	**1.42 (1.50)**	0.96			(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			218.10	0.22	47.98	17.00	3707.70	(29)
Floors			95.40	0.20	19.08	20.00	1908.00	(28)
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	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	377.89	(31)
Fabric heat loss, W/K	99.27	(33)
Heat capacity	7414.60	(34)
Thermal mass parameter, kJ/m²K	77.72	(35)
Effect of thermal bridges	56.68	(36)
Total fabric heat loss	155.95	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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

198.45 (39)

Heat loss parameter (HLP), W/m²K

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 (average) 2.08 (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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.69 (42)

Annual average hot water usage in litres per day Vd,average 98.15 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each 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 content of hot water 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 content (annual) 1547.99 (45)

Distribution loss												
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 water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each month												
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 from water heater for each month, kWh/month												
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 gains from water heating, kWh/month												
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)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
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	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
88.85	86.58	81.86	74.79	69.95	63.41	58.43	65.49	68.43	75.72	83.22	86.59	(72)
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	(73)

6. Solar gains (calculation for January)

	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	0.72 x 0.70	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

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	0.72 x 0.70	0.77	17.3523

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (NorthWest) 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 (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

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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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	
Utilisation factor for gains for living 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	(86)
Mean internal temperature in living area T1												
17.69	17.91	18.42	18.94	19.63	20.18	20.54	20.52	20.01	19.19	18.25	17.74	(87)
Temperature during heating periods in rest of dwelling Th2												
19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	19.29	(88)
Utilisation factor for gains for rest of dwelling												
0.95	0.93	0.90	0.85	0.75	0.61	0.41	0.43	0.70	0.86	0.93	0.95	(89)
Mean internal temperature in the rest of dwelling T2												
16.37	16.59	17.08	17.60	18.25	18.75	19.03	19.03	18.62	17.85	16.93	16.42	(90)

Living area fraction (25.80 / 95.40) 0.27 (91)

Mean internal temperature (for the whole dwelling)

16.72	16.95	17.45	17.96	18.62	19.14	19.44	19.43	19.00	18.21	17.28	16.78	(92)

Apply adjustment to the mean internal temperature, where appropriate

16.72	16.95	17.45	17.96	18.62	19.14	19.44	19.43	19.00	18.21	17.28	16.78	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.93	0.91	0.87	0.82	0.73	0.60	0.43	0.45	0.68	0.84	0.91	0.94	(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	(95)
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	(96)
Heat loss rate for mean internal temperature												
2425.7	2370.7	2112.6	1837.64	1373.75	901.18	504.61	502.13	932.11	1471.41	2040.9	2357.3	(97)
Space heating requirement for each month, kWh/month												
1409.18	1176.41	1060.44	785.90	488.65	-	-	-	-	679.14	1096.32	1381.01	

Total space heating requirement per year (kWh/year) (October to May) 8077.04 (98)

Space heating requirement per m² (kWh/m²/year) 84.66 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1409.18	1176.41	1060.44	785.90	488.65	-	-	-	-	679.14	1096.32	1381.01	(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)												
1502.33	1254.16	1130.54	837.85	520.95	-	-	-	-	724.03	1168.78	1472.29	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												81.50 (216)
91.99	91.90	91.64	91.31	90.31	81.50	81.50	81.50	81.50	90.90	91.73	91.99	(217)
Water heating fuel												
229.87	202.82	213.66	190.26	186.23	181.75	174.12	194.11	196.25	200.31	209.79	224.35	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	8610.92	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2403.51	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	70.39	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	245.39	(231)
Electricity for lighting (100.00% fixed LEL)	401.76	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1073.000 x 0.800	734.790	
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	
	734.790	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	10926.79	(238)

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**22.29**	(273)

Project Information

Building type	Top-floor flat		
Plot number	12		
Reference			
Date	4 July 2016		
Client	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 (m^2)	**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)

2. Ventilation rate

			m³ per hour	
	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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.00	(8)
Pressure test, result q50		4.00		(17)
Air permeability			0.20	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (SouthWest) Window			**1.770**	**1.42 (1.50)**	2.50			(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) Roof window			**0.950**	**1.42 (1.50)**	1.34			(27)
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			50.40	0.22	11.09	17.00	856.80	(29)
Ground floors			126.30	0.20	25.26	75.00	9472.50	(28)
Pitched roofs insulated between rafters			63.15	0.18	11.37	9.00	568.35	(30)
Party wall			37.20	0.00	0.00	70.00	2604.00	
Internal ceiling			63.15	0.00	0.00	9.00	568.35	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	258.12	(31)
Fabric heat loss, W/K	73.57	(33)
Heat capacity	14070.00	(34)
Thermal mass parameter, kJ/m²K	111.40	(35)
Effect of thermal bridges	38.72	(36)
Total fabric heat loss	112.29	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											168.55	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.33	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.88 (42)

Annual average hot water usage in litres per day Vd,average 102.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(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 (45)

Distribution loss												
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 storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each 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	(62)
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)

2208.83 (64)

Heat gains from water heating, kWh/month												
68.58	60.35	63.14	56.27	54.46	47.78	45.49	50.99	51.48	58.36	62.13	66.82	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic 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	(66)
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	(67)
Appliances gains												
437.62	442.16	430.71	406.35	375.60	346.70	327.39	322.85	334.29	358.65	389.41	418.31	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
Total internal gains												
721.81	716.24	688.40	645.19	599.95	559.80	537.20	547.77	573.65	617.09	665.23	702.05	(73)

6. Solar gains (calculation for January)

	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	0.72 x 0.70	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

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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
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												
0.95	0.92	0.88	0.81	0.69	0.53	0.33	0.35	0.61	0.82	0.93	0.95	(89)
Mean internal temperature in the rest of dwelling T2												
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)

Living area fraction (26.11 / 126.30) 0.21 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate

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)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.94	0.91	0.86	0.80	0.68	0.53	0.35	0.36	0.61	0.81	0.91	0.94	(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	(95)
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	(96)
Heat loss rate for mean internal temperature												
2335.2	2285.9	2041.4	1776.12	1331.49	881.50	510.21	509.70	921.94	1441.00	1976.22	2270.5	(97)
Space heating requirement for each month, kWh/month												
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) 5599.15 (98)

Space heating requirement per m² (kWh/m²/year) 44.33 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1067.74	843.02	704.49	474.31	247.24	-	-	-	-	410.82	795.56	1055.96	(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)												
1138.32	898.74	751.06	505.66	263.58	-	-	-	-	437.98	848.15	1125.76	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												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 heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	5969.24	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2517.78	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	93.19	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	268.19	(231)
Electricity for lighting (100.00% fixed LEL)	488.30	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1073.000 x 1.000	918.488	
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	
	918.488	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	8325.03	(238)

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	0.000	0.000	0.00	(241)
Water heating				
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)

11a. SAP rating

Energy cost deflator	0.47	(256)
Energy cost factor (ECF)	0.96	(257)
SAP value	86.58	
SAP rating	**87**	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
CO2 emissions per m²	**12.55**	(273)
EI value	87.60	(273a)
EI rating	**88**	(274)
EI band	**B**	

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

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (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)

Project Information

Building type	Top-floor flat		
Plot number	12		
Reference			
Date	4 July 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 (m^2)	**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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
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	3	x 10	30.00	(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 hour	
Infiltration due to chimneys, fans and flues			0.09	(8)
Pressure test, result q50		10.00		(17)
Air permeability			0.59	(18)
Number of sides on which sheltered			2.00	(19)
Shelter factor			0.85	(20)
Infiltration rate incorporating shelter factor			0.50	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.67	0.64	0.64	0.56	0.51	0.49	0.46	0.46	0.52	0.56	0.60	0.64

6.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing			**29.725**	**1.85 (2.00)**	55.05	(27)
Solid door - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Door			**1.850**	**2.00**	3.70	(26)
Walls			34.08	0.35	11.93	(29)
Ground floors			126.30	0.25	31.57	(28)
Pitched roofs insulated between rafters			66.16	0.16	10.59	(30)
Party wall			37.20	0.00	0.00	
Internal ceiling			63.15	0.00	0.00	

Total area of external elements Sigma A, m²	258.12	(31)
Fabric heat loss, W/K	112.84	(33)
Heat capacity	13240.29	(34)
Thermal mass parameter, kJ/m²K	250.00	(35)
Effect of thermal bridges	28.39	(36)
Total fabric heat loss	141.23	(37)

Ventilation heat loss calculated monthly

81.88	79.11	79.11	74.05	71.03	69.63	68.29	68.29	71.76	74.05	76.50	79.11	(38)

Heat transfer coefficient, W/K

223.11	220.34	220.34	215.28	212.26	210.86	209.52	209.52	212.99	215.28	217.73	220.34	
											215.63	(39)

Heat loss parameter (HLP), W/m²K

1.77	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)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.88 (42)

Annual average hot water usage in litres per day Vd,average 108.12 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
118.93	114.60	110.28	105.96	101.63	97.31	97.31	101.63	105.96	110.28	114.60	118.93	(44)
Energy content of hot water 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 content (annual) 1705.18 (45)

Distribution loss

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) 150.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0191 (51)

Volume factor 0.9283 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.44 (55)

Total storage 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	(56)

Net storage 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 circuit loss (annual) 610.00 (58)

Primary loss

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 heat required for water heating calculated for each month

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 from water heater for each month, kWh/month

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)

2839.47 (64)

Heat gains from water heating, kWh/month

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)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

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	(66)
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	(67)
Appliances gains												
293.20	296.25	288.58	272.26	251.65	232.29	219.35	216.31	223.98	240.30	260.90	280.27	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
Water heating gains												
182.60	180.09	174.89	167.83	163.24	156.78	151.29	158.32	160.82	168.14	176.40	180.10	(72)
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	(73)

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 29.725	19.87	0.72 x 0.70	0.77	206.3192	
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	
Total solar gains, January					206.32	(83-1)

Solar gains

206.32	399.91	639.18	949.03	1154.70	1204.87	1169.46	1017.81	764.16	487.01	256.51	170.19	(83)
Total gains												
802.83	991.98	1211.02	1489.68	1664.02	1685.54	1632.94	1490.25	1254.14	1008.42	812.92	752.51	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (East/West) Reference Glazing	0.9 x 29.72	0.80	0.70 x 0.83	12.43

GL = 12.43 / 126.30 = 0.098
C1 = 0.850
C2 = 0.960
El = 785

SAP 2009 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 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												
3.62	3.65	3.65	3.72	3.75	3.77	3.79	3.79	3.75	3.72	3.69	3.65	
Utilisation factor for gains for living 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 internal temperature in living area T1												
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)
Temperature during heating periods in rest of dwelling Th2												
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)
Utilisation factor for gains for rest of dwelling												
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 internal temperature in the rest of dwelling T2												
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)

Living area fraction (26.11 / 126.30) 0.21 (91)

Mean internal temperature (for the whole dwelling)

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 adjustment to the mean internal temperature, where appropriate												
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.99	0.97	0.91	0.79	0.60	0.37	0.41	0.75	0.95	0.99	0.99	(94)
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	(95)
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	(96)
Heat loss rate for mean internal temperature												
3025.4	2928.3	2619.5	2251.0	1674.63	1096.24	620.36	619.77	1150.12	1803.96	2502.8	2912.6	(97)
Space heating requirement for each month, kWh/month												
1657.21	1309.69	1077.61	639.44	265.18	-	-	-	-	632.61	1223.03	1610.07	

Total space heating requirement per year (kWh/year) (October to May) 8414.83 (98)

Space heating requirement per m² (kWh/m²/year) 66.63 (99)

SAP 2009 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									78.90%				(206)
Efficiency of secondary heating system									100.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1657.21	1309.69	1077.61	639.44	265.18	-	-	-	-	632.61	1223.03	1610.07		(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)													
1890.35	1493.95	1229.21	729.40	302.48	-	-	-	-	721.61	1395.09	1836.58		(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		(212)
Space heating 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 energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
165.72	130.97	107.76	63.94	26.52	-	-	-	-	63.26	122.30	161.01		(215)
Water heating													
Water heating requirement													
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)
Efficiency of water heater												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 heating fuel													
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	
Space heating fuel used, main system 1	9598.66	(211)
Space heating fuel (secondary)	841.48	(215)
Water heating fuel	3845.09	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (30.00% fixed LEL)	784.77	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	15245.01	(238)

10a. Does not apply

11a. Does not apply

SAP 2009 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
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/year	
Emissions per m² for space and water heating	**24.05**	(272a)
Emissions per m² for lighting	**2.62**	(272b)
Emissions per m² for pumps and fans	**0.58**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**16.65**	(273)

= [(24.0463 x 1.0000 x 1.0206) + (2.6221 x 1.2251)] x 0.6000

Project Information

Building type	Top-floor flat		
Plot number	12		
Reference			
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 (m^2)	**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)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
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	0	x 10	0.00	(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 hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	4.00		(17)
Air permeability		0.20	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.17	(21)

Infiltration rate modified for monthly wind speed

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 (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

13.53 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.23	0.22	0.22	0.19	0.17	0.17	0.16	0.16	0.18	0.19	0.20	0.22

2.30 (22b)

Ventilation : Mechanical whole house extract ventilation

Effective air change rate

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)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	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, low-E, En=0.2, hard coat (SouthWest) Window			**4.470**	**1.42 (1.50)**	6.33			(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) Roof window			**2.060**	**1.42 (1.50)**	2.92			(27)
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			50.40	0.22	11.09	17.00	856.80	(29)
Ground floors			126.30	0.20	25.26	75.00	9472.50	(28)
Pitched roofs insulated between rafters			63.15	0.18	11.37	9.00	568.35	(30)
Party wall			37.20	0.00	0.00	70.00	2604.00	
Internal ceiling			63.15	0.00	0.00	9.00	568.35	

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K

Total area of external elements Sigma A, m²	258.12	(31)
Fabric heat loss, W/K	73.57	(33)
Heat capacity	14070.00	(34)
Thermal mass parameter, kJ/m²K	111.40	(35)
Effect of thermal bridges	38.72	(36)
Total fabric heat loss	112.29	(37)

Ventilation heat loss calculated monthly

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 transfer coefficient, 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	
											168.55	(39)

Heat loss parameter (HLP), W/m²K

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 (average)											1.33	(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

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.88 (42)

Annual average hot water usage in litres per day Vd,average 102.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day 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	(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 (45)

Distribution loss												
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 storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage 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	(56)
Net storage 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 circuit loss (annual) 0.00 (58)

Primary 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	(59)
Combi loss calculated for each month												
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 heat required for water heating calculated for each 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	(62)
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)

2208.83 (64)

Heat gains from water heating, kWh/month												
68.58	60.35	63.14	56.27	54.46	47.78	45.49	50.99	51.48	58.36	62.13	66.82	(65)

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	(66)
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	(67)
Appliances gains												
293.20	296.25	288.58	272.26	251.65	232.29	219.35	216.31	223.98	240.30	260.90	280.27	(68)
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	(69)
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	(70)
Losses e.g. evaporation (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	(71)
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	(72)
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	(73)

6. Solar gains (calculation for January)

	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	0.72 x 0.70	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

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

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
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 internal temperature in living area T1											
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 internal temperature in the rest of dwelling T2											
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)

Living area fraction (26.11 / 126.30) 0.21 (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 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)

8. Space heating requirement

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 (94)
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 (95)
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 (96)
Heat loss rate for mean internal temperature											
2303.0	2256.4	2016.8	1757.59	1320.37	876.55	508.78	508.02	913.89	1421.92	1948.08	2238.7 (97)
Space heating requirement for each month, kWh/month											
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) 6322.65 (98)

Space heating requirement per m² (kWh/m²/year) 50.06 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.80%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
1190.96	943.86	797.00	541.76	289.94	-	-	-	-	482.42	898.83	1177.87	(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)												
1269.68	1006.25	849.68	577.57	309.10	-	-	-	-	514.30	958.24	1255.73	(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	(212)
Space heating 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 energy saved (secondary heating system)												
0.00	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	0.00	(215)
Water heating												
Water heating requirement												
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)
Efficiency of water heater												81.50 (216)
91.65	91.46	91.02	90.38	88.74	81.50	81.50	81.50	81.50	89.99	91.30	91.68	(217)
Water heating fuel												
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)

Annual totals	kWh/year	
Space heating fuel used, main system 1	6740.56	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2512.12	(219)
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.2240)	93.19	(230a)
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	268.19	(231)
Electricity for lighting (100.00% fixed LEL)	488.30	(232)
Energy saving/generation technologies		
PVs 0.80 x 1.070 x 1073.000 x 1.000	918.488	
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	
	918.488	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	9090.68	(238)

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

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	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)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**13.76**	(273)

252 Finchley Road SAP Calculation Review Table

Apartment	Target Emissions Rate (TER)	Building Emissions Rate (BER)	% Reduction
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