

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Adrian Fell	Assessor number	3536
Client		Last modified	24/05/2019
Address	B7-A-00-H4 West Cromwell Road, Kensington, London, W14 8		

1. Overall dwelling dimensions

	Area (m ²)		Average storey height (m)		Volume (m ³)
Lowest occupied	41.00 (1a)	x	2.50 (2a)	=	102.50 (3a)
+1	41.00 (1b)	x	3.35 (2b)	=	137.35 (3b)
+2	53.00 (1c)	x	3.33 (2c)	=	176.49 (3c)
+3	36.00 (1d)	x	3.33 (2d)	=	119.88 (3d)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) = 171.00 (4)				
Dwelling volume	(3a) + (3b) + (3c) + (3d)...(3n) = 536.22 (5)				

2. Ventilation rate

			m ³ per hour
Number of chimneys	0	x 40 =	0 (6a)
Number of open flues	0	x 20 =	0 (6b)
Number of intermittent fans	4	x 10 =	40 (7a)
Number of passive vents	0	x 10 =	0 (7b)
Number of flueless gas fires	0	x 40 =	0 (7c)

			Air changes per hour
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) = 40	÷ (5) =	0.07 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q ₅₀ , expressed in cubic metres per hour per square metre of envelope area	5.00 (17)
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If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.32 (18)
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Number of sides on which the dwelling is sheltered	2 (19)
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Shelter factor	1 - [0.075 x (19)] = 0.85 (20)
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Infiltration rate incorporating shelter factor	(18) x (20) = 0.28 (21)
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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 U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18
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Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.35	0.34	0.34	0.30	0.30	0.26	0.26	0.26	0.28	0.30	0.31	0.32
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Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	N/A (23a)
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If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	N/A (23c)
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d) natural ventilation or whole house positive input ventilation from loft

0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)
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Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)

0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)
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3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	κ-value, kJ/m ² .K	A x κ, kJ/K
Window			40.83	x 1.33	= 54.13		(27)
Door			1.89	x 1.00	= 1.89		(26)
Exposed floor			12.00	x 0.13	= 1.56		(28b)
Ground floor			41.00	x 0.13	= 5.33		(28a)
External wall			345.39	x 0.18	= 62.17		(29a)
Party wall			30.51	x 0.00	= 0.00		(32)
Roof			53.00	x 0.13	= 6.89		(30)
Total area of external elements ΣA, m ²			494.11				(31)
Fabric heat loss, W/K = Σ(A x U)						(26)...(30) + (32) =	131.97 (33)
Heat capacity Cm = Σ(A x κ)						(28)...(30) + (32) + (32a)...(32e) =	N/A (34)
Thermal mass parameter (TMP) in kJ/m ² K							250.00 (35)
Thermal bridges: Σ(L x Ψ) calculated using Appendix K							31.23 (36)
Total fabric heat loss						(33) + (36) =	163.20 (37)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

99.43	99.00	98.58	96.63	96.26	94.55	94.55	94.24	95.21	96.26	97.00	97.78	(38)
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Heat transfer coefficient, W/K (37)m + (38)m

262.62	262.20	261.78	259.82	259.46	257.75	257.75	257.44	258.41	259.46	260.20	260.97	
Average = Σ(39)1...12/12 =											259.82	(39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

1.54	1.53	1.53	1.52	1.52	1.51	1.51	1.51	1.51	1.52	1.52	1.53	
Average = Σ(40)1...12/12 =											1.52	(40)

Number of days in month (Table 1a)

31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
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4. Water heating energy requirement

Assumed occupancy, N

2.96 (42)

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

104.59 (43)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

115.05	110.87	106.68	102.50	98.32	94.13	94.13	98.32	102.50	106.68	110.87	115.05	
Σ(44)1...12 =											1255.11	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

170.62	149.22	153.99	134.25	128.82	111.16	103.00	118.20	119.61	139.39	152.16	165.24	
Σ(45)1...12 =											1645.65	(45)

Distribution loss 0.15 x (45)m

25.59	22.38	23.10	20.14	19.32	16.67	15.45	17.73	17.94	20.91	22.82	24.79	(46)
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Storage volume (litres) including any solar or WWHRS storage within same vessel

4.00 (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day)

0.28 (48)

Temperature factor from Table 2b

0.54 (49)

Energy lost from water storage (kWh/day) (48) x (49)

0.15 (50)

Enter (50) or (54) in (55)

0.15

(55)

Water storage loss calculated for each month (55) x (41)m

4.67	4.22	4.67	4.52	4.67	4.52	4.67	4.67	4.52	4.67	4.52	4.67
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(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

4.67	4.22	4.67	4.52	4.67	4.52	4.67	4.67	4.52	4.67	4.52	4.67
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(57)

Primary circuit loss for each month from Table 3

23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26
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(59)

Combi loss for each month from Table 3a, 3b or 3c

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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(61)

Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m

198.56	174.46	181.92	161.28	156.75	138.19	130.94	146.14	146.65	167.33	179.20	193.17
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(62)

Solar DHW input calculated using Appendix G or Appendix H

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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(63)

Output from water heater for each month (kWh/month) (62)m + (63)m

198.56	174.46	181.92	161.28	156.75	138.19	130.94	146.14	146.65	167.33	179.20	193.17
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Σ(64)1...12 =

1974.59

(64)

Heat gains from water heating (kWh/month) 0.25 x [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

79.08	69.80	73.55	66.27	65.18	58.59	56.60	61.65	61.40	68.70	72.22	77.29
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(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Metabolic gains (Table 5)

148.20	148.20	148.20	148.20	148.20	148.20	148.20	148.20	148.20	148.20	148.20	148.20
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(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

30.54	27.13	22.06	16.70	12.48	10.54	11.39	14.80	19.87	25.23	29.44	31.39
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(67)

Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

342.57	346.12	337.17	318.09	294.02	271.40	256.28	252.73	261.68	280.76	304.83	327.45
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(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.82	37.82	37.82	37.82	37.82	37.82	37.82	37.82	37.82	37.82	37.82	37.82
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(69)

Pump and fan gains (Table 5a)

3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
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(70)

Losses e.g. evaporation (Table 5)

-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56	-118.56
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(71)

Water heating gains (Table 5)

106.29	103.87	98.86	92.04	87.61	81.37	76.07	82.86	85.28	92.34	100.31	103.88
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(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

549.86	547.58	528.54	497.29	464.57	433.77	414.20	420.85	437.29	468.78	505.04	533.19
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(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
NorthEast	0.77	x	29.96	x	11.28	x 0.9 x	0.63	x	0.70	=	103.31	(75)
SouthEast	0.77	x	8.68	x	36.79	x 0.9 x	0.63	x	0.70	=	97.60	(77)
NorthWest	0.77	x	2.19	x	11.28	x 0.9 x	0.63	x	0.70	=	7.55	(81)

Solar gains in watts Σ(74)m...(82)m

208.46	391.91	634.04	949.55	1213.22	1270.27	1197.28	990.51	741.72	459.52	256.40	174.06
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(83)

Total gains - internal and solar (73)m + (83)m

758.32	939.50	1162.58	1446.84	1677.79	1704.03	1611.48	1411.36	1179.00	928.30	761.44	707.25
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(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.00	(85)
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Utilisation factor for gains for living area n1,m (see Table 9a)

1.00	1.00	0.99	0.98	0.92	0.79	0.64	0.73	0.93	0.99	1.00	1.00	(86)
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Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

19.14	19.31	19.64	20.11	20.55	20.84	20.95	20.92	20.65	20.08	19.53	19.11	(87)
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Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)

19.66	19.66	19.66	19.67	19.67	19.68	19.68	19.68	19.68	19.67	19.67	19.67	(88)
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Utilisation factor for gains for rest of dwelling n2,m

1.00	1.00	0.99	0.97	0.88	0.69	0.48	0.57	0.87	0.99	1.00	1.00	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

17.20	17.46	17.94	18.62	19.22	19.58	19.66	19.65	19.37	18.59	17.78	17.16	(90)
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Living area fraction

Living area ÷ (4) = 0.22 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

17.63	17.87	18.32	18.95	19.52	19.86	19.95	19.93	19.65	18.92	18.17	17.59	(92)
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Apply adjustment to the mean internal temperature from Table 4e where appropriate

17.63	17.87	18.32	18.95	19.52	19.86	19.95	19.93	19.65	18.92	18.17	17.59	(93)
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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, η_m													
	1.00	1.00	0.99	0.96	0.87	0.70	0.52	0.60	0.87	0.98	1.00	1.00	(94)
Useful gains, $\eta_m G_m$, W (94)m x (84)m													
	757.04	935.62	1148.34	1384.47	1459.67	1196.06	830.30	848.53	1028.71	910.73	758.85	706.35	(95)
Monthly average external temperature from Table U1													
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, L_m , W [(39)m x [(93)m - (96)m]													
	3500.18	3400.21	3093.42	2610.35	2028.10	1354.82	863.26	908.81	1434.54	2158.82	2879.66	3495.10	(97)
Space heating requirement, kWh/month $0.024 \times [(97)m - (95)m] \times (41)m$													
	2040.90	1656.20	1447.14	882.63	422.91	0.00	0.00	0.00	0.00	928.59	1526.99	2074.83	
	$\Sigma(98)_{1...5, 10...12} =$											10980.18	(98)
Space heating requirement kWh/m ² /year	$(98) \div (4)$											64.21	(99)

9a. Energy requirements - individual heating systems including micro-CHP

Space heating

Fraction of space heat from secondary/supplementary system (table 11)

0.00

(201)

Fraction of space heat from main system(s)

1 - (201) =

1.00

(202)

Fraction of space heat from main system 2

0.00

(202)

Fraction of total space heat from main system 1

(202) x [1 - (203)] =

1.00

(204)

Fraction of total space heat from main system 2

(202) x (203) =

0.00

(205)

Efficiency of main system 1 (%)

93.50

(206)

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Space heating fuel (main system 1), kWh/month

2182.78

1771.34

1547.74

943.99

452.32

0.00

0.00

0.00

0.00

993.14

1633.14

2219.07

Σ(211)1...5, 10...12 =

11743.51

(211)

Water heating

Efficiency of water heater

89.44	89.36	89.16	88.66	87.33	79.80	79.80	79.80	79.80	88.68	89.24	89.48	(217)
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Water heating fuel, kWh/month

222.01	195.23	204.03	181.91	179.49	173.17	164.09	183.13	183.77	188.68	200.79	215.89	
$\Sigma(219a)1...12 =$											2292.18	(219)

Annual totals

Space heating fuel - main system 1											11743.51	
Water heating fuel											2292.18	
Electricity for pumps, fans and electric keep-hot (Table 4f)												
central heating pump or water pump within warm air heating unit								30.00				(230c)
boiler flue fan								45.00				(230e)
Total electricity for the above, kWh/year											75.00	(231)
Electricity for lighting (Appendix L)											539.35	(232)
Total delivered energy for all uses											(211)...(221) + (231) + (232)...(237b) =	14650.04 (238)

10a. Fuel costs - individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating - main system 1	11743.51	x	3.48	x 0.01 =	408.67	(240)
Water heating	2292.18	x	3.48	x 0.01 =	79.77	(247)
Pumps and fans	75.00	x	13.19	x 0.01 =	9.89	(249)
Electricity for lighting	539.35	x	13.19	x 0.01 =	71.14	(250)
Additional standing charges					120.00	(251)
Total energy cost				(240)...(242) + (245)...(254) =	689.47	(255)

11a. SAP rating - individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)		1.34	(257)
SAP value		81.30	
SAP rating (section 13)		81	(258)
SAP band		B	

12a. CO₂ emissions - individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO ₂ /kWh		Emissions kg CO ₂ /year	
Space heating - main system 1	11743.51	x	0.216	=	2536.60	(261)
Water heating	2292.18	x	0.216	=	495.11	(264)
Space and water heating				(261) + (262) + (263) + (264) =	3031.71	(265)
Pumps and fans	75.00	x	0.519	=	38.93	(267)
Electricity for lighting	539.35	x	0.519	=	279.92	(268)
Total CO ₂ , kg/year				(265)...(271) =	3350.56	(272)
Dwelling CO ₂ emission rate				(272) ÷ (4) =	19.59	(273)
EI value					79.21	
EI rating (section 14)					79	(274)
EI band					C	

13a. Primary energy - individual heating systems including micro-CHP

	Energy kWh/year		Primary factor		Primary Energy kWh/year	
Space heating - main system 1	11743.51	x	1.22	=	14327.08	(261)
Water heating	2292.18	x	1.22	=	2796.46	(264)

Space and water heating			(261) + (262) + (263) + (264) =	17123.55	(265)
Pumps and fans	75.00	x	3.07	=	230.25 (267)
Electricity for lighting	539.35	x	3.07	=	1655.80 (268)
Primary energy kWh/year					19009.60 (272)
Dwelling primary energy rate kWh/m2/year					111.17 (273)

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