DER WORKSHEET

Dwelling Reference: A01
Dwelling Type: New Dwelling Design Stage

A01
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	92.2	(1a) x	2.6	(2a) =	239.72	(3a)
Total floor area TFA					92.2	(4)
Dwelling volume					239.72	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	19.65		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.22	10142	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	12.74	1188.6	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		196.42	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2766	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.76	(33)
Heat capacity Cm = ∑(A x k)		15603.2	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		169.23	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		9.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		9.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		53.56	(37)

Ventilation heat loss calculated monthly

19.24	19.01	18.78	17.63	17.4	16.25	16.25	16.02	16.71	17.4	17.86	18.32	(38)

Heat transfer coefficient, W/K

72.8	72.57	72.34	71.19	70.97	69.82	69.82	69.59	70.28	70.97	71.42	71.88	(39)

Heat loss parameter (HLP), W/m²K

0.79	0.79	0.78	0.77	0.77	0.76	0.76	0.75	0.76	0.77	0.77	0.78	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		2.65	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

68.73	67.7	66.19	63.31	61.19	58.82	57.47	58.96	60.6	63.15	66.09	68.47	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.68	29.24	28.62	27.47	26.62	25.67	25.15	25.77	26.44	27.46	28.63	29.58	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.82	40.3	38.78	37.25	35.73	34.21	34.21	35.73	37.25	38.78	40.3	41.82	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	129.08	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

140.22	137.23	133.58	128.04	123.54	118.7	116.84	120.47	124.3	129.38	135.01	139.86	1547.16	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

222.08	195.41	205.31	175.28	166.3	145.95	141.3	149.16	153.27	175.56	192.34	218.99	2140.98	(45)

Distribution loss (46) = 0.15 x (45)

33.31	29.31	30.8	26.29	24.95	21.89	21.2	22.37	22.99	26.33	28.85	32.85	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

268.78	237.59	252.01	220.47	213	191.14	188	195.86	198.46	222.26	237.54	265.69	2690.81	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

268.78	237.59	252.01	220.47	213	191.14	188	195.86	198.46	222.26	237.54	265.69	2690.81	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

111.2	98.72	105.63	94.43	92.65	84.68	84.34	86.96	87.12	95.73	100.11	110.17	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

124.58	137.93	124.58	128.73	124.58	128.73	124.58	124.58	128.73	124.58	128.73	124.58		(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

243.07	245.59	239.23	225.7	208.62	192.57	181.84	179.32	185.68	199.21	216.29	232.34		(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27		(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3		(70)

Losses e.g. evaporation (negative values) (Table 5

-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19		(71)

Water heating gains (Table 5)

149.46	146.9	141.97	131.16	124.54	117.61	113.36	116.88	120.99	128.67	139.04	148.08		(72)

Total internal gains

582.93	596.24	571.61	551.42	523.56	501.74	482.61	483.6	498.23	518.28	549.88	570.83		(73)

6. Solar gains

Solar gains in watts, calculated for each month

114.74	195.55	269.74	340.94	390.24	391.69	375.81	337.99	294.03	216.53	137.4	98.23		(83)

Total gains – internal and solar (watts)

697.67	791.79	841.35	892.36	913.8	893.43	858.42	821.58	792.25	734.82	687.29	669.06		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.97	0.95	0.91	0.82	0.68	0.49	0.36	0.39	0.59	0.84	0.95	0.98		(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.08	20.28	20.51	20.78	20.93	20.99	21	21	20.97	20.79	20.41	20.05		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.26	20.26	20.27	20.28	20.28	20.29	20.29	20.29	20.29	20.28	20.28	20.27		(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.97	0.94	0.89	0.79	0.64	0.44	0.3	0.33	0.54	0.81	0.94	0.97		(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.19	19.45	19.73	20.05	20.22	20.28	20.29	20.29	20.27	20.07	19.62	19.16		(90)

Living area fraction 0.34 (91)

Mean internal temperature (for the whole dwelling)

19.49	19.73	20	20.3	20.46	20.52	20.53	20.53	20.5	20.31	19.89	19.46		(92)

Adjusted mean internal temperature:

19.49	19.73	20	20.3	20.46	20.52	20.53	20.53	20.5	20.31	19.89	19.46		(93)

8. Space heating requirement

Utilisation factor for gains,

0.96	0.93	0.89	0.79	0.65	0.46	0.32	0.35	0.55	0.81	0.93	0.97	(94)

Useful gains, mGm , W

669.79	737.85	747.62	707.47	590.38	409.16	273.81	286.57	438.94	593.36	637.9	646.07	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1106	1076.38	976.42	811.31	621.53	413.43	274.34	287.41	450.09	689.31	913.22	1096.91	(97)

Space heating requirement for each month

324.54	227.49	170.23	74.77	23.17	0	0	0	0	71.39	198.23	335.43	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

324.54	227.49	170.23	74.77	23.17	0	0	0	0	71.39	198.23	335.43	(98c)

Space heating requirement in kWh/m²/year 15.46 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
358.61	251.38	188.1	82.62	25.61	0	0	0		0	78.88	219.04	370.64	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
85.32	84.7	83.79	82.26	80.74	79.8	79.8	79.8		79.8	82.16	84.34	85.44	(217)
Fuel for water heating													
315.04	280.52	300.75	268.01	263.82	239.53	235.59	245.44		248.7	270.52	281.65	310.98	3260.54 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1574.86 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			3260.54 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	201.07 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			287.07 (231)
Electricity for lighting			208.91 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5331.38	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.33	(240a)
Low-rate fraction	0		57.33	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.33	(241a)
Low-rate fraction	0		57.33	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.33	(242a)

Low-rate fraction	0		57.33	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		118.68	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		47.34	(249)
Energy For lighting	0		34.45	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		349.8	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.92	(257)
SAP rating		85.12	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			330.72	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			684.71	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1015.44	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		39.82	(267)
Electricity for lighting		30.15	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1085.41	(272)
Dwelling CO2 Emission Rate		11.77	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1779.6	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3684.41	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5464.01	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			434.27	(281)
Electricity for lighting			320.44	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			6218.72	(286)
Dwelling PE Rate			67.45	(287)

TER WORKSHEET

Dwelling Reference: A01
Dwelling Type: New Dwelling Design Stage

A01
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	92.2	(1a) x	2.6	(2a) =	239.72	(3a)
Total floor area TFA					92.2	(4)
Dwelling volume					239.72	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80	=	0 (6a)
Open chimneys	0	x	20	=	0 (6b)
Chimneys / flues attached to closed fire	0	x	10	=	0 (6c)
Flues attached to solid fuel boiler	0	x	20	=	0 (6d)
Flues attached to other heater	0	x	35	=	0 (6e)
Number of blocked chimneys	0	x	20	=	0 (6f)
Number of intermittent extract fans	3	x	10	=	30 (7a)
Number of passive vents	0	x	10	=	0 (7b)
Number of flueless gas fires	0	x	40	=	0 (7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor													0.29	(21)
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34	3.82	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effective air change rate														
	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
Effective air change rate from PCDB:														
	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	19.65		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	11.99	10142	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	15.28	1188.6	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		196.42	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2766	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		49.08	(33)
Heat capacity Cm = ∑(A x k)		15603.2	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		169.23	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		9.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		9.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		58.88	(37)

Ventilation heat loss calculated monthly

44.99	44.78	44.57	43.6	43.42	42.57	42.57	42.41	42.9	43.42	43.79	44.17	(38)

Heat transfer coefficient, W/K

103.87	103.65	103.45	102.48	102.29	101.45	101.45	101.29	101.77	102.29	102.66	103.05	(39)

Heat loss parameter (HLP), W/m²K

1.13	1.12	1.12	1.11	1.11	1.1	1.1	1.1	1.1	1.11	1.11	1.12	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		2.65	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

68.73	67.7	66.19	63.31	61.19	58.82	57.47	58.96	60.6	63.15	66.09	68.47	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.68	29.24	28.62	27.47	26.62	25.67	25.15	25.77	26.44	27.46	28.63	29.58	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.82	40.3	38.78	37.25	35.73	34.21	34.21	35.73	37.25	38.78	40.3	41.82	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	129.08	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

140.22	137.23	133.58	128.04	123.54	118.7	116.84	120.47	124.3	129.38	135.01	139.86	1547.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

222.08	195.41	205.31	175.28	166.3	145.95	141.3	149.16	153.27	175.56	192.34	218.99	2140.98 (45)

Distribution loss (46) = 0.15 x (45)

33.31	29.31	30.8	26.29	24.95	21.89	21.2	22.37	22.99	26.33	28.85	32.85	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

268.68	237.5	251.91	220.37	212.9	191.04	187.9	195.76	198.36	222.16	237.43	265.58	2689.59	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

31.42	27.79	29.1	24.09	22.46	19.22	18.01	19.15	19.88	23.44	26.55	30.84	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

237.26	209.71	222.81	196.28	190.44	171.83	169.89	176.6	178.48	198.72	210.88	234.75	2397.65	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

111.12	98.64	105.54	94.35	92.57	84.6	84.26	86.87	87.04	95.65	100.03	110.09	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	132.73	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

124.58	137.93	124.58	128.73	124.58	128.73	124.58	124.58	128.73	124.58	128.73	124.58		(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

243.07	245.59	239.23	225.7	208.62	192.57	181.84	179.32	185.68	199.21	216.29	232.34		(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27		(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3		(70)

Losses e.g. evaporation (negative values) (Table 5

-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19	-106.19		(71)

Water heating gains (Table 5)

149.35	146.79	141.86	131.05	124.42	117.5	113.25	116.76	120.88	128.56	138.93	147.97		(72)

Total internal gains

582.82	596.13	571.49	551.3	523.45	501.63	482.5	483.49	498.11	518.17	549.77	570.71		(73)

6. Solar gains

Solar gains in watts, calculated for each month

160.63	273.77	377.64	477.32	546.34	548.37	526.14	473.18	411.64	303.15	192.37	137.52		(83)

Total gains – internal and solar (watts)

743.45	869.9	949.13	1028.63	1069.79	1049.99	1008.63	956.67	909.75	821.32	742.14	708.24		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.98	0.96	0.93	0.86	0.74	0.58	0.43	0.47	0.68	0.88	0.96	0.98		(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.42	19.69	20.03	20.44	20.75	20.93	20.98	20.98	20.87	20.46	19.87	19.37		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.98	19.98	19.98	19.99	19.99	20	20	20	20	19.99	19.99	19.99		(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.97	0.95	0.91	0.83	0.69	0.5	0.34	0.38	0.61	0.85	0.95	0.98		(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.15	18.49	18.92	19.42	19.78	19.96	19.99	19.99	19.9	19.46	18.74	18.1		(90)

Living area fraction 0.34 (91)

Mean internal temperature (for the whole dwelling)

18.58	18.9	19.29	19.76	20.11	20.29	20.33	20.32	20.23	19.8	19.12	18.53		(92)

Adjusted mean internal temperature:

18.58	18.9	19.29	19.76	20.11	20.29	20.33	20.32	20.23	19.8	19.12	18.53		(93)

8. Space heating requirement

Utilisation factor for gains,

0.96	0.94	0.9	0.82	0.7	0.52	0.37	0.41	0.63	0.84	0.94	0.97	(94)

Useful gains, mGm , W

715.2	814.98	853.62	846.21	747.61	549.37	372.72	389.47	568.85	692.35	695.6	685.02	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1483.22	1450.86	1323.18	1113.35	859.99	576.8	378.19	397.47	623.72	941.15	1234.17	1476.32	(97)

Space heating requirement for each month

571.4	427.31	349.35	192.35	83.61	0	0	0	0	185.11	387.77	588.73	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

571.4	427.31	349.35	192.35	83.61	0	0	0	0	185.11	387.77	588.73	(98c)

Space heating requirement in kWh/m²/year 30.21 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
619.07	462.96	378.5	208.39	90.59	0	0	0		0	200.55	420.11	637.84		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.96	85.62	85.06	84.01	82.35	79.8	79.8	79.8		79.8	83.9	85.41	86.03		(217)
Fuel for water heating														
276.02	244.93	261.93	233.62	231.27	215.32	212.89	221.31		223.66	236.85	246.92	272.85	2877.58	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													3018.02	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2877.58	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													208.91	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

17.28	26.05	40.01	48.16	54.75	52.13	51.48	47.18	40.14	31.13	19.58	14.75	442.63	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

5.22	11.31	23.09	35.62	48.05	48.64	48.08	40.28	28.96	16.48	7.07	4.11	316.9	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		5430.98	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		109.86	(240a)
Low-rate fraction	0		109.86	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		109.86	(241a)
Low-rate fraction	0		109.86	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		109.86	(242a)

Low-rate fraction	0		109.86	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		104.74	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		34.45	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-90.69	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		264.54	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.69	(257)
SAP rating		88.75	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			633.78	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			604.29	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1238.08	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		30.15	(268)
energy saved or generated	0	-98.61	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1181.54	(272)
Dwelling CO2 Emission Rate		12.82	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			3410.36	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3251.67	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			6662.03	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			320.44	(282)
energy saved or generated	0		-806.05	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			6306.51	(286)
Dwelling PE Rate			68.4	(287)

DER WORKSHEET

Dwelling Reference: A02
Dwelling Type: New Dwelling Design Stage

A02
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	16.01		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.34	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.43	1066.8	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		165.74	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		36.94	(33)
Heat capacity Cm = ∑(A x k)		5854.6	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		79.76	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.3	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.3	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		45.24	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

61.46	61.26	61.06	60.05	59.85	58.85	58.85	58.65	59.25	59.85	60.25	60.66	(39)

Heat loss parameter (HLP), W/m²K

0.84	0.83	0.83	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

104.79	116.01	104.79	108.28	104.79	108.28	104.79	104.79	108.28	104.79	108.28	104.79		(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05		(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63		(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3		(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03		(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23		(72)

Total internal gains

512.27	523.27	502.14	484.27	460.28	440.86	424.4	425.51	438.15	456.14	483.58	501.95		(73)

6. Solar gains

Solar gains in watts, calculated for each month

80.38	146.16	219.89	298.27	352.19	356.14	340.76	300.51	247.54	167.35	98.07	67.57		(83)

Total gains – internal and solar (watts)

592.65	669.43	722.03	782.54	812.46	797	765.16	726.01	685.69	623.49	581.65	569.52		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.86	0.8	0.71	0.59	0.44	0.33	0.36	0.53	0.74	0.85	0.9		(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.21	19.51	19.9	20.38	20.71	20.91	20.97	20.96	20.84	20.41	19.76	19.17		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.22	20.22	20.23	20.24	20.24	20.25	20.25	20.25	20.25	20.24	20.24	20.23		(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.84	0.79	0.68	0.55	0.4	0.28	0.3	0.49	0.71	0.84	0.89		(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.12	18.49	18.97	19.56	19.95	20.17	20.23	20.23	20.1	19.61	18.82	18.07		(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.52	18.87	19.32	19.86	20.23	20.44	20.5	20.5	20.37	19.9	19.16	18.48		(92)

Adjusted mean internal temperature:

18.52	18.87	19.32	19.86	20.23	20.44	20.5	20.5	20.37	19.9	19.16	18.48		(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.76	0.67	0.55	0.41	0.29	0.32	0.49	0.69	0.81	0.87	(94)

Useful gains, mGm , W

507.78	547.1	551.61	524.74	448.64	325.26	224.47	233.38	338.39	433.07	472.65	493.3	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

873.88	855.58	782.5	658.16	510.58	343.94	229.79	240.38	371.65	556.76	726.93	865.92	(97)

Space heating requirement for each month

272.38	207.3	171.79	96.06	46.08	0	0	0	0	92.03	183.08	277.23	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

272.38	207.3	171.79	96.06	46.08	0	0	0	0	92.03	183.08	277.23	(98c)

Space heating requirement in kWh/m²/year 18.34 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
300.97	229.06	189.82	106.14	50.92	0	0	0		0	101.69	202.29	306.34		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.03	84.63	83.99	82.91	81.61	79.8	79.8	79.8		79.8	82.8	84.3	85.11		(217)
Fuel for water heating														
295.13	262.2	280.44	248.94	244.65	224.85	221.38	230.44		233.28	251.41	263.45	291.52	3047.69	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1487.22 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			3047.69 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	157.16 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			243.16 (231)
Electricity for lighting			175.72 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4953.79	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		54.13	(240a)
Low-rate fraction	0		54.13	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		54.13	(241a)
Low-rate fraction	0		54.13	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		54.13	(242a)

Low-rate fraction	0		54.13	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.94	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.98	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		326.14	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.99	(257)
SAP rating		83.93	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			312.32	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			640.02	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		952.33	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.36	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1011.42	(272)
Dwelling CO2 Emission Rate		13.78	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1680.56	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3443.89	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5124.46	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			269.52	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5761.82	(286)
Dwelling PE Rate			78.5	(287)

TER WORKSHEET

Dwelling Reference: A02
Dwelling Type: New Dwelling Design Stage

A02
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.35	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective air change rate														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
Effective air change rate from PCDB:														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	16.01		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.54	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.72	1066.8	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		165.74	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		41.43	(33)
Heat capacity Cm = ∑(A x k)		5854.6	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		79.76	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.3	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.3	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		49.73	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

87.35	87.11	86.88	85.78	85.57	84.62	84.62	84.44	84.99	85.57	85.99	86.42	(39)

Heat loss parameter (HLP), W/m²K

1.19	1.19	1.18	1.17	1.17	1.15	1.15	1.15	1.16	1.17	1.17	1.18	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15	(45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

104.79	116.01	104.79	108.28	104.79	108.28	104.79	104.79	108.28	104.79	108.28	104.79		(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05		(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63		(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3		(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03		(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12		(72)

Total internal gains

512.16	523.16	502.03	484.16	460.17	440.75	424.29	425.4	438.04	456.03	483.47	501.84		(73)

6. Solar gains

Solar gains in watts, calculated for each month

112.54	204.62	307.84	417.58	493.06	498.6	477.06	420.71	346.55	234.29	137.3	94.6		(83)

Total gains – internal and solar (watts)

624.69	727.78	809.87	901.74	953.23	939.34	901.36	846.11	784.59	690.32	620.77	596.43		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.87	0.83	0.74	0.63	0.49	0.38	0.41	0.59	0.78	0.88	0.92		(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.23	18.61	19.16	19.84	20.38	20.75	20.9	20.88	20.61	19.89	18.96	18.17		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.93	19.93	19.93	19.95	19.95	19.96	19.96	19.96	19.95	19.95	19.94	19.94		(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.86	0.81	0.71	0.58	0.43	0.3	0.33	0.53	0.74	0.86	0.91		(89)

Roof

Mean internal temperature in the rest of dwelling T2

16.72	17.2	17.88	18.71	19.35	19.76	19.9	19.88	19.62	18.79	17.65	16.65		(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

17.27	17.72	18.35	19.13	19.73	20.13	20.27	20.25	19.98	19.2	18.13	17.21		(92)

Adjusted mean internal temperature:

17.27	17.72	18.35	19.13	19.73	20.13	20.27	20.25	19.98	19.2	18.13	17.21		(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.77	0.68	0.58	0.44	0.32	0.36	0.53	0.72	0.82	0.87	(94)

Useful gains, mGm , W

538.38	598.65	623.72	616.8	548.16	414.4	292.1	301.6	415.66	494	510.95	519.6	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1133.22	1116.82	1029.33	877.22	687.3	467.62	310.57	325.16	499.97	735.56	948.48	1124.25	(97)

Space heating requirement for each month

442.56	348.21	301.77	187.51	103.52	0	0	0	0	179.72	315.02	449.85	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

442.56	348.21	301.77	187.51	103.52	0	0	0	0	179.72	315.02	449.85	(98c)

Space heating requirement in kWh/m²/year 31.72 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
479.48	377.26	326.95	203.15	112.16	0	0	0		0	194.71	341.3	487.38		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.58	85.33	84.89	84.1	82.88	79.8	79.8	79.8		79.8	83.98	85.1	85.63		(217)
Fuel for water heating														
259.36	230	245.82	218.96	215.86	202.58	200.49	208.23		210.24	222.1	232.17	256.5	2702.3	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2522.39	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2702.3	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													175.72	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.37	39.1	44.59	42.51	42	38.43	32.59	25.17	15.76	11.84	359.25	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.59	37.25	37.7	37.26	31.2	22.41	12.74	5.46	3.17	245.42	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4881.74	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		91.81	(240a)
Low-rate fraction	0		91.81	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		91.81	(241a)
Low-rate fraction	0		91.81	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		91.81	(242a)

Low-rate fraction	0		91.81	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.36	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.98	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.98	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		252.35	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.77		(257)
SAP rating	87.56		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			529.7	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.48	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1097.18	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.36	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1055.95	(272)
Dwelling CO2 Emission Rate		14.39	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2850.3	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3053.6	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5903.9	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			269.52	(282)
energy saved or generated	0		-648.66	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5654.86	(286)
Dwelling PE Rate			77.04	(287)

DER WORKSHEET

Dwelling Reference: A03
Dwelling Type: New Dwelling Design Stage

A03
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.82		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	5.88	1176	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.01	934.08	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		144.12	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		36.87	(33)
Heat capacity Cm = ∑(A x k)		4603.08	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		78.28	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.2	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.2	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		44.07	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

57.07	56.91	56.74	55.94	55.78	54.98	54.98	54.82	55.3	55.78	56.1	56.42	(39)

Heat loss parameter (HLP), W/m²K

0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

85.7	94.88	85.7	88.56	85.7	88.56	85.7	85.7	88.56	85.7	88.56	85.7	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

443.16	451.99	434.28	418.73	398.46	381.36	367.49	368.64	379.34	395.3	418.67	434.52	(73)

6. Solar gains

Solar gains in watts, calculated for each month

39.28	77.47	135.67	220.48	296.67	316.9	296.18	235.58	164.27	93.46	48.93	32.41	(83)

Total gains – internal and solar (watts)

482.44	529.45	569.95	639.21	695.13	698.27	663.67	604.22	543.61	488.76	467.6	466.93	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.87	0.83	0.74	0.61	0.46	0.35	0.39	0.58	0.77	0.87	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.77	19.05	19.5	20.11	20.58	20.85	20.95	20.93	20.72	20.13	19.38	18.74	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.11	20.11	20.11	20.12	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.86	0.81	0.71	0.57	0.4	0.28	0.32	0.53	0.75	0.85	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.5	17.85	18.4	19.16	19.71	20.02	20.1	20.09	19.88	19.2	18.28	17.46	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.08	18.39	18.9	19.59	20.1	20.4	20.49	20.47	20.26	19.62	18.78	18.04	(92)

Adjusted mean internal temperature:

18.08	18.39	18.9	19.59	20.1	20.4	20.49	20.47	20.26	19.62	18.78	18.04	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.83	0.79	0.69	0.57	0.42	0.31	0.35	0.54	0.73	0.82	0.87	(94)

Useful gains, mGm , W

415.05	440.18	447.46	442.23	393.56	293.65	205.42	211.72	292.68	355.23	385.23	405.14	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

786.15	767.83	703.52	597.79	468.54	318.6	213.61	223.08	340.6	503.02	655.12	780.77	(97)

Space heating requirement for each month

276.1	220.18	190.51	112	55.78	0	0	0	0	109.96	194.33	279.47	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

276.1	220.18	190.51	112	55.78	0	0	0	0	109.96	194.33	279.47	(98c)

Space heating requirement in kWh/m²/year 24.46 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
305.09	243.29	210.51	123.76	61.64	0	0	0		0	121.5	214.72	308.8	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
85.3	85.02	84.47	83.46	82.05	79.8	79.8	79.8		79.8	83.39	84.68	85.36	(217)
Fuel for water heating													
270.18	239.8	256.39	227.93	224.62	207.97	205.04	213.19		215.55	230.2	241.31	266.99	2799.17 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1589.31 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2799.17 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	125.9 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			211.9 (231)
Electricity for lighting			143.71 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4744.09	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.85	(240a)
Low-rate fraction	0		57.85	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.85	(241a)
Low-rate fraction	0		57.85	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.85	(242a)

Low-rate fraction	0		57.85	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		101.89	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		23.7	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		310.38	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.08	(257)
SAP rating		82.55	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			333.75	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			587.83	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		921.58	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		20.74	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		971.72	(272)
Dwelling CO2 Emission Rate		16.53	(273)
EI rating		87	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1795.92	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3163.07	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4958.98	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			220.43	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5499.97	(286)
Dwelling PE Rate			93.54	(287)

TER WORKSHEET

Dwelling Reference: A03
Dwelling Type: New Dwelling Design Stage

A03
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.32 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	(24d)

Effective air change rate

0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	(25)

Effective air change rate from PCDB:

0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	14.35		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.64	1176	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	12.71	988.82	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		144.12	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		36.86	(33)
Heat capacity Cm = ∑(A x k)		4657.82	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		79.21	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.2	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.2	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		44.06	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

73.59	73.42	73.26	72.49	72.34	71.68	71.68	71.55	71.93	72.34	72.64	72.94	(39)

Heat loss parameter (HLP), W/m²K

1.25	1.25	1.25	1.23	1.23	1.22	1.22	1.22	1.22	1.23	1.24	1.24	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

85.85	95.05	85.85	88.72	85.85	88.72	85.85	85.85	88.72	85.85	88.72	85.85	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

443.2	452.05	434.32	418.78	398.5	381.41	367.54	368.68	379.39	395.34	418.72	434.56	(73)

6. Solar gains

Solar gains in watts, calculated for each month

41.91	82.66	144.76	235.26	316.55	338.14	316.03	251.37	175.28	99.73	52.21	34.59	(83)

Total gains – internal and solar (watts)

485.11	534.71	579.09	654.04	715.05	719.55	683.56	620.05	554.67	495.07	470.93	469.15	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.89	0.86	0.78	0.67	0.53	0.41	0.46	0.65	0.81	0.89	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.01	18.31	18.84	19.59	20.24	20.69	20.87	20.83	20.47	19.66	18.74	17.96	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.88	19.88	19.88	19.89	19.9	19.9	19.9	19.91	19.9	19.9	19.89	19.89	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.88	0.84	0.75	0.62	0.46	0.32	0.37	0.59	0.78	0.87	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

16.43	16.81	17.47	18.39	19.16	19.66	19.83	19.8	19.45	18.5	17.35	16.37	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

17.14	17.49	18.09	18.93	19.65	20.12	20.3	20.27	19.91	19.02	17.98	17.09	(92)

Adjusted mean internal temperature:

17.14	17.49	18.09	18.93	19.65	20.12	20.3	20.27	19.91	19.02	17.98	17.09	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.84	0.8	0.72	0.61	0.47	0.36	0.4	0.59	0.75	0.84	0.88	(94)

Useful gains, mGm , W

422.05	451.54	465.33	472.32	435.81	339.86	244	248.69	325.13	373.57	395	411.29	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

945.1	924.4	848.98	727.39	575.22	395.83	265.16	276.63	417.96	609.32	790.07	940.41	(97)

Space heating requirement for each month

389.15	317.76	285.44	183.65	103.72	0	0	0	0	175.4	284.45	393.67	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

389.15	317.76	285.44	183.65	103.72	0	0	0	0	175.4	284.45	393.67	(98c)

Space heating requirement in kWh/m²/year 36.28 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
421.61	344.27	309.25	198.97	112.37	0	0	0		0	190.03	308.18	426.51		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.48	85.31	84.94	84.23	83.04	79.8	79.8	79.8		79.8	84.1	85.05	85.53		(217)
Fuel for water heating														
239.07	211.91	226.51	202.05	199.45	187.92	186.23	193.19		194.81	205.08	214.3	236.51	2497.04	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2311.2	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2497.04	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													143.97	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.96	26.21	31.74	36.28	34.63	34.21	31.27	26.47	20.37	12.72	9.54	291.59	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.04	21.69	29.28	29.63	29.28	24.51	17.6	10	4.28	2.48	192.8	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4553.82	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		84.13	(240a)
Low-rate fraction	0		84.13	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		84.13	(241a)
Low-rate fraction	0		84.13	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		84.13	(242a)

Low-rate fraction	0		84.13	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		90.89	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		23.74	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		246.09	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.85	(257)
SAP rating		86.16	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			485.35	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			524.38	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1009.73	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		20.78	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		979.52	(272)
Dwelling CO2 Emission Rate		16.66	(273)
EI rating		87	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2611.66	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2821.65	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5433.31	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			220.83	(282)
energy saved or generated	0		-523.5	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5260.74	(286)
Dwelling PE Rate			89.47	(287)

DER WORKSHEET

Dwelling Reference: A14
Dwelling Type: New Dwelling Design Stage

A14
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.51	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		17.13	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		19.78	(37)

Ventilation heat loss calculated monthly

	11.25	11.11	10.97	10.27	10.13	9.44	9.44	9.3	9.72	10.13	10.41	10.69	(38)

Heat transfer coefficient, W/K

	31.03	30.89	30.75	30.05	29.91	29.22	29.22	29.08	29.49	29.91	30.19	30.47	(39)

Heat loss parameter (HLP), W/m²K

	0.61	0.61	0.6	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.59	0.6	(40)

Number of days in month (Table 1a)

	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.72 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

	53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

	22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

	32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 99.53 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

	108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

	171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

	25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

408.37	416.55	400.23	386.24	367.95	352.41	339.86	341.01	350.78	365.35	386.53	400.7	(73)

6. Solar gains

Solar gains in watts, calculated for each month

24.22	46.41	77.21	118.65	153.88	162	152.34	124.65	91.34	54.99	29.95	20.12	(83)

Total gains – internal and solar (watts)

432.58	462.96	477.44	504.9	521.83	514.41	492.2	465.66	442.12	420.34	416.47	420.82	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.84	0.78	0.66	0.52	0.36	0.26	0.29	0.45	0.68	0.82	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.35	20.49	20.66	20.86	20.96	20.99	21	21	20.98	20.87	20.62	20.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.42	20.42	20.43	20.44	20.44	20.45	20.45	20.46	20.45	20.44	20.44	20.43	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.86	0.82	0.76	0.64	0.49	0.33	0.23	0.25	0.42	0.65	0.8	0.87	(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.66	19.84	20.05	20.29	20.4	20.45	20.45	20.45	20.43	20.31	20.01	19.66	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(92)

Adjusted mean internal temperature:

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(93)

8. Space heating requirement

Utilisation factor for gains,

0.85	0.82	0.76	0.64	0.5	0.34	0.24	0.27	0.43	0.65	0.79	0.86	(94)

Useful gains, mGm , W

369.39	378.12	363.33	324.84	260.65	177.09	119.67	124.85	191.3	275.24	330.82	362.51	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

486.28	470.48	425.1	350.13	267.89	178.13	119.83	125.1	194.19	298.1	398.27	480.45	(97)

Space heating requirement for each month

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98c)

Space heating requirement in kWh/m²/year 7.31 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
96.09	68.58	50.78	20.13	5.95	0	0	0	0	18.8	53.66	96.96		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
82.58	82.17	81.57	80.67	80.08	79.8	79.8	79.8	79.8	80.61	81.74	82.63		(217)
Fuel for water heating													
263.9	234.73	251.35	223.55	218.45	197.66	195.06	202.65	204.73	225.86	236.74	260.89	2715.58	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												410.95	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2715.58	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		108.98	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												194.98	(231)
Electricity for lighting												134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3456.17	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(240a)
Low-rate fraction	0		14.96	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(241a)
Low-rate fraction	0		14.96	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(242a)

Low-rate fraction	0		14.96	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.85	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		260.16	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.98	(257)
SAP rating		84.17	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			86.3	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			570.27	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		656.57	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		703.05	(272)
Dwelling CO2 Emission Rate		13.81	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			464.37	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3068.6	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3532.97	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4034.49	(286)
Dwelling PE Rate			79.26	(287)

TER WORKSHEET

Dwelling Reference: A14
Dwelling Type: New Dwelling Design Stage

A14
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.43	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4	4.48	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.81	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		18.43	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		21.08	(37)

Ventilation heat loss calculated monthly

25.96	25.8	25.65	24.91	24.77	24.13	24.13	24.01	24.37	24.77	25.05	25.34	(38)

Heat transfer coefficient, W/K

47.04	46.88	46.72	45.99	45.85	45.21	45.21	45.09	45.45	45.85	46.13	46.42	(39)

Heat loss parameter (HLP), W/m²K

0.92	0.92	0.92	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.91	0.91	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

408.26	416.44	400.12	386.13	367.84	352.3	339.74	340.9	350.66	365.24	386.42	400.59	(73)

6. Solar gains

Solar gains in watts, calculated for each month

33.9	64.98	108.1	166.12	215.43	226.79	213.28	174.51	127.88	76.99	41.92	28.16	(83)

Total gains – internal and solar (watts)

442.16	481.41	508.22	552.25	583.27	579.09	553.02	515.41	478.54	442.22	428.34	428.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.9	0.86	0.76	0.63	0.47	0.35	0.39	0.59	0.79	0.89	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.43	19.66	19.99	20.44	20.76	20.93	20.98	20.97	20.86	20.47	19.91	19.4	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.15	20.15	20.15	20.16	20.17	20.18	20.18	20.18	20.17	20.17	20.16	20.16	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.84	0.74	0.59	0.42	0.29	0.32	0.53	0.76	0.87	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.32	18.61	19.02	19.57	19.94	20.12	20.17	20.16	20.05	19.61	18.93	18.3	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(92)

Adjusted mean internal temperature:

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.87	0.82	0.73	0.6	0.44	0.32	0.35	0.55	0.75	0.86	0.9	(94)

Useful gains, mGm , W

394.71	416.49	417.6	402.96	349.48	254.24	174.87	181.82	262.25	332.68	366.26	385.6	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

683.35	664.98	605.66	508.83	394.81	266.36	177.98	186.27	287.35	431.07	566.38	677.85	(97)

Space heating requirement for each month

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98c)

Space heating requirement in kWh/m²/year 20.95 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
232.66	180.92	151.59	82.59	36.54	0	0	0		0	79.31	156.11	235.57		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.29	84	83.47	82.48	81.25	79.8	79.8	79.8		79.8	82.38	83.65	84.34		(217)
Fuel for water heating														
229.69	203.97	218.61	196.02	193.86	178.97	177.52	184.02		185.4	198.96	206.72	227.26	2400.99	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1155.29	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2400.99	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

9.73	14.77	22.84	27.71	31.71	30.29	29.94	27.35	23.12	17.76	11.07	8.29	254.57	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.7	5.86	11.99	18.54	25.04	25.34	25.03	20.93	15.03	8.53	3.65	2.12	164.74	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3357.63	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(240a)
Low-rate fraction	0		42.05	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(241a)
Low-rate fraction	0		42.05	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(242a)

Low-rate fraction	0		42.05	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.4	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-51.2	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		206.64	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.43	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			242.61	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			504.21	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		746.82	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	-54.48	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		723.71	(272)
Dwelling CO2 Emission Rate		14.22	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1305.48	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2713.12	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4018.6	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		-455.35	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3899.89	(286)
Dwelling PE Rate			76.62	(287)

DER WORKSHEET

Dwelling Reference: A15
Dwelling Type: New Dwelling Design Stage

A15
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			3	3	(19)
Shelter factor				0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	15.6		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		23.77	(33)
Heat capacity Cm = ∑(A x k)		4369.94	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		105.05	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		26.57	(37)

Ventilation heat loss calculated monthly

8.68	8.58	8.47	7.96	7.85	7.33	7.33	7.23	7.54	7.85	8.06	8.27	(38)

Heat transfer coefficient, W/K

35.25	35.15	35.05	34.53	34.42	33.9	33.9	33.8	34.11	34.42	34.63	34.84	(39)

Heat loss parameter (HLP), W/m²K

0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.81	0.82	0.83	0.83	0.84	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.45 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 91.12 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.48 79.61 85.55 77.3 76.39 70.41 70.53 72.37 72.13 78.57 81.3 88.76 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.34	70.13	63.34	65.45	63.34	65.45	63.34	63.34	65.45	63.34	65.45	63.34	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.28	118.47	114.99	107.35	102.68	97.79	94.79	97.27	100.18	105.6	112.92	119.3	(72)

Total internal gains

356.93	363.22	349.66	337.15	321.54	307.47	296.82	298	306.3	319.6	337.85	350.42	(73)

6. Solar gains

Solar gains in watts, calculated for each month

96.36	166.06	232.29	296.34	339.71	340.67	327.02	294.15	254.39	184.9	115.77	82.24	(83)

Total gains – internal and solar (watts)

453.3	529.27	581.96	633.5	661.25	648.15	623.84	592.14	560.69	504.5	453.62	432.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.79	0.71	0.59	0.46	0.33	0.24	0.26	0.41	0.63	0.79	0.87	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.94	20.22	20.51	20.77	20.92	20.98	21	20.99	20.96	20.77	20.35	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.21	20.21	20.22	20.23	20.23	20.24	20.24	20.24	20.24	20.23	20.23	20.22	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.84	0.77	0.69	0.56	0.43	0.29	0.2	0.22	0.36	0.59	0.77	0.86	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.99	19.34	19.68	19.99	20.15	20.23	20.24	20.24	20.2	20	19.51	18.94	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(92)

Adjusted mean internal temperature:

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(93)

8. Space heating requirement

Utilisation factor for gains,

0.83	0.77	0.69	0.57	0.45	0.32	0.22	0.25	0.39	0.6	0.77	0.84	(94)

Useful gains, mGm , W

375.87	405.71	401.59	363.8	295	204.48	139.43	145.46	218.75	304.65	347.12	364.62	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

539.72	527.86	480.81	400.67	308.23	207.47	140.13	146.43	225.07	341.01	448.72	535.07	(97)

Space heating requirement for each month

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98c)

Space heating requirement in kWh/m²/year 12.65 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
134.7	90.7	65.13	29.33	10.87	0	0	0	0	29.89	80.83	140.13		(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
83.5	82.87	82.08	81.1	80.34	79.8	79.8	79.8	79.8	81.11	82.61	83.62		(217)
Fuel for water heating													
243.68	217.37	233.46	208.29	204.26	185.74	183.52	190.47	192.21	210.36	219.06	240.71	2529.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												581.6	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2529.13	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		89.07	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												175.07	(231)
Electricity for lighting												106.21	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3392.01	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(240a)
Low-rate fraction	0		21.17	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(241a)
Low-rate fraction	0		21.17	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(242a)

Low-rate fraction	0		21.17	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		92.06	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		28.87	(249)
Energy For lighting	0		17.51	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		251.61	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.05	(257)
SAP rating		83.04	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			122.14	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			531.12	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		653.25	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		24.28	(267)
Electricity for lighting		15.33	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		692.87	(272)
Dwelling CO2 Emission Rate		16.66	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			657.21	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2857.91	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3515.12	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			264.85	(281)
Electricity for lighting			162.91	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3942.88	(286)
Dwelling PE Rate			94.78	(287)

TER WORKSHEET

Dwelling Reference: A15
Dwelling Type: New Dwelling Design Stage

A15
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.18	0.18	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.43	0.43	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4	4.42	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	9.45		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	8.19	636.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		19.79	(33)
Heat capacity Cm = ∑(A x k)		4445.12	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		106.85	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		22.59	(37)

Ventilation heat loss calculated monthly

21.14	21.01	20.89	20.3	20.19	19.68	19.68	19.58	19.87	20.19	20.41	20.65	(38)

Heat transfer coefficient, W/K

43.74	43.61	43.48	42.89	42.78	42.27	42.27	42.17	42.47	42.78	43.01	43.24	(39)

Heat loss parameter (HLP), W/m²K

1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.03	1.04	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.45	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	91.12	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.36	180.03	191.53	168.83	163.99	148.12	146.34	151.89	153.29	170.53	180.87	201.18	2059.96	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

22.18	19.62	20.54	17.01	15.85	13.57	12.72	13.52	14.04	16.55	18.75	21.77	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

181.18	160.41	170.99	151.81	148.14	134.56	133.63	138.37	139.25	153.98	162.12	179.41	1853.85	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.4	79.54	85.47	77.21	76.31	70.33	70.44	72.29	72.05	78.48	81.22	88.68	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.84	70.68	63.84	65.97	63.84	65.97	63.84	63.84	65.97	63.84	65.97	63.84	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.16	118.36	114.88	107.24	102.57	97.68	94.68	97.16	100.07	105.49	112.8	119.19	(72)

Total internal gains

357.33	363.66	350.06	337.56	321.94	307.88	297.21	298.39	306.71	319.99	338.26	350.81	(73)

6. Solar gains

Solar gains in watts, calculated for each month

81.7	140.79	196.95	251.27	288.06	288.88	277.3	249.42	215.69	156.77	98.15	69.72	(83)

Total gains – internal and solar (watts)

439.02	504.45	547.01	588.84	609.99	596.76	574.52	547.8	522.4	476.76	436.41	420.53	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.85	0.79	0.7	0.57	0.43	0.32	0.34	0.51	0.72	0.85	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.35	19.67	20.04	20.47	20.76	20.93	20.98	20.97	20.87	20.5	19.88	19.3	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.05	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.06	20.05	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.83	0.77	0.66	0.53	0.37	0.25	0.28	0.45	0.68	0.83	0.89	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.15	18.54	19	19.5	19.84	20.01	20.06	20.05	19.96	19.56	18.82	18.1	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(92)

Adjusted mean internal temperature:

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.76	0.67	0.55	0.41	0.29	0.32	0.48	0.69	0.81	0.87	(94)

Useful gains, mGm , W

378.53	412.25	415.81	392.24	333.41	241.86	168.13	174.87	252.9	327.11	355.3	366.88	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

640.21	627.01	573.06	481.8	373.95	254.05	171.57	179.39	274.18	409.54	533.98	635.06	(97)

Space heating requirement for each month

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98c)

Space heating requirement in kWh/m²/year 22.6 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
210.94	156.36	126.75	69.86	32.68	0	0	0	0	66.44	139.39	216.17		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
84.22	83.82	83.23	82.29	81.19	79.8	79.8	79.8	79.8	82.17	83.55	84.3		(217)
Fuel for water heating													
215.13	191.37	205.45	184.5	182.46	168.62	167.45	173.39	174.5	187.39	194.05	212.83	2257.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		1018.57	(211)
Space heating fuel used, main system 2		0	(213)
Space heating fuel used, secondary		0	(215)
Water heating fuel used		2257.13	(219)
Electricity for instantaneous electric shower(s)		0	(64a)
Space cooling fuel used		0	(221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	(230a)
warm air heating system fans		0	(230b)
Heating circulation pump or water pump within warm air heating unit		41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)		0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)		45	(230e)
Maintaining electric keep-hot facility for gas combi boiler		0	(230f)
Pump for solar water heating		0	(230g)
Pump for storage WWHRS		0	(230h)
Total electricity for the above		86	(231)
Electricity for lighting		107.06	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

7.99	12.15	18.84	22.9	26.27	25.12	24.83	22.66	19.12	14.64	9.1	6.81	210.43	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.16	4.7	9.63	14.9	20.11	20.35	20.09	16.8	12.06	6.84	2.93	1.7	132.27	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3126.06	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(240a)
Low-rate fraction	0		37.08	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(241a)
Low-rate fraction	0		37.08	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(242a)

Low-rate fraction	0		37.08	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		82.16	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		17.65	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-42.08	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		200.99	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.84	(257)
SAP rating		86.46	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			213.9	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			474	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		687.9	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		15.45	(268)
energy saved or generated	0	-44.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		670.75	(272)
Dwelling CO2 Emission Rate		16.12	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1150.99	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2550.55	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3701.54	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			164.21	(282)
energy saved or generated	0		-374.57	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3621.29	(286)
Dwelling PE Rate			87.05	(287)

DER WORKSHEET

Dwelling Reference: A16
Dwelling Type: New Dwelling Design Stage

A16
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	23.98		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.34	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.55	984.48	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		44.03	(33)
Heat capacity Cm = ∑(A x k)		8708.28	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		118.64	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.38	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

68.6	68.39	68.19	67.19	66.99	65.99	65.99	65.79	66.39	66.99	67.39	67.79	(39)

Heat loss parameter (HLP), W/m²K

0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.45	114.53	103.45	106.9	103.45	106.9	103.45	103.45	106.9	103.45	106.9	103.45	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23	(72)

Total internal gains

510.93	521.79	500.81	482.89	458.94	439.48	423.07	424.17	436.77	454.8	482.2	500.61	(73)

6. Solar gains

Solar gains in watts, calculated for each month

107.04	191.31	285.62	393.9	477.7	490.3	466.02	401.05	322.73	217.88	129.85	90.55	(83)

Total gains – internal and solar (watts)

617.97	713.1	786.43	876.79	936.64	929.78	889.09	825.22	759.5	672.68	612.04	591.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.94	0.9	0.85	0.74	0.6	0.44	0.32	0.36	0.56	0.79	0.9	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.48	19.78	20.14	20.56	20.83	20.96	20.99	20.98	20.9	20.55	19.97	19.44	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.14	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.93	0.89	0.83	0.71	0.56	0.39	0.26	0.3	0.5	0.75	0.89	0.94	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.38	18.74	19.19	19.7	20	20.14	20.16	20.16	20.08	19.7	18.99	18.33	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(92)

Adjusted mean internal temperature:

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.91	0.87	0.82	0.71	0.56	0.4	0.28	0.32	0.52	0.75	0.87	0.92	(94)

Useful gains, mGm , W

563.5	622.62	641.57	620.25	528.48	374.24	252.71	263.68	391.39	502.75	533.66	544.07	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

993.67	972.75	889.31	747.09	576.59	385.32	255.19	267.4	417.35	630.38	825.65	985.61	(97)

Space heating requirement for each month

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98c)

Space heating requirement in kWh/m²/year 20.44 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
353.64	259.99	203.67	100.91	39.55	0	0	0		0	104.93	232.3	362.98		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.46	84.97	84.17	82.8	81.26	79.8	79.8	79.8		79.8	82.87	84.67	85.56		(217)
Fuel for water heating														
293.64	261.16	279.84	249.27	245.7	224.85	221.38	230.44		233.28	251.21	262.32	289.97	3043.06	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1657.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3043.06	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			157.16	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													243.16	(231)
Electricity for lighting													173.47	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5117.65	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(240a)
Low-rate fraction	0		60.35	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(241a)
Low-rate fraction	0		60.35	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(242a)

Low-rate fraction	0		60.35	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.77	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		331.82	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.01	(257)
SAP rating	83.65	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			348.17	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			639.04	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		987.21	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1045.98	(272)
Dwelling CO2 Emission Rate		14.25	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1873.49	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3438.66	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5312.15	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			266.08	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5946.08	(286)
Dwelling PE Rate			81.01	(287)

TER WORKSHEET

Dwelling Reference: A16
Dwelling Type: New Dwelling Design Stage

A16
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.35	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective air change rate														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
Effective air change rate from PCDB:														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.55		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.54	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.51	1050.84	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.76	(33)
Heat capacity Cm = ∑(A x k)		8774.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		119.55	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.11	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

89.73	89.5	89.26	88.17	87.96	87.01	87.01	86.83	87.37	87.96	88.38	88.81	(39)

Heat loss parameter (HLP), W/m²K

1.22	1.22	1.22	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.21	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.47	114.56	103.47	106.92	103.47	106.92	103.47	103.47	106.92	103.47	106.92	103.47	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12	(72)

Total internal gains

510.85	521.71	500.72	482.81	458.85	439.39	422.98	424.08	436.68	454.72	482.11	500.53	(73)

6. Solar gains

Solar gains in watts, calculated for each month

115.97	207.27	309.42	426.68	517.43	531.07	504.78	434.41	349.61	236.04	140.68	98.1	(83)

Total gains – internal and solar (watts)

626.82	728.97	810.14	909.49	976.29	970.46	927.76	858.5	786.29	690.76	622.79	598.63	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.95	0.92	0.88	0.8	0.67	0.52	0.39	0.44	0.64	0.83	0.92	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.8	19.13	19.58	20.16	20.6	20.87	20.95	20.94	20.75	20.17	19.4	18.75	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.9	19.9	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.94	0.91	0.86	0.76	0.62	0.45	0.3	0.35	0.57	0.8	0.91	0.95	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.37	17.78	18.35	19.05	19.56	19.83	19.91	19.9	19.73	19.08	18.14	17.32	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(92)

Adjusted mean internal temperature:

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(93)

8. Space heating requirement

Utilisation factor for gains,

0.92	0.89	0.84	0.75	0.62	0.47	0.34	0.38	0.58	0.78	0.89	0.93	(94)

Useful gains, mGm , W

575.94	645.96	679.05	680.63	607.67	452.08	311.27	322.84	455.15	541.41	551.98	554.49	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1220.31	1197.32	1098.28	930.98	724.95	488.53	321.5	337.22	524.59	781.32	1016.71	1211.85	(97)

Space heating requirement for each month

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98c)

Space heating requirement in kWh/m²/year 33.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
519.41	401.43	337.93	195.29	94.54	0	0	0		0	193.39	362.52	529.88		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.74	85.46	84.96	84.01	82.54	79.8	79.8	79.8		79.8	83.96	85.23	85.8		(217)
Fuel for water heating														
258.87	229.64	245.61	219.19	216.74	202.58	200.49	208.23		210.24	222.14	231.81	255.99	2701.53	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2634.38	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2701.53	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													173.52	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.36	39.1	44.58	42.51	41.99	38.42	32.59	25.16	15.76	11.84	359.18	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.6	37.25	37.71	37.27	31.21	22.42	12.74	5.46	3.17	245.48	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4990.77	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(240a)
Low-rate fraction	0		95.89	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(241a)
Low-rate fraction	0		95.89	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(242a)

Low-rate fraction	0		95.89	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.34	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.92	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		256.1	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.38	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			553.22	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.32	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1120.54	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1078.99	(272)
Dwelling CO2 Emission Rate		14.7	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2976.85	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.73	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			6029.58	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			266.15	(282)
energy saved or generated	0		-648.6	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5777.23	(286)
Dwelling PE Rate			78.71	(287)

DER WORKSHEET

Dwelling Reference: A17
Dwelling Type: New Dwelling Design Stage

A17
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =		0	(6a)
Open chimneys	0	x 20 =		0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =		0	(6c)
Flues attached to solid fuel boiler	0	x 20 =		0	(6d)
Flues attached to other heater	0	x 35 =		0	(6e)
Number of blocked chimneys	0	x 20 =		0	(6f)
Number of intermittent extract fans	0	x 10 =		0	(7a)
Number of passive vents	0	x 10 =		0	(7b)
Number of flueless gas fires	0	x 40 =		0	(7c)
		Air changes per hour			
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.32	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		25.99	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		30.44	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

43.43	43.27	43.11	42.3	42.14	41.34	41.34	41.18	41.66	42.14	42.47	42.79	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.73	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.72	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

444.57	453.55	435.69	420.19	399.87	382.82	368.91	370.05	380.8	396.71	420.13	435.93	(73)

6. Solar gains

Solar gains in watts, calculated for each month

25.68	49.79	85.81	138.6	186.6	199.56	186.4	148.07	103.51	59.64	31.82	21.31	(83)

Total gains – internal and solar (watts)

470.25	503.34	521.51	558.79	586.47	582.38	555.31	518.11	484.32	456.36	451.95	457.24	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.89	0.84	0.75	0.61	0.44	0.32	0.36	0.55	0.77	0.87	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.8	19.99	20.25	20.61	20.85	20.97	20.99	20.99	20.92	20.64	20.2	19.79	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.31	20.31	20.31	20.32	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.87	0.83	0.72	0.57	0.4	0.28	0.31	0.51	0.74	0.86	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.9	19.13	19.46	19.91	20.18	20.31	20.33	20.33	20.26	19.95	19.41	18.89	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(92)

Adjusted mean internal temperature:

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.82	0.72	0.58	0.42	0.3	0.33	0.52	0.74	0.84	0.89	(94)

Useful gains, mGm , W

416.37	432.06	425.24	401.34	340.48	241.8	165.17	171.96	253.92	335.69	381.4	407.87	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

651.85	632.55	574.21	479.18	370.21	248.31	166.62	174.13	269.16	407.08	538.09	645.84	(97)

Space heating requirement for each month

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98c)

Space heating requirement in kWh/m²/year 14.32 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
193.59	148.87	122.47	61.93	24.44	0	0	0		0	58.69	124.66	195.63	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.09	83.74	83.13	82.01	80.82	79.8	79.8	79.8		79.8	81.9	83.3	84.15	(217)
Fuel for water heating													
274.05	243.46	260.55	231.97	228.03	207.97	205.04	213.19		215.55	234.4	245.3	270.82	2830.32 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			930.28 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2830.32 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	125.9 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			211.9 (231)
Electricity for lighting			146.08 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4118.59	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(240a)
Low-rate fraction	0		33.86	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(241a)
Low-rate fraction	0		33.86	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(242a)

Low-rate fraction	0		33.86	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.02	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		287.92	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1	(257)
SAP rating		83.81	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			195.36	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			594.37	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		789.73	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		840.2	(272)
Dwelling CO2 Emission Rate		14.29	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1051.22	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3198.27	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4249.49	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4794.11	(286)
Dwelling PE Rate			81.53	(287)

TER WORKSHEET

Dwelling Reference: A17
Dwelling Type: New Dwelling Design Stage

A17
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.32	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
Effective air change rate from PCDB:														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.59	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		28.25	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		32.7	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

62.22	62.06	61.89	61.12	60.98	60.31	60.31	60.19	60.57	60.98	61.27	61.57	(39)

Heat loss parameter (HLP), W/m²K

1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.03	1.04	1.04	1.05	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

444.46	453.44	435.58	420.08	399.76	382.71	368.79	369.94	380.69	396.6	420.02	435.82	(73)

6. Solar gains

Solar gains in watts, calculated for each month

35.95	69.71	120.14	194.03	261.24	279.38	260.96	207.29	144.92	83.5	44.55	29.83	(83)

Total gains – internal and solar (watts)

480.41	523.15	555.72	614.12	661	662.09	629.76	577.23	525.61	480.1	464.57	465.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.93	0.91	0.88	0.8	0.68	0.52	0.4	0.45	0.65	0.83	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.89	19.13	19.54	20.11	20.57	20.85	20.95	20.93	20.72	20.15	19.45	18.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.04	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.92	0.9	0.86	0.77	0.63	0.46	0.32	0.37	0.59	0.8	0.89	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.58	17.89	18.39	19.1	19.64	19.95	20.03	20.02	19.82	19.16	18.3	17.54	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(92)

Adjusted mean internal temperature:

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.88	0.84	0.76	0.63	0.48	0.35	0.4	0.6	0.78	0.87	0.91	(94)

Useful gains, mGm , W

432.77	459.1	466.59	464.99	419.66	317.8	222.99	229.94	315.1	376.27	404.16	422.29	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

863.06	840.98	768.02	651.16	509.76	347.19	232.03	242.67	371.08	549.36	718.21	858.1	(97)

Space heating requirement for each month

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98c)

Space heating requirement in kWh/m²/year 28.59 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
346.84	278.03	242.98	145.23	72.63	0	0	0		0	139.52	244.98	351.3		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.06	84.85	84.4	83.53	82.2	79.8	79.8	79.8		79.8	83.41	84.54	85.11		(217)
Fuel for water heating														
240.24	213.08	227.95	203.75	201.49	187.92	186.23	193.19		194.81	206.76	215.59	237.66	2508.68	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1821.51	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2508.68	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.97	26.21	31.75	36.28	34.63	34.22	31.28	26.47	20.38	12.72	9.54	291.64	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.03	21.68	29.27	29.63	29.27	24.5	17.59	9.99	4.28	2.48	192.75	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4077.88	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(240a)
Low-rate fraction	0		66.3	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(241a)
Low-rate fraction	0		66.3	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(242a)

Low-rate fraction	0		66.3	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		91.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		229.04	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.79	(257)
SAP rating		87.12	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			382.52	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			526.82	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		909.34	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		879.43	(272)
Dwelling CO2 Emission Rate		14.96	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2058.31	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2834.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4893.11	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		-523.55	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4723.72	(286)
Dwelling PE Rate			80.34	(287)

DER WORKSHEET

Dwelling Reference: A28
Dwelling Type: New Dwelling Design Stage

A28
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.51	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		17.13	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		19.78	(37)

Ventilation heat loss calculated monthly

	11.25	11.11	10.97	10.27	10.13	9.44	9.44	9.3	9.72	10.13	10.41	10.69	(38)

Heat transfer coefficient, W/K

	31.03	30.89	30.75	30.05	29.91	29.22	29.22	29.08	29.49	29.91	30.19	30.47	(39)

Heat loss parameter (HLP), W/m²K

	0.61	0.61	0.6	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.59	0.6	(40)

Number of days in month (Table 1a)

	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.72 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

	53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

	22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

	32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 99.53 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

	108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

	171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

	25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

408.37	416.55	400.23	386.24	367.95	352.41	339.86	341.01	350.78	365.35	386.53	400.7	(73)

6. Solar gains

Solar gains in watts, calculated for each month

24.22	46.41	77.21	118.65	153.88	162	152.34	124.65	91.34	54.99	29.95	20.12	(83)

Total gains – internal and solar (watts)

432.58	462.96	477.44	504.9	521.83	514.41	492.2	465.66	442.12	420.34	416.47	420.82	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.84	0.78	0.66	0.52	0.36	0.26	0.29	0.45	0.68	0.82	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.35	20.49	20.66	20.86	20.96	20.99	21	21	20.98	20.87	20.62	20.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.42	20.42	20.43	20.44	20.44	20.45	20.45	20.46	20.45	20.44	20.44	20.43	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.86	0.82	0.76	0.64	0.49	0.33	0.23	0.25	0.42	0.65	0.8	0.87	(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.66	19.84	20.05	20.29	20.4	20.45	20.45	20.45	20.43	20.31	20.01	19.66	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(92)

Adjusted mean internal temperature:

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(93)

8. Space heating requirement

Utilisation factor for gains,

0.85	0.82	0.76	0.64	0.5	0.34	0.24	0.27	0.43	0.65	0.79	0.86	(94)

Useful gains, mGm , W

369.39	378.12	363.33	324.84	260.65	177.09	119.67	124.85	191.3	275.24	330.82	362.51	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

486.28	470.48	425.1	350.13	267.89	178.13	119.83	125.1	194.19	298.1	398.27	480.45	(97)

Space heating requirement for each month

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98c)

Space heating requirement in kWh/m²/year 7.31 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
96.09	68.58	50.78	20.13	5.95	0	0	0	0	18.8	53.66	96.96		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
82.58	82.17	81.57	80.67	80.08	79.8	79.8	79.8	79.8	80.61	81.74	82.63		(217)
Fuel for water heating													
263.9	234.73	251.35	223.55	218.45	197.66	195.06	202.65	204.73	225.86	236.74	260.89	2715.58	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												410.95	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2715.58	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		108.98	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												194.98	(231)
Electricity for lighting												134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3456.17	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(240a)
Low-rate fraction	0		14.96	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(241a)
Low-rate fraction	0		14.96	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(242a)

Low-rate fraction	0		14.96	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.85	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		260.16	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.98	(257)
SAP rating		84.17	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			86.3	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			570.27	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		656.57	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		703.05	(272)
Dwelling CO2 Emission Rate		13.81	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			464.37	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3068.6	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3532.97	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4034.49	(286)
Dwelling PE Rate			79.26	(287)

TER WORKSHEET

Dwelling Reference: A28
Dwelling Type: New Dwelling Design Stage

A28
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.43	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4	4.48	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.81	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		18.43	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		21.08	(37)

Ventilation heat loss calculated monthly

25.96	25.8	25.65	24.91	24.77	24.13	24.13	24.01	24.37	24.77	25.05	25.34	(38)

Heat transfer coefficient, W/K

47.04	46.88	46.72	45.99	45.85	45.21	45.21	45.09	45.45	45.85	46.13	46.42	(39)

Heat loss parameter (HLP), W/m²K

0.92	0.92	0.92	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.91	0.91	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

408.26	416.44	400.12	386.13	367.84	352.3	339.74	340.9	350.66	365.24	386.42	400.59	(73)

6. Solar gains

Solar gains in watts, calculated for each month

33.9	64.98	108.1	166.12	215.43	226.79	213.28	174.51	127.88	76.99	41.92	28.16	(83)

Total gains – internal and solar (watts)

442.16	481.41	508.22	552.25	583.27	579.09	553.02	515.41	478.54	442.22	428.34	428.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.9	0.86	0.76	0.63	0.47	0.35	0.39	0.59	0.79	0.89	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.43	19.66	19.99	20.44	20.76	20.93	20.98	20.97	20.86	20.47	19.91	19.4	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.15	20.15	20.15	20.16	20.17	20.18	20.18	20.18	20.17	20.17	20.16	20.16	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.84	0.74	0.59	0.42	0.29	0.32	0.53	0.76	0.87	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.32	18.61	19.02	19.57	19.94	20.12	20.17	20.16	20.05	19.61	18.93	18.3	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(92)

Adjusted mean internal temperature:

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.87	0.82	0.73	0.6	0.44	0.32	0.35	0.55	0.75	0.86	0.9	(94)

Useful gains, mGm , W

394.71	416.49	417.6	402.96	349.48	254.24	174.87	181.82	262.25	332.68	366.26	385.6	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

683.35	664.98	605.66	508.83	394.81	266.36	177.98	186.27	287.35	431.07	566.38	677.85	(97)

Space heating requirement for each month

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98c)

Space heating requirement in kWh/m²/year 20.95 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
232.66	180.92	151.59	82.59	36.54	0	0	0		0	79.31	156.11	235.57		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.29	84	83.47	82.48	81.25	79.8	79.8	79.8		79.8	82.38	83.65	84.34		(217)
Fuel for water heating														
229.69	203.97	218.61	196.02	193.86	178.97	177.52	184.02		185.4	198.96	206.72	227.26	2400.99	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1155.29	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2400.99	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

9.73	14.77	22.84	27.71	31.71	30.29	29.94	27.35	23.12	17.76	11.07	8.29	254.57	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.7	5.86	11.99	18.54	25.04	25.34	25.03	20.93	15.03	8.53	3.65	2.12	164.74	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3357.63	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(240a)
Low-rate fraction	0		42.05	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(241a)
Low-rate fraction	0		42.05	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(242a)

Low-rate fraction	0		42.05	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.4	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-51.2	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		206.64	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.43	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			242.61	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			504.21	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		746.82	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	-54.48	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		723.71	(272)
Dwelling CO2 Emission Rate		14.22	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1305.48	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2713.12	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4018.6	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		-455.35	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3899.89	(286)
Dwelling PE Rate			76.62	(287)

DER WORKSHEET

Dwelling Reference: A29
Dwelling Type: New Dwelling Design Stage

A29
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			3	3	(19)
Shelter factor				0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	15.6		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		23.77	(33)
Heat capacity Cm = ∑(A x k)		4369.94	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		105.05	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		26.57	(37)

Ventilation heat loss calculated monthly

8.68	8.58	8.47	7.96	7.85	7.33	7.33	7.23	7.54	7.85	8.06	8.27	(38)

Heat transfer coefficient, W/K

35.25	35.15	35.05	34.53	34.42	33.9	33.9	33.8	34.11	34.42	34.63	34.84	(39)

Heat loss parameter (HLP), W/m²K

0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.81	0.82	0.83	0.83	0.84	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.45 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 91.12 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.48 79.61 85.55 77.3 76.39 70.41 70.53 72.37 72.13 78.57 81.3 88.76 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.34	70.13	63.34	65.45	63.34	65.45	63.34	63.34	65.45	63.34	65.45	63.34	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.28	118.47	114.99	107.35	102.68	97.79	94.79	97.27	100.18	105.6	112.92	119.3	(72)

Total internal gains

356.93	363.22	349.66	337.15	321.54	307.47	296.82	298	306.3	319.6	337.85	350.42	(73)

6. Solar gains

Solar gains in watts, calculated for each month

96.36	166.06	232.29	296.34	339.71	340.67	327.02	294.15	254.39	184.9	115.77	82.24	(83)

Total gains – internal and solar (watts)

453.3	529.27	581.96	633.5	661.25	648.15	623.84	592.14	560.69	504.5	453.62	432.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.79	0.71	0.59	0.46	0.33	0.24	0.26	0.41	0.63	0.79	0.87	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.94	20.22	20.51	20.77	20.92	20.98	21	20.99	20.96	20.77	20.35	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.21	20.21	20.22	20.23	20.23	20.24	20.24	20.24	20.24	20.23	20.23	20.22	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.84	0.77	0.69	0.56	0.43	0.29	0.2	0.22	0.36	0.59	0.77	0.86	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.99	19.34	19.68	19.99	20.15	20.23	20.24	20.24	20.2	20	19.51	18.94	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(92)

Adjusted mean internal temperature:

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(93)

8. Space heating requirement

Utilisation factor for gains,

0.83	0.77	0.69	0.57	0.45	0.32	0.22	0.25	0.39	0.6	0.77	0.84	(94)

Useful gains, mGm , W

375.87	405.71	401.59	363.8	295	204.48	139.43	145.46	218.75	304.65	347.12	364.62	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

539.72	527.86	480.81	400.67	308.23	207.47	140.13	146.43	225.07	341.01	448.72	535.07	(97)

Space heating requirement for each month

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98c)

Space heating requirement in kWh/m²/year 12.65 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
134.7	90.7	65.13	29.33	10.87	0	0	0	0	29.89	80.83	140.13		(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
83.5	82.87	82.08	81.1	80.34	79.8	79.8	79.8	79.8	81.11	82.61	83.62		(217)
Fuel for water heating													
243.68	217.37	233.46	208.29	204.26	185.74	183.52	190.47	192.21	210.36	219.06	240.71	2529.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												581.6	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2529.13	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		89.07	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												175.07	(231)
Electricity for lighting												106.21	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3392.01	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(240a)
Low-rate fraction	0		21.17	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(241a)
Low-rate fraction	0		21.17	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(242a)

Low-rate fraction	0		21.17	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		92.06	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		28.87	(249)
Energy For lighting	0		17.51	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		251.61	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.05	(257)
SAP rating		83.04	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			122.14	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			531.12	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		653.25	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		24.28	(267)
Electricity for lighting		15.33	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		692.87	(272)
Dwelling CO2 Emission Rate		16.66	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			657.21	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2857.91	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3515.12	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			264.85	(281)
Electricity for lighting			162.91	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3942.88	(286)
Dwelling PE Rate			94.78	(287)

TER WORKSHEET

Dwelling Reference: A29
Dwelling Type: New Dwelling Design Stage

A29
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.18	0.18	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.43	0.43	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4	4.42	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	9.45		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	8.19	636.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		19.79	(33)
Heat capacity Cm = ∑(A x k)		4445.12	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		106.85	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		22.59	(37)

Ventilation heat loss calculated monthly

21.14	21.01	20.89	20.3	20.19	19.68	19.68	19.58	19.87	20.19	20.41	20.65	(38)

Heat transfer coefficient, W/K

43.74	43.61	43.48	42.89	42.78	42.27	42.27	42.17	42.47	42.78	43.01	43.24	(39)

Heat loss parameter (HLP), W/m²K

1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.03	1.04	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.45	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	91.12	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.36	180.03	191.53	168.83	163.99	148.12	146.34	151.89	153.29	170.53	180.87	201.18	2059.96	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

22.18	19.62	20.54	17.01	15.85	13.57	12.72	13.52	14.04	16.55	18.75	21.77	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

181.18	160.41	170.99	151.81	148.14	134.56	133.63	138.37	139.25	153.98	162.12	179.41	1853.85	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.4	79.54	85.47	77.21	76.31	70.33	70.44	72.29	72.05	78.48	81.22	88.68	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.84	70.68	63.84	65.97	63.84	65.97	63.84	63.84	65.97	63.84	65.97	63.84	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.16	118.36	114.88	107.24	102.57	97.68	94.68	97.16	100.07	105.49	112.8	119.19	(72)

Total internal gains

357.33	363.66	350.06	337.56	321.94	307.88	297.21	298.39	306.71	319.99	338.26	350.81	(73)

6. Solar gains

Solar gains in watts, calculated for each month

81.7	140.79	196.95	251.27	288.06	288.88	277.3	249.42	215.69	156.77	98.15	69.72	(83)

Total gains – internal and solar (watts)

439.02	504.45	547.01	588.84	609.99	596.76	574.52	547.8	522.4	476.76	436.41	420.53	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.85	0.79	0.7	0.57	0.43	0.32	0.34	0.51	0.72	0.85	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.35	19.67	20.04	20.47	20.76	20.93	20.98	20.97	20.87	20.5	19.88	19.3	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.05	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.06	20.05	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.83	0.77	0.66	0.53	0.37	0.25	0.28	0.45	0.68	0.83	0.89	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.15	18.54	19	19.5	19.84	20.01	20.06	20.05	19.96	19.56	18.82	18.1	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(92)

Adjusted mean internal temperature:

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.76	0.67	0.55	0.41	0.29	0.32	0.48	0.69	0.81	0.87	(94)

Useful gains, mGm , W

378.53	412.25	415.81	392.24	333.41	241.86	168.13	174.87	252.9	327.11	355.3	366.88	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

640.21	627.01	573.06	481.8	373.95	254.05	171.57	179.39	274.18	409.54	533.98	635.06	(97)

Space heating requirement for each month

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98c)

Space heating requirement in kWh/m²/year 22.6 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
210.94	156.36	126.75	69.86	32.68	0	0	0	0	66.44	139.39	216.17		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
84.22	83.82	83.23	82.29	81.19	79.8	79.8	79.8	79.8	82.17	83.55	84.3		(217)
Fuel for water heating													
215.13	191.37	205.45	184.5	182.46	168.62	167.45	173.39	174.5	187.39	194.05	212.83	2257.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		1018.57	(211)
Space heating fuel used, main system 2		0	(213)
Space heating fuel used, secondary		0	(215)
Water heating fuel used		2257.13	(219)
Electricity for instantaneous electric shower(s)		0	(64a)
Space cooling fuel used		0	(221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	(230a)
warm air heating system fans		0	(230b)
Heating circulation pump or water pump within warm air heating unit		41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)		0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)		45	(230e)
Maintaining electric keep-hot facility for gas combi boiler		0	(230f)
Pump for solar water heating		0	(230g)
Pump for storage WWHRS		0	(230h)
Total electricity for the above		86	(231)
Electricity for lighting		107.06	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

7.99	12.15	18.84	22.9	26.27	25.12	24.83	22.66	19.12	14.64	9.1	6.81	210.43	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.16	4.7	9.63	14.9	20.11	20.35	20.09	16.8	12.06	6.84	2.93	1.7	132.27	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3126.06	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(240a)
Low-rate fraction	0		37.08	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(241a)
Low-rate fraction	0		37.08	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(242a)

Low-rate fraction	0		37.08	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		82.16	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		17.65	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-42.08	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		200.99	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.84	(257)
SAP rating		86.46	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			213.9	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			474	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		687.9	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		15.45	(268)
energy saved or generated	0	-44.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		670.75	(272)
Dwelling CO2 Emission Rate		16.12	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1150.99	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2550.55	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3701.54	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			164.21	(282)
energy saved or generated	0		-374.57	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3621.29	(286)
Dwelling PE Rate			87.05	(287)

DER WORKSHEET

Dwelling Reference: A210
Dwelling Type: New Dwelling Design Stage

A210
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	23.98		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.34	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.55	984.48	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		44.03	(33)
Heat capacity Cm = ∑(A x k)		8708.28	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		118.64	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.38	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

68.6	68.39	68.19	67.19	66.99	65.99	65.99	65.79	66.39	66.99	67.39	67.79	(39)

Heat loss parameter (HLP), W/m²K

0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.45	114.53	103.45	106.9	103.45	106.9	103.45	103.45	106.9	103.45	106.9	103.45	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23	(72)

Total internal gains

510.93	521.79	500.81	482.89	458.94	439.48	423.07	424.17	436.77	454.8	482.2	500.61	(73)

6. Solar gains

Solar gains in watts, calculated for each month

107.04	191.31	285.62	393.9	477.7	490.3	466.02	401.05	322.73	217.88	129.85	90.55	(83)

Total gains – internal and solar (watts)

617.97	713.1	786.43	876.79	936.64	929.78	889.09	825.22	759.5	672.68	612.04	591.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.94	0.9	0.85	0.74	0.6	0.44	0.32	0.36	0.56	0.79	0.9	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.48	19.78	20.14	20.56	20.83	20.96	20.99	20.98	20.9	20.55	19.97	19.44	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.14	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.93	0.89	0.83	0.71	0.56	0.39	0.26	0.3	0.5	0.75	0.89	0.94	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.38	18.74	19.19	19.7	20	20.14	20.16	20.16	20.08	19.7	18.99	18.33	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(92)

Adjusted mean internal temperature:

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.91	0.87	0.82	0.71	0.56	0.4	0.28	0.32	0.52	0.75	0.87	0.92	(94)

Useful gains, mGm , W

563.5	622.62	641.57	620.25	528.48	374.24	252.71	263.68	391.39	502.75	533.66	544.07	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

993.67	972.75	889.31	747.09	576.59	385.32	255.19	267.4	417.35	630.38	825.65	985.61	(97)

Space heating requirement for each month

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98c)

Space heating requirement in kWh/m²/year 20.44 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
353.64	259.99	203.67	100.91	39.55	0	0	0		0	104.93	232.3	362.98		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.46	84.97	84.17	82.8	81.26	79.8	79.8	79.8		79.8	82.87	84.67	85.56		(217)
Fuel for water heating														
293.64	261.16	279.84	249.27	245.7	224.85	221.38	230.44		233.28	251.21	262.32	289.97	3043.06	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1657.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3043.06	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			157.16	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													243.16	(231)
Electricity for lighting													173.47	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5117.65	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(240a)
Low-rate fraction	0		60.35	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(241a)
Low-rate fraction	0		60.35	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(242a)

Low-rate fraction	0		60.35	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.77	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		331.82	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.01	(257)
SAP rating	83.65	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			348.17	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			639.04	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		987.21	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1045.98	(272)
Dwelling CO2 Emission Rate		14.25	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1873.49	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3438.66	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5312.15	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			266.08	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5946.08	(286)
Dwelling PE Rate			81.01	(287)

TER WORKSHEET

Dwelling Reference: A210
Dwelling Type: New Dwelling Design Stage

A210
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

Air changes per hour

Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.35	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective air change rate														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
Effective air change rate from PCDB:														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.55		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.54	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.51	1050.84	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.76	(33)
Heat capacity Cm = ∑(A x k)		8774.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		119.55	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.11	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

89.73	89.5	89.26	88.17	87.96	87.01	87.01	86.83	87.37	87.96	88.38	88.81	(39)

Heat loss parameter (HLP), W/m²K

1.22	1.22	1.22	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.21	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.47	114.56	103.47	106.92	103.47	106.92	103.47	103.47	106.92	103.47	106.92	103.47	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12	(72)

Total internal gains

510.85	521.71	500.72	482.81	458.85	439.39	422.98	424.08	436.68	454.72	482.11	500.53	(73)

6. Solar gains

Solar gains in watts, calculated for each month

115.97	207.27	309.42	426.68	517.43	531.07	504.78	434.41	349.61	236.04	140.68	98.1	(83)

Total gains – internal and solar (watts)

626.82	728.97	810.14	909.49	976.29	970.46	927.76	858.5	786.29	690.76	622.79	598.63	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.95	0.92	0.88	0.8	0.67	0.52	0.39	0.44	0.64	0.83	0.92	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.8	19.13	19.58	20.16	20.6	20.87	20.95	20.94	20.75	20.17	19.4	18.75	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.9	19.9	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.94	0.91	0.86	0.76	0.62	0.45	0.3	0.35	0.57	0.8	0.91	0.95	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.37	17.78	18.35	19.05	19.56	19.83	19.91	19.9	19.73	19.08	18.14	17.32	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(92)

Adjusted mean internal temperature:

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(93)

8. Space heating requirement

Utilisation factor for gains,

0.92	0.89	0.84	0.75	0.62	0.47	0.34	0.38	0.58	0.78	0.89	0.93	(94)

Useful gains, mGm , W

575.94	645.96	679.05	680.63	607.67	452.08	311.27	322.84	455.15	541.41	551.98	554.49	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1220.31	1197.32	1098.28	930.98	724.95	488.53	321.5	337.22	524.59	781.32	1016.71	1211.85	(97)

Space heating requirement for each month

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98c)

Space heating requirement in kWh/m²/year 33.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
519.41	401.43	337.93	195.29	94.54	0	0	0		0	193.39	362.52	529.88		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.74	85.46	84.96	84.01	82.54	79.8	79.8	79.8		79.8	83.96	85.23	85.8		(217)
Fuel for water heating														
258.87	229.64	245.61	219.19	216.74	202.58	200.49	208.23		210.24	222.14	231.81	255.99	2701.53	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2634.38	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2701.53	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													173.52	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.36	39.1	44.58	42.51	41.99	38.42	32.59	25.16	15.76	11.84	359.18	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.6	37.25	37.71	37.27	31.21	22.42	12.74	5.46	3.17	245.48	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4990.77	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(240a)
Low-rate fraction	0		95.89	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(241a)
Low-rate fraction	0		95.89	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(242a)

Low-rate fraction	0		95.89	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.34	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.92	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		256.1	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.38	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			553.22	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.32	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1120.54	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1078.99	(272)
Dwelling CO2 Emission Rate		14.7	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2976.85	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.73	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			6029.58	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			266.15	(282)
energy saved or generated	0		-648.6	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5777.23	(286)
Dwelling PE Rate			78.71	(287)

DER WORKSHEET

Dwelling Reference: A211
Dwelling Type: New Dwelling Design Stage

A211
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.32	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		25.99	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		30.44	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

43.43	43.27	43.11	42.3	42.14	41.34	41.34	41.18	41.66	42.14	42.47	42.79	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.73	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.72	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

444.57	453.55	435.69	420.19	399.87	382.82	368.91	370.05	380.8	396.71	420.13	435.93	(73)

6. Solar gains

Solar gains in watts, calculated for each month

25.68	49.79	85.81	138.6	186.6	199.56	186.4	148.07	103.51	59.64	31.82	21.31	(83)

Total gains – internal and solar (watts)

470.25	503.34	521.51	558.79	586.47	582.38	555.31	518.11	484.32	456.36	451.95	457.24	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.89	0.84	0.75	0.61	0.44	0.32	0.36	0.55	0.77	0.87	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.8	19.99	20.25	20.61	20.85	20.97	20.99	20.99	20.92	20.64	20.2	19.79	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.31	20.31	20.31	20.32	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.87	0.83	0.72	0.57	0.4	0.28	0.31	0.51	0.74	0.86	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.9	19.13	19.46	19.91	20.18	20.31	20.33	20.33	20.26	19.95	19.41	18.89	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(92)

Adjusted mean internal temperature:

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.82	0.72	0.58	0.42	0.3	0.33	0.52	0.74	0.84	0.89	(94)

Useful gains, mGm , W

416.37	432.06	425.24	401.34	340.48	241.8	165.17	171.96	253.92	335.69	381.4	407.87	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

651.85	632.55	574.21	479.18	370.21	248.31	166.62	174.13	269.16	407.08	538.09	645.84	(97)

Space heating requirement for each month

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98c)

Space heating requirement in kWh/m²/year 14.32 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
193.59	148.87	122.47	61.93	24.44	0	0	0		0	58.69	124.66	195.63	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.09	83.74	83.13	82.01	80.82	79.8	79.8	79.8		79.8	81.9	83.3	84.15	(217)
Fuel for water heating													
274.05	243.46	260.55	231.97	228.03	207.97	205.04	213.19		215.55	234.4	245.3	270.82	2830.32 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			930.28 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2830.32 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	125.9 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			211.9 (231)
Electricity for lighting			146.08 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4118.59	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(240a)
Low-rate fraction	0		33.86	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(241a)
Low-rate fraction	0		33.86	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(242a)

Low-rate fraction	0		33.86	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.02	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		287.92	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1	(257)
SAP rating		83.81	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			195.36	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			594.37	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		789.73	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		840.2	(272)
Dwelling CO2 Emission Rate		14.29	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1051.22	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3198.27	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4249.49	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4794.11	(286)
Dwelling PE Rate			81.53	(287)

TER WORKSHEET

Dwelling Reference: A211
Dwelling Type: New Dwelling Design Stage

A211
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =	0	(6a)
Open chimneys	0	x 20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =	0	(6c)
Flues attached to solid fuel boiler	0	x 20 =	0	(6d)
Flues attached to other heater	0	x 35 =	0	(6e)
Number of blocked chimneys	0	x 20 =	0	(6f)
Number of intermittent extract fans	2	x 10 =	20	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

Air changes per hour

Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.32	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
Effective air change rate from PCDB:														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.59	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		28.25	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		32.7	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

62.22	62.06	61.89	61.12	60.98	60.31	60.31	60.19	60.57	60.98	61.27	61.57	(39)

Heat loss parameter (HLP), W/m²K

1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.03	1.04	1.04	1.05	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

444.46	453.44	435.58	420.08	399.76	382.71	368.79	369.94	380.69	396.6	420.02	435.82	(73)

6. Solar gains

Solar gains in watts, calculated for each month

35.95	69.71	120.14	194.03	261.24	279.38	260.96	207.29	144.92	83.5	44.55	29.83	(83)

Total gains – internal and solar (watts)

480.41	523.15	555.72	614.12	661	662.09	629.76	577.23	525.61	480.1	464.57	465.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.93	0.91	0.88	0.8	0.68	0.52	0.4	0.45	0.65	0.83	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.89	19.13	19.54	20.11	20.57	20.85	20.95	20.93	20.72	20.15	19.45	18.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.04	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.92	0.9	0.86	0.77	0.63	0.46	0.32	0.37	0.59	0.8	0.89	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.58	17.89	18.39	19.1	19.64	19.95	20.03	20.02	19.82	19.16	18.3	17.54	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(92)

Adjusted mean internal temperature:

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.88	0.84	0.76	0.63	0.48	0.35	0.4	0.6	0.78	0.87	0.91	(94)

Useful gains, mGm , W

432.77	459.1	466.59	464.99	419.66	317.8	222.99	229.94	315.1	376.27	404.16	422.29	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

863.06	840.98	768.02	651.16	509.76	347.19	232.03	242.67	371.08	549.36	718.21	858.1	(97)

Space heating requirement for each month

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98c)

Space heating requirement in kWh/m²/year 28.59 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
346.84	278.03	242.98	145.23	72.63	0	0	0		0	139.52	244.98	351.3		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.06	84.85	84.4	83.53	82.2	79.8	79.8	79.8		79.8	83.41	84.54	85.11		(217)
Fuel for water heating														
240.24	213.08	227.95	203.75	201.49	187.92	186.23	193.19		194.81	206.76	215.59	237.66	2508.68	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1821.51	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2508.68	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.97	26.21	31.75	36.28	34.63	34.22	31.28	26.47	20.38	12.72	9.54	291.64	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.03	21.68	29.27	29.63	29.27	24.5	17.59	9.99	4.28	2.48	192.75	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4077.88	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(240a)
Low-rate fraction	0		66.3	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(241a)
Low-rate fraction	0		66.3	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(242a)

Low-rate fraction	0		66.3	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		91.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		229.04	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.79	(257)
SAP rating		87.12	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			382.52	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			526.82	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		909.34	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		879.43	(272)
Dwelling CO2 Emission Rate		14.96	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2058.31	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2834.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4893.11	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		-523.55	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4723.72	(286)
Dwelling PE Rate			80.34	(287)

DER WORKSHEET

Dwelling Reference: A312
Dwelling Type: New Dwelling Design Stage

A312
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.51	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		17.13	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		19.78	(37)

Ventilation heat loss calculated monthly

	11.25	11.11	10.97	10.27	10.13	9.44	9.44	9.3	9.72	10.13	10.41	10.69	(38)

Heat transfer coefficient, W/K

	31.03	30.89	30.75	30.05	29.91	29.22	29.22	29.08	29.49	29.91	30.19	30.47	(39)

Heat loss parameter (HLP), W/m²K

	0.61	0.61	0.6	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.59	0.6	(40)

Number of days in month (Table 1a)

	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.72 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

	53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

	22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

	32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 99.53 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

	108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

	171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

	25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

408.37	416.55	400.23	386.24	367.95	352.41	339.86	341.01	350.78	365.35	386.53	400.7	(73)

6. Solar gains

Solar gains in watts, calculated for each month

24.22	46.41	77.21	118.65	153.88	162	152.34	124.65	91.34	54.99	29.95	20.12	(83)

Total gains – internal and solar (watts)

432.58	462.96	477.44	504.9	521.83	514.41	492.2	465.66	442.12	420.34	416.47	420.82	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.84	0.78	0.66	0.52	0.36	0.26	0.29	0.45	0.68	0.82	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.35	20.49	20.66	20.86	20.96	20.99	21	21	20.98	20.87	20.62	20.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.42	20.42	20.43	20.44	20.44	20.45	20.45	20.46	20.45	20.44	20.44	20.43	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.86	0.82	0.76	0.64	0.49	0.33	0.23	0.25	0.42	0.65	0.8	0.87	(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.66	19.84	20.05	20.29	20.4	20.45	20.45	20.45	20.43	20.31	20.01	19.66	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(92)

Adjusted mean internal temperature:

19.97	20.13	20.33	20.55	20.66	20.7	20.7	20.7	20.68	20.57	20.29	19.97	(93)

8. Space heating requirement

Utilisation factor for gains,

0.85	0.82	0.76	0.64	0.5	0.34	0.24	0.27	0.43	0.65	0.79	0.86	(94)

Useful gains, mGm , W

369.39	378.12	363.33	324.84	260.65	177.09	119.67	124.85	191.3	275.24	330.82	362.51	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

486.28	470.48	425.1	350.13	267.89	178.13	119.83	125.1	194.19	298.1	398.27	480.45	(97)

Space heating requirement for each month

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

86.96	62.07	45.95	18.21	5.39	0	0	0	0	17.01	48.56	87.75	(98c)

Space heating requirement in kWh/m²/year 7.31 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
96.09	68.58	50.78	20.13	5.95	0	0	0	0	18.8	53.66	96.96		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
82.58	82.17	81.57	80.67	80.08	79.8	79.8	79.8	79.8	80.61	81.74	82.63		(217)
Fuel for water heating													
263.9	234.73	251.35	223.55	218.45	197.66	195.06	202.65	204.73	225.86	236.74	260.89	2715.58	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												410.95	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2715.58	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		108.98	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												194.98	(231)
Electricity for lighting												134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3456.17	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(240a)
Low-rate fraction	0		14.96	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(241a)
Low-rate fraction	0		14.96	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		14.96	(242a)

Low-rate fraction	0		14.96	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.85	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		260.16	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.98	(257)
SAP rating		84.17	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			86.3	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			570.27	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		656.57	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		703.05	(272)
Dwelling CO2 Emission Rate		13.81	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			464.37	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3068.6	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3532.97	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4034.49	(286)
Dwelling PE Rate			79.26	(287)

TER WORKSHEET

Dwelling Reference: A312
Dwelling Type: New Dwelling Design Stage

A312
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.43	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4	4.48	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	8.46		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.81	607.18	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		52.92	(31)
Party Wall	0	556.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		18.43	(33)
Heat capacity Cm = ∑(A x k)		5455.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		107.18	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		21.08	(37)

Ventilation heat loss calculated monthly

25.96	25.8	25.65	24.91	24.77	24.13	24.13	24.01	24.37	24.77	25.05	25.34	(38)

Heat transfer coefficient, W/K

47.04	46.88	46.72	45.99	45.85	45.21	45.21	45.09	45.45	45.85	46.13	46.42	(39)

Heat loss parameter (HLP), W/m²K

0.92	0.92	0.92	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.91	0.91	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

80.3	88.91	80.3	82.98	80.3	82.98	80.3	80.3	82.98	80.3	82.98	80.3	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

408.26	416.44	400.12	386.13	367.84	352.3	339.74	340.9	350.66	365.24	386.42	400.59	(73)

6. Solar gains

Solar gains in watts, calculated for each month

33.9	64.98	108.1	166.12	215.43	226.79	213.28	174.51	127.88	76.99	41.92	28.16	(83)

Total gains – internal and solar (watts)

442.16	481.41	508.22	552.25	583.27	579.09	553.02	515.41	478.54	442.22	428.34	428.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.9	0.86	0.76	0.63	0.47	0.35	0.39	0.59	0.79	0.89	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.43	19.66	19.99	20.44	20.76	20.93	20.98	20.97	20.86	20.47	19.91	19.4	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.15	20.15	20.15	20.16	20.17	20.18	20.18	20.18	20.17	20.17	20.16	20.16	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.84	0.74	0.59	0.42	0.29	0.32	0.53	0.76	0.87	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.32	18.61	19.02	19.57	19.94	20.12	20.17	20.16	20.05	19.61	18.93	18.3	(90)

Living area fraction 0.46 (91)

Mean internal temperature (for the whole dwelling)

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(92)

Adjusted mean internal temperature:

18.83	19.08	19.46	19.96	20.31	20.49	20.54	20.53	20.42	20	19.38	18.8	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.87	0.82	0.73	0.6	0.44	0.32	0.35	0.55	0.75	0.86	0.9	(94)

Useful gains, mGm , W

394.71	416.49	417.6	402.96	349.48	254.24	174.87	181.82	262.25	332.68	366.26	385.6	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

683.35	664.98	605.66	508.83	394.81	266.36	177.98	186.27	287.35	431.07	566.38	677.85	(97)

Space heating requirement for each month

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

214.75	166.99	139.92	76.23	33.73	0	0	0	0	73.21	144.09	217.43	(98c)

Space heating requirement in kWh/m²/year 20.95 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
232.66	180.92	151.59	82.59	36.54	0	0	0		0	79.31	156.11	235.57		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.29	84	83.47	82.48	81.25	79.8	79.8	79.8		79.8	82.38	83.65	84.34		(217)
Fuel for water heating														
229.69	203.97	218.61	196.02	193.86	178.97	177.52	184.02		185.4	198.96	206.72	227.26	2400.99	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1155.29	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2400.99	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													134.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

9.73	14.77	22.84	27.71	31.71	30.29	29.94	27.35	23.12	17.76	11.07	8.29	254.57	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.7	5.86	11.99	18.54	25.04	25.34	25.03	20.93	15.03	8.53	3.65	2.12	164.74	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3357.63	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(240a)
Low-rate fraction	0		42.05	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(241a)
Low-rate fraction	0		42.05	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		42.05	(242a)

Low-rate fraction	0		42.05	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.4	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		22.21	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-51.2	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		206.64	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.43	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			242.61	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			504.21	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		746.82	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		19.44	(268)
energy saved or generated	0	-54.48	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		723.71	(272)
Dwelling CO2 Emission Rate		14.22	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1305.48	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2713.12	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4018.6	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			206.54	(282)
energy saved or generated	0		-455.35	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3899.89	(286)
Dwelling PE Rate			76.62	(287)

DER WORKSHEET

Dwelling Reference: A313
Dwelling Type: New Dwelling Design Stage

A313
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			3	3	(19)
Shelter factor				0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	15.6		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		23.77	(33)
Heat capacity Cm = ∑(A x k)		4369.94	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		105.05	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		26.57	(37)

Ventilation heat loss calculated monthly

8.68	8.58	8.47	7.96	7.85	7.33	7.33	7.23	7.54	7.85	8.06	8.27	(38)

Heat transfer coefficient, W/K

35.25	35.15	35.05	34.53	34.42	33.9	33.9	33.8	34.11	34.42	34.63	34.84	(39)

Heat loss parameter (HLP), W/m²K

0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.81	0.82	0.83	0.83	0.84	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.45 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 91.12 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

203.47 180.13 191.63 168.93 164.1 148.22 146.45 151.99 153.39 170.63 180.97 201.28 2061.18 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.48 79.61 85.55 77.3 76.39 70.41 70.53 72.37 72.13 78.57 81.3 88.76 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 72.47 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.34	70.13	63.34	65.45	63.34	65.45	63.34	63.34	65.45	63.34	65.45	63.34	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.28	118.47	114.99	107.35	102.68	97.79	94.79	97.27	100.18	105.6	112.92	119.3	(72)

Total internal gains

356.93	363.22	349.66	337.15	321.54	307.47	296.82	298	306.3	319.6	337.85	350.42	(73)

6. Solar gains

Solar gains in watts, calculated for each month

96.36	166.06	232.29	296.34	339.71	340.67	327.02	294.15	254.39	184.9	115.77	82.24	(83)

Total gains – internal and solar (watts)

453.3	529.27	581.96	633.5	661.25	648.15	623.84	592.14	560.69	504.5	453.62	432.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.79	0.71	0.59	0.46	0.33	0.24	0.26	0.41	0.63	0.79	0.87	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.94	20.22	20.51	20.77	20.92	20.98	21	20.99	20.96	20.77	20.35	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.21	20.21	20.22	20.23	20.23	20.24	20.24	20.24	20.24	20.23	20.23	20.22	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.84	0.77	0.69	0.56	0.43	0.29	0.2	0.22	0.36	0.59	0.77	0.86	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.99	19.34	19.68	19.99	20.15	20.23	20.24	20.24	20.2	20	19.51	18.94	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(92)

Adjusted mean internal temperature:

19.61	19.92	20.22	20.5	20.65	20.72	20.73	20.73	20.7	20.51	20.06	19.56	(93)

8. Space heating requirement

Utilisation factor for gains,

0.83	0.77	0.69	0.57	0.45	0.32	0.22	0.25	0.39	0.6	0.77	0.84	(94)

Useful gains, mGm , W

375.87	405.71	401.59	363.8	295	204.48	139.43	145.46	218.75	304.65	347.12	364.62	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

539.72	527.86	480.81	400.67	308.23	207.47	140.13	146.43	225.07	341.01	448.72	535.07	(97)

Space heating requirement for each month

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

121.91	82.09	58.95	26.54	9.84	0	0	0	0	27.05	73.15	126.81	(98c)

Space heating requirement in kWh/m²/year 12.65 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
134.7	90.7	65.13	29.33	10.87	0	0	0	0	29.89	80.83	140.13		(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
83.5	82.87	82.08	81.1	80.34	79.8	79.8	79.8	79.8	81.11	82.61	83.62		(217)
Fuel for water heating													
243.68	217.37	233.46	208.29	204.26	185.74	183.52	190.47	192.21	210.36	219.06	240.71	2529.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												581.6	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2529.13	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		89.07	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												175.07	(231)
Electricity for lighting												106.21	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3392.01	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(240a)
Low-rate fraction	0		21.17	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(241a)
Low-rate fraction	0		21.17	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		21.17	(242a)

Low-rate fraction	0		21.17	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		92.06	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		28.87	(249)
Energy For lighting	0		17.51	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		251.61	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.05	(257)
SAP rating		83.04	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			122.14	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			531.12	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		653.25	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		24.28	(267)
Electricity for lighting		15.33	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		692.87	(272)
Dwelling CO2 Emission Rate		16.66	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			657.21	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2857.91	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3515.12	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			264.85	(281)
Electricity for lighting			162.91	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3942.88	(286)
Dwelling PE Rate			94.78	(287)

TER WORKSHEET

Dwelling Reference: A313
Dwelling Type: New Dwelling Design Stage

A313
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground Floor	41.6	(1a) x	2.6	(2a) =	108.16	(3a)
Total floor area TFA					41.6	(4)
Dwelling volume					108.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.18	0.18	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, (m³/h/m²)	5	5	(17)
Air permeability value, AP4, (m³/h/m²)	0	0	(17a)
Air permeability value)	0.43	0.43	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.34 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4	4.42	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

Effective air change rate from PCDB:

0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	9.45		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	8.19	636.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		55.89	(31)
Party Wall	0	556.2	(32)
Party floor		1664	(32a)
Party ceiling		1248	(32b)
Internal wall **		340.2	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		19.79	(33)
Heat capacity Cm = ∑(A x k)		4445.12	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		106.85	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		22.59	(37)

Ventilation heat loss calculated monthly

21.14	21.01	20.89	20.3	20.19	19.68	19.68	19.58	19.87	20.19	20.41	20.65	(38)

Heat transfer coefficient, W/K

43.74	43.61	43.48	42.89	42.78	42.27	42.27	42.17	42.47	42.78	43.01	43.24	(39)

Heat loss parameter (HLP), W/m²K

1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.03	1.04	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.45	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

48.52	47.79	46.73	44.7	43.2	41.52	40.57	41.63	42.78	44.58	46.66	48.34	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

20.99	20.68	20.24	19.43	18.82	18.15	17.79	18.22	18.7	19.42	20.24	20.92	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

29.47	28.4	27.33	26.26	25.19	24.12	24.12	25.19	26.26	27.33	28.4	29.47	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	91.12	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

98.99	96.87	94.3	90.39	87.21	83.79	82.48	85.04	87.74	91.33	95.3	98.73	1092.16 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

156.77	137.95	144.94	123.73	117.4	103.03	99.75	105.3	108.19	123.93	135.78	154.59	1511.35 (45)

Distribution loss (46) = 0.15 x (45)

23.52	20.69	21.74	18.56	17.61	15.45	14.96	15.79	16.23	18.59	20.37	23.19	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

203.36	180.03	191.53	168.83	163.99	148.12	146.34	151.89	153.29	170.53	180.87	201.18	2059.96	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

22.18	19.62	20.54	17.01	15.85	13.57	12.72	13.52	14.04	16.55	18.75	21.77	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

181.18	160.41	170.99	151.81	148.14	134.56	133.63	138.37	139.25	153.98	162.12	179.41	1853.85	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

89.4	79.54	85.47	77.21	76.31	70.33	70.44	72.29	72.05	78.48	81.22	88.68	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	72.47	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

63.84	70.68	63.84	65.97	63.84	65.97	63.84	63.84	65.97	63.84	65.97	63.84	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

125.58	126.88	123.6	116.61	107.78	99.49	93.95	92.64	95.93	102.92	111.74	120.04	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	30.25	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	-57.98	(71)

Water heating gains (Table 5)

120.16	118.36	114.88	107.24	102.57	97.68	94.68	97.16	100.07	105.49	112.8	119.19	(72)

Total internal gains

357.33	363.66	350.06	337.56	321.94	307.88	297.21	298.39	306.71	319.99	338.26	350.81	(73)

6. Solar gains

Solar gains in watts, calculated for each month

81.7	140.79	196.95	251.27	288.06	288.88	277.3	249.42	215.69	156.77	98.15	69.72	(83)

Total gains – internal and solar (watts)

439.02	504.45	547.01	588.84	609.99	596.76	574.52	547.8	522.4	476.76	436.41	420.53	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.85	0.79	0.7	0.57	0.43	0.32	0.34	0.51	0.72	0.85	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.35	19.67	20.04	20.47	20.76	20.93	20.98	20.97	20.87	20.5	19.88	19.3	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.05	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.06	20.05	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.83	0.77	0.66	0.53	0.37	0.25	0.28	0.45	0.68	0.83	0.89	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.15	18.54	19	19.5	19.84	20.01	20.06	20.05	19.96	19.56	18.82	18.1	(90)

Living area fraction 0.65 (91)

Mean internal temperature (for the whole dwelling)

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(92)

Adjusted mean internal temperature:

18.94	19.28	19.68	20.13	20.44	20.61	20.66	20.65	20.56	20.17	19.52	18.89	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.76	0.67	0.55	0.41	0.29	0.32	0.48	0.69	0.81	0.87	(94)

Useful gains, mGm , W

378.53	412.25	415.81	392.24	333.41	241.86	168.13	174.87	252.9	327.11	355.3	366.88	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

640.21	627.01	573.06	481.8	373.95	254.05	171.57	179.39	274.18	409.54	533.98	635.06	(97)

Space heating requirement for each month

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

194.69	144.32	116.99	64.48	30.17	0	0	0	0	61.32	128.65	199.52	(98c)

Space heating requirement in kWh/m²/year 22.6 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
210.94	156.36	126.75	69.86	32.68	0	0	0	0	66.44	139.39	216.17		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
84.22	83.82	83.23	82.29	81.19	79.8	79.8	79.8	79.8	82.17	83.55	84.3		(217)
Fuel for water heating													
215.13	191.37	205.45	184.5	182.46	168.62	167.45	173.39	174.5	187.39	194.05	212.83	2257.13	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		1018.57	(211)
Space heating fuel used, main system 2		0	(213)
Space heating fuel used, secondary		0	(215)
Water heating fuel used		2257.13	(219)
Electricity for instantaneous electric shower(s)		0	(64a)
Space cooling fuel used		0	(221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	(230a)
warm air heating system fans		0	(230b)
Heating circulation pump or water pump within warm air heating unit		41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)		0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)		45	(230e)
Maintaining electric keep-hot facility for gas combi boiler		0	(230f)
Pump for solar water heating		0	(230g)
Pump for storage WWHRS		0	(230h)
Total electricity for the above		86	(231)
Electricity for lighting		107.06	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

7.99	12.15	18.84	22.9	26.27	25.12	24.83	22.66	19.12	14.64	9.1	6.81	210.43	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

2.16	4.7	9.63	14.9	20.11	20.35	20.09	16.8	12.06	6.84	2.93	1.7	132.27	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3126.06	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(240a)
Low-rate fraction	0		37.08	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(241a)
Low-rate fraction	0		37.08	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		37.08	(242a)

Low-rate fraction	0		37.08	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		82.16	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		17.65	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-42.08	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		200.99	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.84	(257)
SAP rating		86.46	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			213.9	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			474	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		687.9	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		15.45	(268)
energy saved or generated	0	-44.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		670.75	(272)
Dwelling CO2 Emission Rate		16.12	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1150.99	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2550.55	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3701.54	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			164.21	(282)
energy saved or generated	0		-374.57	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3621.29	(286)
Dwelling PE Rate			87.05	(287)

DER WORKSHEET

Dwelling Reference: A314
Dwelling Type: New Dwelling Design Stage

A314
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	23.98		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.34	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.55	984.48	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		44.03	(33)
Heat capacity Cm = ∑(A x k)		8708.28	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		118.64	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.38	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

68.6	68.39	68.19	67.19	66.99	65.99	65.99	65.79	66.39	66.99	67.39	67.79	(39)

Heat loss parameter (HLP), W/m²K

0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.45	114.53	103.45	106.9	103.45	106.9	103.45	103.45	106.9	103.45	106.9	103.45	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23	(72)

Total internal gains

510.93	521.79	500.81	482.89	458.94	439.48	423.07	424.17	436.77	454.8	482.2	500.61	(73)

6. Solar gains

Solar gains in watts, calculated for each month

107.04	191.31	285.62	393.9	477.7	490.3	466.02	401.05	322.73	217.88	129.85	90.55	(83)

Total gains – internal and solar (watts)

617.97	713.1	786.43	876.79	936.64	929.78	889.09	825.22	759.5	672.68	612.04	591.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.94	0.9	0.85	0.74	0.6	0.44	0.32	0.36	0.56	0.79	0.9	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.48	19.78	20.14	20.56	20.83	20.96	20.99	20.98	20.9	20.55	19.97	19.44	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.14	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.93	0.89	0.83	0.71	0.56	0.39	0.26	0.3	0.5	0.75	0.89	0.94	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.38	18.74	19.19	19.7	20	20.14	20.16	20.16	20.08	19.7	18.99	18.33	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(92)

Adjusted mean internal temperature:

18.79	19.12	19.54	20.02	20.31	20.44	20.47	20.46	20.39	20.01	19.35	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.91	0.87	0.82	0.71	0.56	0.4	0.28	0.32	0.52	0.75	0.87	0.92	(94)

Useful gains, mGm , W

563.5	622.62	641.57	620.25	528.48	374.24	252.71	263.68	391.39	502.75	533.66	544.07	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

993.67	972.75	889.31	747.09	576.59	385.32	255.19	267.4	417.35	630.38	825.65	985.61	(97)

Space heating requirement for each month

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.04	235.29	184.32	91.32	35.79	0	0	0	0	94.96	210.23	328.5	(98c)

Space heating requirement in kWh/m²/year 20.44 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
353.64	259.99	203.67	100.91	39.55	0	0	0		0	104.93	232.3	362.98		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.46	84.97	84.17	82.8	81.26	79.8	79.8	79.8		79.8	82.87	84.67	85.56		(217)
Fuel for water heating														
293.64	261.16	279.84	249.27	245.7	224.85	221.38	230.44		233.28	251.21	262.32	289.97	3043.06	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1657.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3043.06	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			157.16	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													243.16	(231)
Electricity for lighting													173.47	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5117.65	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(240a)
Low-rate fraction	0		60.35	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(241a)
Low-rate fraction	0		60.35	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		60.35	(242a)

Low-rate fraction	0		60.35	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.77	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		331.82	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.01	(257)
SAP rating	83.65	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			348.17	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			639.04	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		987.21	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1045.98	(272)
Dwelling CO2 Emission Rate		14.25	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1873.49	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3438.66	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5312.15	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			266.08	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5946.08	(286)
Dwelling PE Rate			81.01	(287)

TER WORKSHEET

Dwelling Reference: A314
Dwelling Type: New Dwelling Design Stage

A314
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.35	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective air change rate														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
Effective air change rate from PCDB:														
	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.55		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.54	1468	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.51	1050.84	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.76	(33)
Heat capacity Cm = ∑(A x k)		8774.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		119.55	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.11	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

89.73	89.5	89.26	88.17	87.96	87.01	87.01	86.83	87.37	87.96	88.38	88.81	(39)

Heat loss parameter (HLP), W/m²K

1.22	1.22	1.22	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.21	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15 (45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.47	114.56	103.47	106.92	103.47	106.92	103.47	103.47	106.92	103.47	106.92	103.47	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12	(72)

Total internal gains

510.85	521.71	500.72	482.81	458.85	439.39	422.98	424.08	436.68	454.72	482.11	500.53	(73)

6. Solar gains

Solar gains in watts, calculated for each month

115.97	207.27	309.42	426.68	517.43	531.07	504.78	434.41	349.61	236.04	140.68	98.1	(83)

Total gains – internal and solar (watts)

626.82	728.97	810.14	909.49	976.29	970.46	927.76	858.5	786.29	690.76	622.79	598.63	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.95	0.92	0.88	0.8	0.67	0.52	0.39	0.44	0.64	0.83	0.92	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.8	19.13	19.58	20.16	20.6	20.87	20.95	20.94	20.75	20.17	19.4	18.75	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.9	19.9	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.94	0.91	0.86	0.76	0.62	0.45	0.3	0.35	0.57	0.8	0.91	0.95	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.37	17.78	18.35	19.05	19.56	19.83	19.91	19.9	19.73	19.08	18.14	17.32	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(92)

Adjusted mean internal temperature:

17.9	18.28	18.8	19.46	19.94	20.21	20.3	20.28	20.1	19.48	18.6	17.85	(93)

8. Space heating requirement

Utilisation factor for gains,

0.92	0.89	0.84	0.75	0.62	0.47	0.34	0.38	0.58	0.78	0.89	0.93	(94)

Useful gains, mGm , W

575.94	645.96	679.05	680.63	607.67	452.08	311.27	322.84	455.15	541.41	551.98	554.49	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1220.31	1197.32	1098.28	930.98	724.95	488.53	321.5	337.22	524.59	781.32	1016.71	1211.85	(97)

Space heating requirement for each month

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

479.41	370.52	311.91	180.25	87.26	0	0	0	0	178.5	334.61	489.08	(98c)

Space heating requirement in kWh/m²/year 33.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
519.41	401.43	337.93	195.29	94.54	0	0	0		0	193.39	362.52	529.88		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.74	85.46	84.96	84.01	82.54	79.8	79.8	79.8		79.8	83.96	85.23	85.8		(217)
Fuel for water heating														
258.87	229.64	245.61	219.19	216.74	202.58	200.49	208.23		210.24	222.14	231.81	255.99	2701.53	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2634.38	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2701.53	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													173.52	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.36	39.1	44.58	42.51	41.99	38.42	32.59	25.16	15.76	11.84	359.18	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.6	37.25	37.71	37.27	31.21	22.42	12.74	5.46	3.17	245.48	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4990.77	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(240a)
Low-rate fraction	0		95.89	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(241a)
Low-rate fraction	0		95.89	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		95.89	(242a)

Low-rate fraction	0		95.89	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.34	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.92	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		256.1	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.78	(257)
SAP rating		87.38	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			553.22	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.32	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1120.54	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1078.99	(272)
Dwelling CO2 Emission Rate		14.7	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2976.85	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.73	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			6029.58	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			266.15	(282)
energy saved or generated	0		-648.6	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5777.23	(286)
Dwelling PE Rate			78.71	(287)

DER WORKSHEET

Dwelling Reference: A315
Dwelling Type: New Dwelling Design Stage

A315
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =		0	(6a)
Open chimneys	0	x 20 =		0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =		0	(6c)
Flues attached to solid fuel boiler	0	x 20 =		0	(6d)
Flues attached to other heater	0	x 35 =		0	(6e)
Number of blocked chimneys	0	x 20 =		0	(6f)
Number of intermittent extract fans	0	x 10 =		0	(7a)
Number of passive vents	0	x 10 =		0	(7b)
Number of flueless gas fires	0	x 40 =		0	(7c)
		Air changes per hour			
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.32	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		25.99	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		30.44	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

43.43	43.27	43.11	42.3	42.14	41.34	41.34	41.18	41.66	42.14	42.47	42.79	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.73	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.72	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

444.57	453.55	435.69	420.19	399.87	382.82	368.91	370.05	380.8	396.71	420.13	435.93	(73)

6. Solar gains

Solar gains in watts, calculated for each month

25.68	49.79	85.81	138.6	186.6	199.56	186.4	148.07	103.51	59.64	31.82	21.31	(83)

Total gains – internal and solar (watts)

470.25	503.34	521.51	558.79	586.47	582.38	555.31	518.11	484.32	456.36	451.95	457.24	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.89	0.84	0.75	0.61	0.44	0.32	0.36	0.55	0.77	0.87	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.8	19.99	20.25	20.61	20.85	20.97	20.99	20.99	20.92	20.64	20.2	19.79	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.31	20.31	20.31	20.32	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.87	0.83	0.72	0.57	0.4	0.28	0.31	0.51	0.74	0.86	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.9	19.13	19.46	19.91	20.18	20.31	20.33	20.33	20.26	19.95	19.41	18.89	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(92)

Adjusted mean internal temperature:

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.82	0.72	0.58	0.42	0.3	0.33	0.52	0.74	0.84	0.89	(94)

Useful gains, mGm , W

416.37	432.06	425.24	401.34	340.48	241.8	165.17	171.96	253.92	335.69	381.4	407.87	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

651.85	632.55	574.21	479.18	370.21	248.31	166.62	174.13	269.16	407.08	538.09	645.84	(97)

Space heating requirement for each month

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98c)

Space heating requirement in kWh/m²/year 14.32 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
193.59	148.87	122.47	61.93	24.44	0	0	0		0	58.69	124.66	195.63	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.09	83.74	83.13	82.01	80.82	79.8	79.8	79.8		79.8	81.9	83.3	84.15	(217)
Fuel for water heating													
274.05	243.46	260.55	231.97	228.03	207.97	205.04	213.19		215.55	234.4	245.3	270.82	2830.32 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			930.28 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2830.32 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	125.9 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			211.9 (231)
Electricity for lighting			146.08 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4118.59	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(240a)
Low-rate fraction	0		33.86	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(241a)
Low-rate fraction	0		33.86	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(242a)

Low-rate fraction	0		33.86	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.02	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		287.92	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1	(257)
SAP rating		83.81	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			195.36	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			594.37	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		789.73	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		840.2	(272)
Dwelling CO2 Emission Rate		14.29	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1051.22	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3198.27	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4249.49	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4794.11	(286)
Dwelling PE Rate			81.53	(287)

TER WORKSHEET

Dwelling Reference: A315
Dwelling Type: New Dwelling Design Stage

A315
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x 80 =	0	(6a)
Open chimneys	0	x 20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x 10 =	0	(6c)
Flues attached to solid fuel boiler	0	x 20 =	0	(6d)
Flues attached to other heater	0	x 35 =	0	(6e)
Number of blocked chimneys	0	x 20 =	0	(6f)
Number of intermittent extract fans	2	x 10 =	20	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

Air changes per hour

Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.32	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
Effective air change rate from PCDB:														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.59	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		28.25	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		32.7	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

62.22	62.06	61.89	61.12	60.98	60.31	60.31	60.19	60.57	60.98	61.27	61.57	(39)

Heat loss parameter (HLP), W/m²K

1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.03	1.04	1.04	1.05	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

444.46	453.44	435.58	420.08	399.76	382.71	368.79	369.94	380.69	396.6	420.02	435.82	(73)

6. Solar gains

Solar gains in watts, calculated for each month

35.95	69.71	120.14	194.03	261.24	279.38	260.96	207.29	144.92	83.5	44.55	29.83	(83)

Total gains – internal and solar (watts)

480.41	523.15	555.72	614.12	661	662.09	629.76	577.23	525.61	480.1	464.57	465.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.93	0.91	0.88	0.8	0.68	0.52	0.4	0.45	0.65	0.83	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.89	19.13	19.54	20.11	20.57	20.85	20.95	20.93	20.72	20.15	19.45	18.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.04	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.92	0.9	0.86	0.77	0.63	0.46	0.32	0.37	0.59	0.8	0.89	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.58	17.89	18.39	19.1	19.64	19.95	20.03	20.02	19.82	19.16	18.3	17.54	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(92)

Adjusted mean internal temperature:

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.88	0.84	0.76	0.63	0.48	0.35	0.4	0.6	0.78	0.87	0.91	(94)

Useful gains, mGm , W

432.77	459.1	466.59	464.99	419.66	317.8	222.99	229.94	315.1	376.27	404.16	422.29	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

863.06	840.98	768.02	651.16	509.76	347.19	232.03	242.67	371.08	549.36	718.21	858.1	(97)

Space heating requirement for each month

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98c)

Space heating requirement in kWh/m²/year 28.59 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
346.84	278.03	242.98	145.23	72.63	0	0	0		0	139.52	244.98	351.3		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.06	84.85	84.4	83.53	82.2	79.8	79.8	79.8		79.8	83.41	84.54	85.11		(217)
Fuel for water heating														
240.24	213.08	227.95	203.75	201.49	187.92	186.23	193.19		194.81	206.76	215.59	237.66	2508.68	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1821.51	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2508.68	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.97	26.21	31.75	36.28	34.63	34.22	31.28	26.47	20.38	12.72	9.54	291.64	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.03	21.68	29.27	29.63	29.27	24.5	17.59	9.99	4.28	2.48	192.75	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4077.88	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(240a)
Low-rate fraction	0		66.3	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(241a)
Low-rate fraction	0		66.3	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(242a)

Low-rate fraction	0		66.3	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		91.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		229.04	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.79	(257)
SAP rating		87.12	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			382.52	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			526.82	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		909.34	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		879.43	(272)
Dwelling CO2 Emission Rate		14.96	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2058.31	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2834.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4893.11	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		-523.55	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4723.72	(286)
Dwelling PE Rate			80.34	(287)

DER WORKSHEET

Dwelling Reference: A416
Dwelling Type: New Dwelling Design Stage

A416
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	56.2	(1a) x	2.6	(2a) =	146.12	(3a)
Total floor area TFA					56.2	(4)
Dwelling volume					146.12	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			3	3	(19)
Shelter factor				0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	19.65		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	9.09	848.4	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		79.92	(31)
Party Wall	0	0	(32)
Party floor		2248	(32a)
Party ceiling		1686	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		30.9	(33)
Heat capacity Cm = ∑(A x k)		6289	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		111.9	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		34.9	(37)

Ventilation heat loss calculated monthly

11.73	11.59	11.45	10.75	10.61	9.91	9.91	9.77	10.19	10.61	10.89	11.17	(38)

Heat transfer coefficient, W/K

46.63	46.49	46.35	45.65	45.51	44.8	44.8	44.66	45.09	45.51	45.79	46.07	(39)

Heat loss parameter (HLP), W/m²K

0.83	0.83	0.82	0.81	0.81	0.8	0.8	0.79	0.8	0.81	0.81	0.82	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.87	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

55.61	54.78	53.56	51.23	49.51	47.59	46.5	47.71	49.04	51.1	53.48	55.4	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.04	23.68	23.18	22.25	21.56	20.79	20.37	20.87	21.42	22.24	23.19	23.96	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

33.81	32.58	31.35	30.12	28.89	27.66	27.66	28.89	30.12	31.35	32.58	33.81	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	104.44	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

113.46	111.04	108.09	103.6	99.96	96.04	94.53	97.47	100.57	104.68	109.24	113.16	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

179.69	158.11	166.12	141.82	134.56	118.09	114.33	120.69	124.01	142.05	155.63	177.19	(45)

Distribution loss (46) = 0.15 x (45)

26.95	23.72	24.92	21.27	20.18	17.71	17.15	18.1	18.6	21.31	23.34	26.58	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

226.39 200.29 212.82 187.02 181.26 163.28 161.03 167.39 169.2 188.75 200.82 223.89 2282.14 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

226.39 200.29 212.82 187.02 181.26 163.28 161.03 167.39 169.2 188.75 200.82 223.89 2282.14 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

97.11 86.32 92.6 83.31 82.1 75.42 75.37 77.49 77.39 84.59 87.9 96.27 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

82.35	91.18	82.35	85.1	82.35	85.1	82.35	82.35	85.1	82.35	85.1	82.35	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

163.27	164.97	160.7	151.61	140.13	129.35	122.15	120.45	124.72	133.81	145.28	156.07	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	(71)

Water heating gains (Table 5)

130.52	128.45	124.46	115.71	110.35	104.75	101.31	104.15	107.48	113.7	122.08	129.4	(72)

Total internal gains

430.23	438.68	421.59	406.5	386.92	370.28	356.89	358.04	368.39	383.95	406.55	421.91	(73)

6. Solar gains

Solar gains in watts, calculated for each month

114.74	195.55	269.74	340.94	390.24	391.69	375.81	337.99	294.03	216.53	137.4	98.23	(83)

Total gains – internal and solar (watts)

544.97	634.23	691.33	747.44	777.17	761.98	732.71	696.03	662.42	600.48	543.96	520.14	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.84	0.77	0.65	0.51	0.37	0.27	0.29	0.45	0.68	0.84	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.9	20.18	20.46	20.75	20.91	20.98	21	20.99	20.96	20.75	20.31	19.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.23	20.23	20.23	20.24	20.24	20.26	20.26	20.26	20.25	20.24	20.24	20.24	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.82	0.75	0.62	0.48	0.33	0.22	0.25	0.41	0.65	0.82	0.89	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.95	19.3	19.64	19.98	20.16	20.24	20.25	20.25	20.22	20	19.48	18.9	(90)

Living area fraction 0.53 (91)

Mean internal temperature (for the whole dwelling)

19.45	19.76	20.08	20.39	20.56	20.63	20.64	20.64	20.61	20.4	19.92	19.4	(92)

Adjusted mean internal temperature:

19.45	19.76	20.08	20.39	20.56	20.63	20.64	20.64	20.61	20.4	19.92	19.4	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.81	0.74	0.63	0.49	0.35	0.25	0.27	0.43	0.65	0.81	0.88	(94)

Useful gains, mGm , W

471.98	513.77	511.86	468.85	383.25	265.94	180.29	188.26	284.29	392.21	439.77	456.78	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

706.35	690.89	629.18	524.33	402.97	270.15	181.18	189.52	293.33	445.73	586.78	700.16	(97)

Space heating requirement for each month

174.37	119.03	87.28	39.95	14.67	0	0	0	0	39.82	105.85	181.07	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

174.37	119.03	87.28	39.95	14.67	0	0	0	0	39.82	105.85	181.07	(98c)

Space heating requirement in kWh/m²/year 13.56 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
192.68	131.52	96.45	44.14	16.21	0	0	0		0	44	116.96	200.08	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.13	83.48	82.64	81.5	80.51	79.8	79.8	79.8		79.8	81.48	83.2	84.25	(217)
Fuel for water heating													
269.1	239.93	257.53	229.48	225.13	204.62	201.79	209.76		212.04	231.66	241.38	265.73	2788.14 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			842.04 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2788.14 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	122.56 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			208.56 (231)
Electricity for lighting			138.1 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3976.83	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		30.65	(240a)
Low-rate fraction	0		30.65	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		30.65	(241a)
Low-rate fraction	0		30.65	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		30.65	(242a)

Low-rate fraction	0		30.65	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		101.49	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.39	(249)
Energy For lighting	0		22.77	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		281.3	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	1		(257)
SAP rating	83.78		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			176.83	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			585.51	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		762.34	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		28.93	(267)
Electricity for lighting		19.93	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		811.2	(272)
Dwelling CO2 Emission Rate		14.43	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			951.5	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3150.6	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4102.1	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			315.51	(281)
Electricity for lighting			211.82	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4629.43	(286)
Dwelling PE Rate			82.37	(287)

TER WORKSHEET

Dwelling Reference: A416
Dwelling Type: New Dwelling Design Stage

A416
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	56.2	(1a) x	2.6	(2a) =	146.12	(3a)
Total floor area TFA					56.2	(4)
Dwelling volume					146.12	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.14	0.14	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.39	0.39	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.3 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35	3.94	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)

Effective air change rate

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

Effective air change rate from PCDB:

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	13.6		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.86	922.32	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		79.92	(31)
Party Wall	0	0	(32)
Party floor		2248	(32a)
Party ceiling		1686	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		27.62	(33)
Heat capacity Cm = ∑(A x k)		6362.92	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		113.22	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		31.62	(37)

Ventilation heat loss calculated monthly

27.63	27.5	27.36	26.73	26.61	26.07	26.07	25.96	26.28	26.61	26.85	27.1	(38)

Heat transfer coefficient, W/K

59.25	59.12	58.98	58.35	58.24	57.69	57.69	57.59	57.9	58.24	58.47	58.72	(39)

Heat loss parameter (HLP), W/m²K

1.05	1.05	1.05	1.04	1.04	1.03	1.03	1.02	1.03	1.04	1.04	1.04	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.87 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

55.61	54.78	53.56	51.23	49.51	47.59	46.5	47.71	49.04	51.1	53.48	55.4	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.04	23.68	23.18	22.25	21.56	20.79	20.37	20.87	21.42	22.24	23.19	23.96	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

33.81	32.58	31.35	30.12	28.89	27.66	27.66	28.89	30.12	31.35	32.58	33.81	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 104.44 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

113.46	111.04	108.09	103.6	99.96	96.04	94.53	97.47	100.57	104.68	109.24	113.16	1251.84 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

179.69	158.11	166.12	141.82	134.56	118.09	114.33	120.69	124.01	142.05	155.63	177.19	1732.31 (45)

Distribution loss (46) = 0.15 x (45)

26.95	23.72	24.92	21.27	20.18	17.71	17.15	18.1	18.6	21.31	23.34	26.58	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

226.29	200.2	212.72	186.92	181.16	163.18	160.93	167.29	169.1	188.65	200.72	223.78	2280.93	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

25.42	22.49	23.55	19.5	18.17	15.55	14.57	15.5	16.09	18.96	21.48	24.95	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

200.86	177.71	189.17	167.42	162.99	147.64	146.35	151.79	153.02	169.68	179.24	198.83	2044.69	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

97.02	86.24	92.51	83.23	82.02	75.34	75.29	77.41	77.31	84.51	87.82	96.19	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

82.54	91.38	82.54	85.29	82.54	85.29	82.54	82.54	85.29	82.54	85.29	82.54	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

163.27	164.97	160.7	151.61	140.13	129.35	122.15	120.45	124.72	133.81	145.28	156.07	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	(71)

Water heating gains (Table 5)

130.41	128.34	124.34	115.6	110.24	104.64	101.2	104.04	107.37	113.59	121.97	129.29	(72)

Total internal gains

430.31	438.77	421.67	406.58	387	370.37	356.97	358.12	368.47	384.03	406.64	421.98	(73)

6. Solar gains

Solar gains in watts, calculated for each month

111.21	189.54	261.44	330.45	378.24	379.64	364.25	327.59	284.98	209.87	133.18	95.21	(83)

Total gains – internal and solar (watts)

541.51	628.31	683.11	737.04	765.24	750.01	721.22	685.71	653.45	593.89	539.81	517.19	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.88	0.83	0.73	0.61	0.46	0.34	0.37	0.55	0.76	0.88	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.29	19.61	19.99	20.43	20.74	20.92	20.98	20.97	20.86	20.46	19.82	19.23	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.05	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.86	0.81	0.7	0.57	0.4	0.27	0.3	0.49	0.72	0.86	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.07	18.47	18.93	19.46	19.81	20	20.05	20.04	19.94	19.51	18.74	18.01	(90)

Living area fraction 0.53 (91)

Mean internal temperature (for the whole dwelling)

18.72	19.07	19.49	19.97	20.3	20.48	20.54	20.53	20.43	20.01	19.31	18.65	(92)

Adjusted mean internal temperature:

18.72	19.07	19.49	19.97	20.3	20.48	20.54	20.53	20.43	20.01	19.31	18.65	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.85	0.79	0.7	0.58	0.43	0.31	0.34	0.51	0.72	0.84	0.9	(94)

Useful gains, mGm , W

480.9	531.11	540.43	515.65	442.2	322.11	222.43	231.62	335.52	427.87	455.81	464.37	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

854.17	837.83	766.24	645.85	500.94	339.47	227.1	237.88	366.27	547.97	713.98	848.77	(97)

Space heating requirement for each month

277.71	206.12	168	93.75	43.7	0	0	0	0	89.36	185.89	285.99	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

277.71	206.12	168	93.75	43.7	0	0	0	0	89.36	185.89	285.99	(98c)

Space heating requirement in kWh/m²/year 24.03 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
300.88	223.31	182.01	101.57	47.35	0	0	0		0	96.81	201.39	309.85		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.79	84.39	83.79	82.81	81.55	79.8	79.8	79.8		79.8	82.69	84.14	84.87		(217)
Fuel for water heating														
236.9	210.58	225.76	202.16	199.87	185.01	183.4	190.21		191.75	205.2	213.02	234.26	2478.12	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1463.18 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2478.12 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	0 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			86 (231)
Electricity for lighting			138.41 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

10.71	16.24	25.1	30.41	34.77	33.2	32.8	29.98	25.36	19.51	12.17	9.13	279.37	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.01	6.53	13.37	20.66	27.89	28.22	27.88	23.33	16.76	9.52	4.07	2.36	183.6	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3702.74	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		53.26	(240a)
Low-rate fraction	0		53.26	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		53.26	(241a)
Low-rate fraction	0		53.26	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		53.26	(242a)

Low-rate fraction	0		53.26	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		90.2	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		22.82	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-56.34	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		216.13	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.77		(257)
SAP rating	87.54		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			307.27	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			520.4	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		827.67	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		19.98	(268)
energy saved or generated	0	-60.14	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		799.44	(272)
Dwelling CO2 Emission Rate		14.22	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1653.39	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2800.27	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4453.66	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			212.3	(282)
energy saved or generated	0		-501.04	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4295.03	(286)
Dwelling PE Rate			76.42	(287)

DER WORKSHEET

Dwelling Reference: A417
Dwelling Type: New Dwelling Design Stage

A417
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	23.98		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.55	984.48	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		93.42	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		36.69	(33)
Heat capacity Cm = ∑(A x k)		7240.28	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		98.64	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		41.34	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

57.56	57.35	57.15	56.15	55.95	54.95	54.95	54.75	55.35	55.95	56.35	56.75	(39)

Heat loss parameter (HLP), W/m²K

0.78	0.78	0.78	0.76	0.76	0.75	0.75	0.75	0.75	0.76	0.77	0.77	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.33 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 118.72 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15	(45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.45	114.53	103.45	106.9	103.45	106.9	103.45	103.45	106.9	103.45	106.9	103.45	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23	(72)

Total internal gains

510.93	521.79	500.81	482.89	458.94	439.48	423.07	424.17	436.77	454.8	482.2	500.61	(73)

6. Solar gains

Solar gains in watts, calculated for each month

107.04	191.31	285.62	393.9	477.7	490.3	466.02	401.05	322.73	217.88	129.85	90.55	(83)

Total gains – internal and solar (watts)

617.97	713.1	786.43	876.79	936.64	929.78	889.09	825.22	759.5	672.68	612.04	591.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.86	0.79	0.67	0.52	0.37	0.27	0.3	0.48	0.71	0.86	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.71	20	20.33	20.69	20.89	20.97	20.99	20.99	20.94	20.67	20.16	19.67	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.27	20.27	20.27	20.28	20.29	20.3	20.3	20.3	20.29	20.29	20.28	20.28	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.84	0.77	0.64	0.49	0.33	0.23	0.26	0.43	0.68	0.84	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.76	19.11	19.52	19.96	20.18	20.28	20.29	20.29	20.24	19.94	19.33	18.71	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

19.11	19.44	19.82	20.23	20.44	20.53	20.55	20.55	20.5	20.21	19.64	19.06	(92)

Adjusted mean internal temperature:

19.11	19.44	19.82	20.23	20.44	20.53	20.55	20.55	20.5	20.21	19.64	19.06	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.83	0.76	0.64	0.49	0.34	0.24	0.27	0.45	0.68	0.82	0.89	(94)

Useful gains, mGm , W

540.43	588.78	595.55	558.09	461.82	320.28	215.87	225.33	339.74	457.25	504.1	523.24	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

852.2	833.94	761.37	635.99	489.11	326.09	217.16	227.26	354.11	537.77	706.58	843.55	(97)

Space heating requirement for each month

231.96	164.75	123.37	56.08	20.3	0	0	0	0	59.91	145.79	238.31	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

231.96	164.75	123.37	56.08	20.3	0	0	0	0	59.91	145.79	238.31	(98c)

Space heating requirement in kWh/m²/year 14.18 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
256.31	182.05	136.32	61.97	22.44	0	0	0		0	66.2	161.09	263.32		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.6	84.03	83.18	81.87	80.68	79.8	79.8	79.8		79.8	81.97	83.72	84.71		(217)
Fuel for water heating														
296.62	264.07	283.16	252.12	247.47	224.85	221.38	230.44		233.28	253.97	265.28	292.91	3065.55	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1149.7 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			3065.55 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	157.16 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			243.16 (231)
Electricity for lighting			173.47 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4631.88	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		41.85	(240a)
Low-rate fraction	0		41.85	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		41.85	(241a)
Low-rate fraction	0		41.85	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		41.85	(242a)

Low-rate fraction	0		41.85	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		111.59	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		314.14	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.96	(257)
SAP rating		84.52	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			241.44	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			643.77	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		885.2	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		943.97	(272)
Dwelling CO2 Emission Rate		12.86	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1299.16	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3464.07	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4763.23	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			266.08	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5397.16	(286)
Dwelling PE Rate			73.53	(287)

TER WORKSHEET

Dwelling Reference: A417
Dwelling Type: New Dwelling Design Stage

A417
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.35 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(24d)

Effective air change rate

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(25)

Effective air change rate from PCDB:

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.55		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.51	1050.84	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		93.42	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		2202	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		34.22	(33)
Heat capacity Cm = ∑(A x k)		7306.64	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		99.55	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		38.87	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

76.49	76.25	76.02	74.92	74.72	73.76	73.76	73.59	74.13	74.72	75.13	75.57	(39)

Heat loss parameter (HLP), W/m²K

1.04	1.04	1.04	1.02	1.02	1	1	1	1.01	1.02	1.02	1.03	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.33 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 118.72 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15	(45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.47	114.56	103.47	106.92	103.47	106.92	103.47	103.47	106.92	103.47	106.92	103.47	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12	(72)

Total internal gains

510.85	521.71	500.72	482.81	458.85	439.39	422.98	424.08	436.68	454.72	482.11	500.53	(73)

6. Solar gains

Solar gains in watts, calculated for each month

115.97	207.27	309.42	426.68	517.43	531.07	504.78	434.41	349.61	236.04	140.68	98.1	(83)

Total gains – internal and solar (watts)

626.82	728.97	810.14	909.49	976.29	970.46	927.76	858.5	786.29	690.76	622.79	598.63	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.89	0.84	0.74	0.6	0.45	0.34	0.38	0.57	0.78	0.89	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.98	19.32	19.77	20.31	20.69	20.9	20.97	20.96	20.81	20.3	19.57	18.93	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.05	20.05	20.05	20.07	20.07	20.08	20.08	20.08	20.08	20.07	20.06	20.06	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.82	0.71	0.56	0.4	0.27	0.31	0.51	0.75	0.87	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.7	18.13	18.68	19.34	19.77	20	20.06	20.05	19.91	19.35	18.46	17.65	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.57	19.08	19.7	20.11	20.33	20.4	20.39	20.24	19.7	18.87	18.12	(92)

Adjusted mean internal temperature:

18.17	18.57	19.08	19.7	20.11	20.33	20.4	20.39	20.24	19.7	18.87	18.12	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.85	0.79	0.69	0.56	0.41	0.29	0.33	0.52	0.73	0.85	0.9	(94)

Useful gains, mGm , W

557.59	619.24	642.56	629.96	548.71	399.33	273.36	284.09	408.67	505.5	529.06	537.97	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1061.22	1042.21	956.48	808.86	628.54	422.99	279.98	293.41	455.43	680.04	884.2	1051.96	(97)

Space heating requirement for each month

374.7	284.24	233.56	128.81	59.4	0	0	0	0	129.86	255.7	382.4	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

374.7	284.24	233.56	128.81	59.4	0	0	0	0	129.86	255.7	382.4	(98c)

Space heating requirement in kWh/m²/year 25.19 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
405.96	307.95	253.04	139.55	64.36	0	0	0		0	140.7	277.03	414.3		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.22	84.89	84.31	83.27	81.87	79.8	79.8	79.8		79.8	83.26	84.64	85.29		(217)
Fuel for water heating														
260.43	231.19	247.49	221.13	218.52	202.58	200.49	208.23		210.24	224	233.43	257.52	2715.27	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2002.9	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2715.27	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													173.52	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.36	39.1	44.58	42.51	41.99	38.42	32.59	25.16	15.76	11.84	359.18	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.6	37.25	37.71	37.27	31.21	22.42	12.74	5.46	3.17	245.48	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4373.02	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		72.91	(240a)
Low-rate fraction	0		72.91	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		72.91	(241a)
Low-rate fraction	0		72.91	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		72.91	(242a)

Low-rate fraction	0		72.91	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.84	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.92	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		233.61	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.71		(257)
SAP rating	88.49		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			420.61	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			570.21	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		990.82	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		949.26	(272)
Dwelling CO2 Emission Rate		12.93	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2263.27	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3068.26	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5331.53	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			266.15	(282)
energy saved or generated	0		-648.6	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5079.18	(286)
Dwelling PE Rate			69.2	(287)

DER WORKSHEET

Dwelling Reference: A418
Dwelling Type: New Dwelling Design Stage

A418
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.32	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		25.99	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		30.44	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

43.43	43.27	43.11	42.3	42.14	41.34	41.34	41.18	41.66	42.14	42.47	42.79	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.73	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.72	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.95 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 106.81 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54 (45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

444.57	453.55	435.69	420.19	399.87	382.82	368.91	370.05	380.8	396.71	420.13	435.93	(73)

6. Solar gains

Solar gains in watts, calculated for each month

25.68	49.79	85.81	138.6	186.6	199.56	186.4	148.07	103.51	59.64	31.82	21.31	(83)

Total gains – internal and solar (watts)

470.25	503.34	521.51	558.79	586.47	582.38	555.31	518.11	484.32	456.36	451.95	457.24	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.89	0.84	0.75	0.61	0.44	0.32	0.36	0.55	0.77	0.87	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.8	19.99	20.25	20.61	20.85	20.97	20.99	20.99	20.92	20.64	20.2	19.79	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.31	20.31	20.31	20.32	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.87	0.83	0.72	0.57	0.4	0.28	0.31	0.51	0.74	0.86	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.9	19.13	19.46	19.91	20.18	20.31	20.33	20.33	20.26	19.95	19.41	18.89	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(92)

Adjusted mean internal temperature:

19.31	19.52	19.82	20.23	20.48	20.61	20.63	20.63	20.56	20.26	19.77	19.29	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.82	0.72	0.58	0.42	0.3	0.33	0.52	0.74	0.84	0.89	(94)

Useful gains, mGm , W

416.37	432.06	425.24	401.34	340.48	241.8	165.17	171.96	253.92	335.69	381.4	407.87	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

651.85	632.55	574.21	479.18	370.21	248.31	166.62	174.13	269.16	407.08	538.09	645.84	(97)

Space heating requirement for each month

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

175.2	134.73	110.83	56.04	22.12	0	0	0	0	53.12	112.82	177.05	(98c)

Space heating requirement in kWh/m²/year 14.32 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
193.59	148.87	122.47	61.93	24.44	0	0	0		0	58.69	124.66	195.63	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.09	83.74	83.13	82.01	80.82	79.8	79.8	79.8		79.8	81.9	83.3	84.15	(217)
Fuel for water heating													
274.05	243.46	260.55	231.97	228.03	207.97	205.04	213.19		215.55	234.4	245.3	270.82	2830.32 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			930.28 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2830.32 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	125.9 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			211.9 (231)
Electricity for lighting			146.08 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4118.59	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(240a)
Low-rate fraction	0		33.86	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(241a)
Low-rate fraction	0		33.86	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		33.86	(242a)

Low-rate fraction	0		33.86	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.02	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		287.92	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1	(257)
SAP rating		83.81	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			195.36	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			594.37	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		789.73	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		840.2	(272)
Dwelling CO2 Emission Rate		14.29	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1051.22	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3198.27	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4249.49	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4794.11	(286)
Dwelling PE Rate			81.53	(287)

TER WORKSHEET

Dwelling Reference: A418
Dwelling Type: New Dwelling Design Stage

A418
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.32	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
Effective air change rate from PCDB:														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.59	1056.72	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		88.56	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		1764	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		28.25	(33)
Heat capacity Cm = ∑(A x k)		5901.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		100.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		4.45	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		4.45	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		32.7	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

62.22	62.06	61.89	61.12	60.98	60.31	60.31	60.19	60.57	60.98	61.27	61.57	(39)

Heat loss parameter (HLP), W/m²K

1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.03	1.04	1.04	1.05	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

444.46	453.44	435.58	420.08	399.76	382.71	368.79	369.94	380.69	396.6	420.02	435.82	(73)

6. Solar gains

Solar gains in watts, calculated for each month

35.95	69.71	120.14	194.03	261.24	279.38	260.96	207.29	144.92	83.5	44.55	29.83	(83)

Total gains – internal and solar (watts)

480.41	523.15	555.72	614.12	661	662.09	629.76	577.23	525.61	480.1	464.57	465.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.93	0.91	0.88	0.8	0.68	0.52	0.4	0.45	0.65	0.83	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.89	19.13	19.54	20.11	20.57	20.85	20.95	20.93	20.72	20.15	19.45	18.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.04	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.92	0.9	0.86	0.77	0.63	0.46	0.32	0.37	0.59	0.8	0.89	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.58	17.89	18.39	19.1	19.64	19.95	20.03	20.02	19.82	19.16	18.3	17.54	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(92)

Adjusted mean internal temperature:

18.17	18.45	18.91	19.55	20.06	20.36	20.45	20.43	20.23	19.61	18.82	18.14	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.88	0.84	0.76	0.63	0.48	0.35	0.4	0.6	0.78	0.87	0.91	(94)

Useful gains, mGm , W

432.77	459.1	466.59	464.99	419.66	317.8	222.99	229.94	315.1	376.27	404.16	422.29	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

863.06	840.98	768.02	651.16	509.76	347.19	232.03	242.67	371.08	549.36	718.21	858.1	(97)

Space heating requirement for each month

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

320.14	256.62	224.27	134.04	67.04	0	0	0	0	128.78	226.12	324.25	(98c)

Space heating requirement in kWh/m²/year 28.59 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
346.84	278.03	242.98	145.23	72.63	0	0	0		0	139.52	244.98	351.3		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.06	84.85	84.4	83.53	82.2	79.8	79.8	79.8		79.8	83.41	84.54	85.11		(217)
Fuel for water heating														
240.24	213.08	227.95	203.75	201.49	187.92	186.23	193.19		194.81	206.76	215.59	237.66	2508.68	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1821.51	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2508.68	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.97	26.21	31.75	36.28	34.63	34.22	31.28	26.47	20.38	12.72	9.54	291.64	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.03	21.68	29.27	29.63	29.27	24.5	17.59	9.99	4.28	2.48	192.75	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4077.88	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(240a)
Low-rate fraction	0		66.3	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(241a)
Low-rate fraction	0		66.3	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		66.3	(242a)

Low-rate fraction	0		66.3	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		91.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		229.04	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.79	(257)
SAP rating		87.12	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			382.52	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			526.82	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		909.34	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		879.43	(272)
Dwelling CO2 Emission Rate		14.96	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2058.31	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2834.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4893.11	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		-523.55	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4723.72	(286)
Dwelling PE Rate			80.34	(287)

DER WORKSHEET

Dwelling Reference: A519
Dwelling Type: New Dwelling Design Stage

A519
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	56.2	(1a) x	2.6	(2a) =	146.12	(3a)
Total floor area TFA					56.2	(4)
Dwelling volume					146.12	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			3	3	(19)
Shelter factor				0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	19.65		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	9.09	848.4	(29a)
Roof	5.62	505.8	(30)

Total area of external elements ∑A, m²		136.12	(31)
Party Wall	0	0	(32)
Party floor		2248	(32a)
Party ceiling		0	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		36.52	(33)
Heat capacity Cm = ∑(A x k)		5108.8	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		90.9	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		6.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		6.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		43.32	(37)

Ventilation heat loss calculated monthly

11.73	11.59	11.45	10.75	10.61	9.91	9.91	9.77	10.19	10.61	10.89	11.17	(38)

Heat transfer coefficient, W/K

55.05	54.91	54.77	54.07	53.93	53.22	53.22	53.08	53.51	53.93	54.21	54.49	(39)

Heat loss parameter (HLP), W/m²K

0.98	0.98	0.97	0.96	0.96	0.95	0.95	0.94	0.95	0.96	0.96	0.97	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.87	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

55.61	54.78	53.56	51.23	49.51	47.59	46.5	47.71	49.04	51.1	53.48	55.4	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.04	23.68	23.18	22.25	21.56	20.79	20.37	20.87	21.42	22.24	23.19	23.96	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

33.81	32.58	31.35	30.12	28.89	27.66	27.66	28.89	30.12	31.35	32.58	33.81	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	104.44	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

113.46	111.04	108.09	103.6	99.96	96.04	94.53	97.47	100.57	104.68	109.24	113.16	1251.84	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

179.69	158.11	166.12	141.82	134.56	118.09	114.33	120.69	124.01	142.05	155.63	177.19	1732.31	(45)

Distribution loss (46) = 0.15 x (45)

26.95	23.72	24.92	21.27	20.18	17.71	17.15	18.1	18.6	21.31	23.34	26.58	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

226.39 200.29 212.82 187.02 181.26 163.28 161.03 167.39 169.2 188.75 200.82 223.89 2282.14 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

226.39 200.29 212.82 187.02 181.26 163.28 161.03 167.39 169.2 188.75 200.82 223.89 2282.14 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

97.11 86.32 92.6 83.31 82.1 75.42 75.37 77.49 77.39 84.59 87.9 96.27 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 93.62 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

82.35	91.18	82.35	85.1	82.35	85.1	82.35	82.35	85.1	82.35	85.1	82.35	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

163.27	164.97	160.7	151.61	140.13	129.35	122.15	120.45	124.72	133.81	145.28	156.07	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	(71)

Water heating gains (Table 5)

130.52	128.45	124.46	115.71	110.35	104.75	101.31	104.15	107.48	113.7	122.08	129.4	(72)

Total internal gains

430.23	438.68	421.59	406.5	386.92	370.28	356.89	358.04	368.39	383.95	406.55	421.91	(73)

6. Solar gains

Solar gains in watts, calculated for each month

114.74	195.55	269.74	340.94	390.24	391.69	375.81	337.99	294.03	216.53	137.4	98.23	(83)

Total gains – internal and solar (watts)

544.97	634.23	691.33	747.44	777.17	761.98	732.71	696.03	662.42	600.48	543.96	520.14	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.84	0.78	0.68	0.56	0.42	0.31	0.34	0.5	0.71	0.84	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.21	19.56	19.95	20.41	20.73	20.91	20.97	20.96	20.85	20.44	19.78	19.15	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.1	20.1	20.1	20.12	20.12	20.13	20.13	20.13	20.12	20.12	20.11	20.11	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.87	0.82	0.76	0.65	0.52	0.37	0.25	0.28	0.45	0.67	0.82	0.88	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.03	18.46	18.94	19.49	19.86	20.06	20.11	20.11	20	19.54	18.74	17.96	(90)

Living area fraction 0.53 (91)

Mean internal temperature (for the whole dwelling)

18.65	19.04	19.48	19.97	20.31	20.51	20.56	20.56	20.45	20.02	19.29	18.59	(92)

Adjusted mean internal temperature:

18.65	19.04	19.48	19.97	20.31	20.51	20.56	20.56	20.45	20.02	19.29	18.59	(93)

8. Space heating requirement

Utilisation factor for gains,

0.85	0.8	0.74	0.65	0.53	0.39	0.28	0.31	0.47	0.67	0.8	0.86	(94)

Useful gains, mGm , W

462.69	507.61	512.77	484.08	411.59	298.05	206.22	214.47	311.2	402.02	434.96	447.49	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

790.05	776.16	710.64	598.63	464.55	314.44	211	220.73	339.5	507.72	660.58	783.98	(97)

Space heating requirement for each month

243.55	180.46	147.21	82.48	39.4	0	0	0	0	78.64	162.45	250.34	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

243.55	180.46	147.21	82.48	39.4	0	0	0	0	78.64	162.45	250.34	(98c)

Space heating requirement in kWh/m²/year 21.08 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
269.12	199.41	162.67	91.13	43.54	0	0	0	0	86.89	179.5	276.62		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
85.01	84.54	83.85	82.8	81.52	79.8	79.8	79.8	79.8	82.67	84.25	85.11		(217)
Fuel for water heating													
266.31	236.93	253.8	225.87	222.35	204.62	201.79	209.76	212.04	228.3	238.35	263.05	2763.17	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												1308.88	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2763.17	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		122.56	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												208.56	(231)
Electricity for lighting												138.1	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4418.71	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.64	(240a)
Low-rate fraction	0		47.64	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.64	(241a)
Low-rate fraction	0		47.64	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.64	(242a)

Low-rate fraction	0		47.64	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		100.58	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.39	(249)
Energy For lighting	0		22.77	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		297.39	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.06	(257)
SAP rating		82.85	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			274.86	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			580.27	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		855.13	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		28.93	(267)
Electricity for lighting		19.93	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		903.99	(272)
Dwelling CO2 Emission Rate		16.09	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1479.03	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3122.38	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4601.42	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			315.51	(281)
Electricity for lighting			211.82	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5128.74	(286)
Dwelling PE Rate			91.26	(287)

TER WORKSHEET

Dwelling Reference: A519
Dwelling Type: New Dwelling Design Stage

A519
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	56.2	(1a) x	2.6	(2a) =	146.12	(3a)
Total floor area TFA					56.2	(4)
Dwelling volume					146.12	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.14	0.14	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.39	0.39	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor												0.3	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35	3.94	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(24d)
Effective air change rate														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)
Effective air change rate from PCDB:														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	13.6		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.86	922.32	(29a)
Roof	6.18	505.8	(30)

Total area of external elements ∑A, m²		136.12	(31)
Party Wall	0	0	(32)
Party floor		2248	(32a)
Party ceiling		0	(32b)
Internal wall **		1506.6	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		33.8	(33)
Heat capacity Cm = ∑(A x k)		5182.72	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		92.22	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		6.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		6.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		40.6	(37)

Ventilation heat loss calculated monthly

27.63	27.5	27.36	26.73	26.61	26.07	26.07	25.96	26.28	26.61	26.85	27.1	(38)

Heat transfer coefficient, W/K

68.24	68.1	67.97	67.34	67.22	66.67	66.67	66.57	66.88	67.22	67.46	67.71	(39)

Heat loss parameter (HLP), W/m²K

1.21	1.21	1.21	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.2	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.87 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

55.61	54.78	53.56	51.23	49.51	47.59	46.5	47.71	49.04	51.1	53.48	55.4	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.04	23.68	23.18	22.25	21.56	20.79	20.37	20.87	21.42	22.24	23.19	23.96	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

33.81	32.58	31.35	30.12	28.89	27.66	27.66	28.89	30.12	31.35	32.58	33.81	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 104.44 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

113.46	111.04	108.09	103.6	99.96	96.04	94.53	97.47	100.57	104.68	109.24	113.16	1251.84 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

179.69	158.11	166.12	141.82	134.56	118.09	114.33	120.69	124.01	142.05	155.63	177.19	1732.31 (45)

Distribution loss (46) = 0.15 x (45)

26.95	23.72	24.92	21.27	20.18	17.71	17.15	18.1	18.6	21.31	23.34	26.58	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

226.29	200.2	212.72	186.92	181.16	163.18	160.93	167.29	169.1	188.65	200.72	223.78	2280.93	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

25.42	22.49	23.55	19.5	18.17	15.55	14.57	15.5	16.09	18.96	21.48	24.95	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

200.86	177.71	189.17	167.42	162.99	147.64	146.35	151.79	153.02	169.68	179.24	198.83	2044.69	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

97.02	86.24	92.51	83.23	82.02	75.34	75.29	77.41	77.31	84.51	87.82	96.19	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	93.62	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

82.54	91.38	82.54	85.29	82.54	85.29	82.54	82.54	85.29	82.54	85.29	82.54	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

163.27	164.97	160.7	151.61	140.13	129.35	122.15	120.45	124.72	133.81	145.28	156.07	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	32.36	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	-74.9	(71)

Water heating gains (Table 5)

130.41	128.34	124.34	115.6	110.24	104.64	101.2	104.04	107.37	113.59	121.97	129.29	(72)

Total internal gains

430.31	438.77	421.67	406.58	387	370.37	356.97	358.12	368.47	384.03	406.64	421.98	(73)

6. Solar gains

Solar gains in watts, calculated for each month

111.21	189.54	261.44	330.45	378.24	379.64	364.25	327.59	284.98	209.87	133.18	95.21	(83)

Total gains – internal and solar (watts)

541.51	628.31	683.11	737.04	765.24	750.01	721.22	685.71	653.45	593.89	539.81	517.19	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.87	0.82	0.74	0.63	0.5	0.38	0.41	0.58	0.76	0.87	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.58	18.95	19.42	20	20.48	20.8	20.92	20.91	20.69	20.08	19.25	18.52	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.91	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.92	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.85	0.8	0.71	0.59	0.43	0.3	0.33	0.51	0.73	0.85	0.9	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.13	17.59	18.17	18.87	19.43	19.77	19.89	19.88	19.67	18.99	17.97	17.05	(90)

Living area fraction 0.53 (91)

Mean internal temperature (for the whole dwelling)

17.9	18.3	18.83	19.47	19.98	20.31	20.43	20.42	20.21	19.56	18.64	17.82	(92)

Adjusted mean internal temperature:

17.9	18.3	18.83	19.47	19.98	20.31	20.43	20.42	20.21	19.56	18.64	17.82	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.78	0.7	0.59	0.45	0.34	0.37	0.53	0.71	0.82	0.87	(94)

Useful gains, mGm , W

468.08	517.74	529.47	512.58	451.04	341.07	242.07	250.44	347.48	423.64	444.45	452.09	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

927.8	912.86	837.89	711.48	556.45	380.81	255.59	267.48	408.32	602.46	778.75	922.45	(97)

Space heating requirement for each month

342.03	265.52	229.46	143.21	78.43	0	0	0	0	133.04	240.7	349.95	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

342.03	265.52	229.46	143.21	78.43	0	0	0	0	133.04	240.7	349.95	(98c)

Space heating requirement in kWh/m²/year 31.71 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
370.56	287.67	248.61	155.15	84.97	0	0	0	0	144.14	260.78	379.15		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
85.24	84.96	84.49	83.71	82.52	79.8	79.8	79.8	79.8	83.52	84.72	85.31		(217)
Fuel for water heating													
235.63	209.18	223.89	199.99	197.52	185.01	183.4	190.21	191.75	203.16	211.56	233.06	2464.36	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												1931.03	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2464.36	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		0	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												86	(231)
Electricity for lighting												138.41	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

10.71	16.24	25.1	30.41	34.77	33.2	32.8	29.98	25.36	19.51	12.17	9.13	279.37	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.01	6.53	13.37	20.66	27.89	28.22	27.88	23.33	16.76	9.52	4.07	2.36	183.6	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4156.83	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		70.29	(240a)
Low-rate fraction	0		70.29	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		70.29	(241a)
Low-rate fraction	0		70.29	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		70.29	(242a)

Low-rate fraction	0		70.29	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		89.7	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		22.82	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-56.34	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		232.65	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.83		(257)
SAP rating	86.58		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			405.52	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			517.52	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		923.03	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		19.98	(268)
energy saved or generated	0	-60.14	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		894.8	(272)
Dwelling CO2 Emission Rate		15.92	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2182.06	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2784.73	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4966.79	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			212.3	(282)
energy saved or generated	0		-501.04	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4808.16	(286)
Dwelling PE Rate			85.55	(287)

DER WORKSHEET

Dwelling Reference: A520
Dwelling Type: New Dwelling Design Stage

A520
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	23.98		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	10.55	984.48	(29a)
Roof	7.34	660.6	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		0	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		44.03	(33)
Heat capacity Cm = ∑(A x k)		5698.88	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		77.64	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.38	(37)

Ventilation heat loss calculated monthly

16.22	16.02	15.82	14.82	14.61	13.61	13.61	13.41	14.01	14.61	15.02	15.42	(38)

Heat transfer coefficient, W/K

68.6	68.39	68.19	67.19	66.99	65.99	65.99	65.79	66.39	66.99	67.39	67.79	(39)

Heat loss parameter (HLP), W/m²K

0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.33 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 118.72 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15	(45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

250.96	221.91	235.54	206.4	199.66	179.43	176.66	183.89	186.16	208.17	222.1	248.11	2518.99	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.27	93.5	100.15	89.76	88.22	80.79	80.57	82.97	83.03	91.05	94.97	104.33	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.45	114.53	103.45	106.9	103.45	106.9	103.45	103.45	106.9	103.45	106.9	103.45	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.5	139.14	134.61	124.66	118.57	112.21	108.29	111.53	115.31	122.38	131.91	140.23	(72)

Total internal gains

510.93	521.79	500.81	482.89	458.94	439.48	423.07	424.17	436.77	454.8	482.2	500.61	(73)

6. Solar gains

Solar gains in watts, calculated for each month

107.04	191.31	285.62	393.9	477.7	490.3	466.02	401.05	322.73	217.88	129.85	90.55	(83)

Total gains – internal and solar (watts)

617.97	713.1	786.43	876.79	936.64	929.78	889.09	825.22	759.5	672.68	612.04	591.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.85	0.79	0.69	0.56	0.42	0.31	0.35	0.53	0.73	0.85	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.91	19.26	19.72	20.27	20.66	20.89	20.96	20.95	20.79	20.28	19.53	18.86	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.14	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.84	0.78	0.66	0.53	0.37	0.26	0.29	0.48	0.7	0.83	0.89	(89)

Roof Mean internal temperature in the rest of dwelling T2

17.69	18.13	18.69	19.37	19.82	20.07	20.14	20.14	19.98	19.39	18.48	17.63	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.14	18.55	19.07	19.7	20.13	20.37	20.45	20.44	20.28	19.72	18.87	18.09	(92)

Adjusted mean internal temperature:

18.14	18.55	19.07	19.7	20.13	20.37	20.45	20.44	20.28	19.72	18.87	18.09	(93)

8. Space heating requirement

Utilisation factor for gains,

0.85	0.81	0.75	0.65	0.53	0.39	0.28	0.31	0.48	0.68	0.81	0.86	(94)

Useful gains, mGm , W

525.16	575.06	588.56	569.07	491.97	357.97	246.69	255.93	367.19	460.66	492.86	508.41	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

949.63	933.5	857.39	725.68	564.89	381.03	253.73	265.48	410.15	610.91	792.91	941.41	(97)

Space heating requirement for each month

315.81	240.87	200.01	112.76	54.25	0	0	0	0	111.79	216.04	322.15	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

315.81	240.87	200.01	112.76	54.25	0	0	0	0	111.79	216.04	322.15	(98c)

Space heating requirement in kWh/m²/year 21.44 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
348.96	266.16	221	124.6	59.95	0	0	0		0	123.52	238.72	355.97	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
85.43	85.03	84.38	83.28	81.87	79.8	79.8	79.8		79.8	83.24	84.74	85.51	(217)
Fuel for water heating													
293.76	260.97	279.13	247.85	243.88	224.85	221.38	230.44		233.28	250.09	262.09	290.15	3037.87 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1738.88 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			3037.87 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	157.16 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			243.16 (231)
Electricity for lighting			173.47 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5193.38	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		63.3	(240a)
Low-rate fraction	0		63.3	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		63.3	(241a)
Low-rate fraction	0		63.3	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		63.3	(242a)

Low-rate fraction	0		63.3	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.58	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.1	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		334.58	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.02	(257)
SAP rating		83.51	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			365.16	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			637.95	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1003.12	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.73	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1061.88	(272)
Dwelling CO2 Emission Rate		14.47	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1964.93	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3432.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5397.73	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			367.85	(281)
Electricity for lighting			266.08	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			6031.66	(286)
Dwelling PE Rate			82.18	(287)

TER WORKSHEET

Dwelling Reference: A520
Dwelling Type: New Dwelling Design Stage

A520
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.4	(1a) x	2.6	(2a) =	190.84	(3a)
Total floor area TFA					73.4	(4)
Dwelling volume					190.84	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor 0.35 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	4.54	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(24d)

Effective air change rate

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(25)

Effective air change rate from PCDB:

0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.55		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.51	1050.84	(29a)
Roof	8.07	660.6	(30)

Total area of external elements ∑A, m²		166.82	(31)
Party Wall	0	0	(32)
Party floor		2936	(32a)
Party ceiling		0	(32b)
Internal wall **		1117.8	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		42.29	(33)
Heat capacity Cm = ∑(A x k)		5765.24	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		78.55	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		50.64	(37)

Ventilation heat loss calculated monthly

37.62	37.38	37.15	36.05	35.85	34.89	34.89	34.72	35.26	35.85	36.26	36.7	(38)

Heat transfer coefficient, W/K

88.27	88.03	87.79	86.7	86.49	85.54	85.54	85.36	85.91	86.49	86.91	87.34	(39)

Heat loss parameter (HLP), W/m²K

1.2	1.2	1.2	1.18	1.18	1.17	1.17	1.16	1.17	1.18	1.18	1.19	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.33	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.22	62.27	60.88	58.23	56.28	54.1	52.86	54.23	55.74	58.08	60.78	62.97	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.31	26.9	26.33	25.28	24.49	23.62	23.14	23.71	24.33	25.26	26.34	27.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.45	37.05	35.65	34.25	32.86	31.46	31.46	32.86	34.25	35.65	37.05	38.45	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	118.72	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

128.97	126.22	122.86	117.76	113.62	109.17	107.46	110.8	114.32	118.99	124.17	128.64	1422.99	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.26	179.73	188.84	161.21	152.96	134.24	129.96	137.19	140.97	161.47	176.91	201.41	1969.15	(45)

Distribution loss (46) = 0.15 x (45)

30.64	26.96	28.33	24.18	22.94	20.14	19.49	20.58	21.15	24.22	26.54	30.21	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

250.85	221.82	235.43	206.3	199.55	179.33	176.56	183.79	186.06	208.07	222	248.01	2517.77	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.9	25.56	26.76	22.16	20.65	17.67	16.57	17.62	18.29	21.56	24.42	28.36	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

221.95	196.26	208.67	184.14	178.9	161.66	159.99	166.17	167.77	186.51	197.58	219.64	2249.25	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.19	93.43	100.06	89.68	88.13	80.71	80.49	82.89	82.95	90.97	94.89	104.25	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

103.47	114.56	103.47	106.92	103.47	106.92	103.47	103.47	106.92	103.47	106.92	103.47	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	(71)

Water heating gains (Table 5)

141.39	139.03	134.49	124.55	118.46	112.09	108.18	111.41	115.2	122.27	131.8	140.12	(72)

Total internal gains

510.85	521.71	500.72	482.81	458.85	439.39	422.98	424.08	436.68	454.72	482.11	500.53	(73)

6. Solar gains

Solar gains in watts, calculated for each month

115.97	207.27	309.42	426.68	517.43	531.07	504.78	434.41	349.61	236.04	140.68	98.1	(83)

Total gains – internal and solar (watts)

626.82	728.97	810.14	909.49	976.29	970.46	927.76	858.5	786.29	690.76	622.79	598.63	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.87	0.83	0.74	0.62	0.48	0.37	0.41	0.59	0.78	0.87	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.17	18.56	19.11	19.81	20.38	20.75	20.9	20.87	20.59	19.85	18.91	18.11	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.92	19.92	19.92	19.94	19.94	19.95	19.95	19.95	19.94	19.94	19.93	19.93	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.86	0.81	0.71	0.58	0.42	0.29	0.33	0.53	0.74	0.86	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

16.65	17.13	17.81	18.67	19.33	19.75	19.89	19.87	19.59	18.75	17.59	16.58	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

17.21	17.66	18.29	19.09	19.72	20.12	20.26	20.24	19.96	19.16	18.08	17.14	(92)

Adjusted mean internal temperature:

17.21	17.66	18.29	19.09	19.72	20.12	20.26	20.24	19.96	19.16	18.08	17.14	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.82	0.77	0.68	0.57	0.43	0.32	0.35	0.53	0.71	0.82	0.87	(94)

Useful gains, mGm , W

538.57	597.99	622.55	618.91	553.77	419.04	294.69	303.58	416.34	493.36	510.98	519.93	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1139.52	1123.01	1035.13	883.59	693.64	472.15	313.32	327.87	503.54	739.96	954.01	1130.58	(97)

Space heating requirement for each month

447.11	352.82	306.96	190.56	104.06	0	0	0	0	183.47	318.98	454.32	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

447.11	352.82	306.96	190.56	104.06	0	0	0	0	183.47	318.98	454.32	(98c)

Space heating requirement in kWh/m²/year 32.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
484.41	382.25	332.56	206.46	112.74	0	0	0		0	198.78	345.59	492.22		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.6	85.36	84.92	84.14	82.89	79.8	79.8	79.8		79.8	84.02	85.13	85.65		(217)
Fuel for water heating														
259.3	229.92	245.71	218.86	215.83	202.58	200.49	208.23		210.24	221.98	232.09	256.44	2701.68	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			2555.02 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2701.68 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	0 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			86 (231)
Electricity for lighting			173.52 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.88	21	32.36	39.1	44.58	42.51	41.99	38.42	32.59	25.16	15.76	11.84	359.18	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.03	8.74	17.87	27.6	37.25	37.71	37.27	31.21	22.42	12.74	5.46	3.17	245.48	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4911.55	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		93	(240a)
Low-rate fraction	0		93	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		93	(241a)
Low-rate fraction	0		93	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		93	(242a)

Low-rate fraction	0		93	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.34	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.92	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		253.22	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.77	(257)
SAP rating	87.52	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			536.55	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.35	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1103.91	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.04	(268)
energy saved or generated	0	-78.53	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1062.35	(272)
Dwelling CO2 Emission Rate		14.47	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2887.18	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.89	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5940.07	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			266.15	(282)
energy saved or generated	0		-648.6	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5687.72	(286)
Dwelling PE Rate			77.49	(287)

DER WORKSHEET

Dwelling Reference: A521
Dwelling Type: New Dwelling Design Stage

A521
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)
			Air changes per hour		
Number of storeys in the dwelling (ns)			0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc			0	0	(9)
Additional infiltration			0	0	(10)
Structural infiltration			0	0	(11)
Suspended wooden ground floor			0	0	(12)
No draught lobby			0	0	(13)
Percentage of windows and doors draught proofed			0	0	(14)
Window infiltration			0	0	(15)
Infiltration rate			0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)			3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)			0	0	(17a)
Air permeability value)			0.15	0.15	(18)
Number of sides on which dwelling is sheltered			2	2	(19)
Shelter factor				0.85	(20)

Infiltration rate incorporating shelter factor 0.13 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1.67	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

Effective air change rate from PCDB:

0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.32	1056.72	(29a)
Roof	5.88	529.2	(30)

Total area of external elements ∑A, m²		147.36	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		31.87	(33)
Heat capacity Cm = ∑(A x k)		4666.92	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		79.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		39.22	(37)

Ventilation heat loss calculated monthly

12.99	12.83	12.67	11.87	11.71	10.9	10.9	10.74	11.23	11.71	12.03	12.35	(38)

Heat transfer coefficient, W/K

52.21	52.05	51.89	51.08	50.92	50.12	50.12	49.96	50.44	50.92	51.25	51.57	(39)

Heat loss parameter (HLP), W/m²K

0.89	0.89	0.88	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/day (48) x (49) = 0.76 (50)

b) If manufacturer's declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/day 0 (54)

Enter (50) or (54) in (55) 0.76 (55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,

(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m

where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44 21.17 23.44 22.68 23.44 22.68 23.44 23.44 22.68 23.44 22.68 23.44 (57)

Primary circuit loss for each month from Table 3

modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

230.46 203.87 216.59 190.23 184.31 165.96 163.62 170.12 172.01 191.97 204.34 227.9 2321.37 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.46 87.51 93.85 84.38 83.11 76.31 76.23 78.4 78.32 85.66 89.07 97.61 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 97.38 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.34	130.22	126.14	117.19	111.71	105.98	102.47	105.37	108.78	115.14	123.71	131.19	(72)

Total internal gains

444.57	453.55	435.69	420.19	399.87	382.82	368.91	370.05	380.8	396.71	420.13	435.93	(73)

6. Solar gains

Solar gains in watts, calculated for each month

25.68	49.79	85.81	138.6	186.6	199.56	186.4	148.07	103.51	59.64	31.82	21.31	(83)

Total gains – internal and solar (watts)

470.25	503.34	521.51	558.79	586.47	582.38	555.31	518.11	484.32	456.36	451.95	457.24	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.88	0.84	0.76	0.65	0.5	0.38	0.42	0.6	0.78	0.87	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.02	19.25	19.62	20.15	20.58	20.86	20.95	20.93	20.75	20.23	19.58	18.99	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.18	20.18	20.18	20.19	20.2	20.21	20.21	20.21	20.2	20.2	20.19	20.19	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.87	0.83	0.74	0.61	0.45	0.32	0.35	0.55	0.75	0.85	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.85	18.14	18.6	19.26	19.77	20.08	20.17	20.16	19.97	19.37	18.56	17.83	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

18.38	18.64	19.06	19.66	20.14	20.43	20.53	20.51	20.32	19.76	19.02	18.35	(92)

Adjusted mean internal temperature:

18.38	18.64	19.06	19.66	20.14	20.43	20.53	20.51	20.32	19.76	19.02	18.35	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.84	0.8	0.72	0.61	0.46	0.34	0.38	0.56	0.74	0.83	0.87	(94)

Useful gains, mGm , W

405.95	422.43	418.48	404.13	357.08	268.27	189.06	195.21	271.33	336.5	373.92	397.7	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

735.08	715.27	651.75	549.86	429.74	292.41	196.74	205.46	313.87	466.33	610.85	729.84	(97)

Space heating requirement for each month

244.87	196.79	173.55	104.92	54.06	0	0	0	0	96.6	170.59	247.11	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

244.87	196.79	173.55	104.92	54.06	0	0	0	0	96.6	170.59	247.11	(98c)

Space heating requirement in kWh/m²/year 21.91 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
270.58	217.45	191.77	115.94	59.74	0	0	0		0	106.74	188.5	273.05	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.98	84.72	84.23	83.3	82	79.8	79.8	79.8		79.8	83.09	84.34	85.03	(217)
Fuel for water heating													
271.2	240.65	257.13	228.36	224.77	207.97	205.04	213.19		215.55	231.04	242.3	268.02	2805.21 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												1423.75	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2805.21	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		125.9	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												211.9	(231)
Electricity for lighting												146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4586.94	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		51.82	(240a)
Low-rate fraction	0		51.82	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		51.82	(241a)
Low-rate fraction	0		51.82	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		51.82	(242a)

Low-rate fraction	0		51.82	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		102.11	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		34.94	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		304.96	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.06	(257)
SAP rating	82.85	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			298.99	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			589.09	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		888.08	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		29.39	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		938.56	(272)
Dwelling CO2 Emission Rate		15.96	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1608.84	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3169.89	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4778.73	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			320.56	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5323.35	(286)
Dwelling PE Rate			90.53	(287)

TER WORKSHEET

Dwelling Reference: A521
Dwelling Type: New Dwelling Design Stage

A521
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	58.8	(1a) x	2.6	(2a) =	152.88	(3a)
Total floor area TFA					58.8	(4)
Dwelling volume					152.88	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	2	2	(19)
Shelter factor		0.85	(20)

Infiltration rate incorporating shelter factor												0.32	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	4.25	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
Effective air change rate from PCDB:														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.5		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	13.59	1056.72	(29a)
Roof	6.47	529.2	(30)

Total area of external elements ∑A, m²		147.36	(31)
Party Wall	0	0	(32)
Party floor		2352	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		34.72	(33)
Heat capacity Cm = ∑(A x k)		4666.92	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		79.37	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		42.07	(37)

Ventilation heat loss calculated monthly

29.52	29.36	29.19	28.42	28.28	27.61	27.61	27.49	27.87	28.28	28.57	28.87	(38)

Heat transfer coefficient, W/K

71.59	71.42	71.26	70.49	70.35	69.68	69.68	69.55	69.94	70.35	70.64	70.94	(39)

Heat loss parameter (HLP), W/m²K

1.22	1.21	1.21	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.21	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.95	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

56.87	56.02	54.77	52.39	50.63	48.67	47.56	48.79	50.15	52.25	54.69	56.65	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

24.58	24.22	23.7	22.75	22.04	21.26	20.83	21.34	21.9	22.74	23.71	24.5	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

34.57	33.32	32.06	30.8	29.55	28.29	28.29	29.55	30.8	32.06	33.32	34.57	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	106.81	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

116.03	113.55	110.53	105.95	102.22	98.22	96.68	99.68	102.85	107.05	111.71	115.73	1280.18	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

183.76	161.69	169.89	145.03	137.61	120.77	116.92	123.42	126.82	145.27	159.15	181.2	1771.54	(45)

Distribution loss (46) = 0.15 x (45)

27.56	24.25	25.48	21.76	20.64	18.12	17.54	18.51	19.02	21.79	23.87	27.18	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

230.35	203.78	216.48	190.13	184.2	165.86	163.52	170.02	171.91	191.86	204.24	227.8	2320.15	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

26	22.99	24.08	19.94	18.58	15.9	14.9	15.85	16.45	19.39	21.97	25.52	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

204.35	180.79	192.4	170.19	165.62	149.96	148.61	154.17	155.46	172.47	182.27	202.28	2078.57	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

98.38	87.43	93.76	84.3	83.03	76.23	76.15	78.31	78.24	85.58	88.99	97.52	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	97.38	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

87.11	96.45	87.11	90.02	87.11	90.02	87.11	87.11	90.02	87.11	90.02	87.11	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

169.91	171.67	167.23	157.77	145.83	134.61	127.11	125.35	129.79	139.25	151.19	162.41	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	32.74	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	-77.9	(71)

Water heating gains (Table 5)

132.23	130.11	126.03	117.08	111.6	105.87	102.35	105.26	108.67	115.02	123.6	131.08	(72)

Total internal gains

444.46	453.44	435.58	420.08	399.76	382.71	368.79	369.94	380.69	396.6	420.02	435.82	(73)

6. Solar gains

Solar gains in watts, calculated for each month

35.95	69.71	120.14	194.03	261.24	279.38	260.96	207.29	144.92	83.5	44.55	29.83	(83)

Total gains – internal and solar (watts)

480.41	523.15	555.72	614.12	661	662.09	629.76	577.23	525.61	480.1	464.57	465.66	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.9	0.86	0.79	0.69	0.55	0.43	0.48	0.66	0.82	0.89	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.09	18.37	18.86	19.58	20.22	20.68	20.86	20.83	20.47	19.68	18.79	18.04	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.91	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.85	0.77	0.64	0.48	0.34	0.39	0.6	0.79	0.88	0.91	(89)

Roof Mean internal temperature in the rest of dwelling T2

16.53	16.89	17.51	18.4	19.16	19.67	19.85	19.82	19.47	18.54	17.44	16.49	(90)

Living area fraction 0.45 (91)

Mean internal temperature (for the whole dwelling)

17.24	17.56	18.12	18.93	19.64	20.12	20.31	20.28	19.92	19.06	18.05	17.19	(92)

Adjusted mean internal temperature:

17.24	17.56	18.12	18.93	19.64	20.12	20.31	20.28	19.92	19.06	18.05	17.19	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.85	0.81	0.74	0.63	0.49	0.38	0.42	0.6	0.76	0.84	0.88	(94)

Useful gains, mGm , W

418.57	443.64	451.05	452.68	416.71	327.11	236.5	241.15	314.96	365.13	390.54	408.65	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

926.1	904.28	828.16	707.18	558.51	384.87	258.44	269.62	407.16	595.1	773.59	921.61	(97)

Space heating requirement for each month

377.6	309.55	280.57	183.24	105.5	0	0	0	0	171.09	275.79	381.64	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

377.6	309.55	280.57	183.24	105.5	0	0	0	0	171.09	275.79	381.64	(98c)

Space heating requirement in kWh/m²/year 35.46 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
409.1	335.37	303.98	198.52	114.3	0	0	0		0	185.37	298.8	413.48		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.42	85.25	84.9	84.23	83.08	79.8	79.8	79.8		79.8	84.04	84.99	85.46		(217)
Fuel for water heating														
239.24	212.05	226.61	202.06	199.36	187.92	186.23	193.19		194.81	205.22	214.47	236.69	2497.87	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2258.92	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2497.87	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													146.08	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

11.19	16.97	26.21	31.75	36.28	34.63	34.22	31.28	26.47	20.38	12.72	9.54	291.64	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

3.16	6.86	14.03	21.68	29.27	29.63	29.27	24.5	17.59	9.99	4.28	2.48	192.75	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4504.48	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.22	(240a)
Low-rate fraction	0		82.22	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.22	(241a)
Low-rate fraction	0		82.22	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.22	(242a)

Low-rate fraction	0		82.22	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		90.92	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		24.09	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-58.85	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		244.56	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.85		(257)
SAP rating	86.25		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			474.37	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			524.55	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		998.92	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		21.08	(268)
energy saved or generated	0	-62.92	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		969.02	(272)
Dwelling CO2 Emission Rate		16.48	(273)
EI rating		87	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2552.58	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2822.59	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5375.17	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			224.06	(282)
energy saved or generated	0		-523.55	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5205.78	(286)
Dwelling PE Rate			88.53	(287)

DER WORKSHEET

Dwelling Reference: B11
Dwelling Type: New Dwelling Design Stage

B11
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.61		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	7.13	1426	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.67	715.68	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		142.58	(31)
Party Wall	0	394.2	(32)
Party floor		0	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		37.57	(33)
Heat capacity Cm = ∑(A x k)		5403.88	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		75.79	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.15	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.15	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		44.72	(37)

Ventilation heat loss calculated monthly

14.88	14.7	14.52	13.63	13.46	12.57	12.57	12.39	12.92	13.46	13.81	14.17	(38)

Heat transfer coefficient, W/K

59.6	59.42	59.24	58.35	58.18	57.29	57.29	57.11	57.64	58.18	58.53	58.89	(39)

Heat loss parameter (HLP), W/m²K

0.84	0.83	0.83	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.28	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	117.19	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82	(45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.4	92.74	99.34	89.07	87.56	80.21	80.02	82.39	82.42	90.36	94.22	103.47	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.03	111.86	101.03	104.4	101.03	104.4	101.03	101.03	104.4	101.03	104.4	101.03	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.32	138	133.52	123.7	117.69	111.41	107.55	110.74	114.48	121.45	130.86	139.07	(72)

Total internal gains

501.83	512.41	491.87	474.27	450.81	431.66	415.6	416.71	429.05	446.81	473.66	491.74	(73)

6. Solar gains

Solar gains in watts, calculated for each month

137.29	231.9	313.84	385.88	431.56	428.7	413.16	378.68	338.53	255.2	164.05	117.78	(83)

Total gains – internal and solar (watts)

639.12	744.31	805.7	860.15	882.37	860.36	828.76	795.39	767.59	702.01	637.71	609.51	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.81	0.75	0.66	0.54	0.4	0.3	0.32	0.47	0.67	0.81	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.3	19.65	20.03	20.45	20.74	20.92	20.97	20.97	20.87	20.49	19.86	19.24	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.22	20.22	20.23	20.24	20.24	20.25	20.25	20.25	20.25	20.24	20.24	20.23	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.8	0.73	0.63	0.5	0.36	0.25	0.27	0.43	0.64	0.79	0.86	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.23	18.66	19.13	19.64	19.98	20.18	20.23	20.23	20.12	19.7	18.94	18.17	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

18.64	19.04	19.47	19.95	20.27	20.46	20.52	20.51	20.41	20	19.29	18.58	(92)

Adjusted mean internal temperature:

18.64	19.04	19.47	19.95	20.27	20.46	20.52	20.51	20.41	20	19.29	18.58	(93)

8. Space heating requirement

Utilisation factor for gains,

0.82	0.77	0.71	0.62	0.51	0.37	0.27	0.29	0.44	0.63	0.77	0.84	(94)

Useful gains, mGm , W

526.44	573.88	573.18	532.43	446.58	319.86	219.74	228.94	337.17	445.7	491.01	509.57	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

854.62	840.07	768.32	644.75	498.77	335.77	224.29	234.75	363.56	547.05	713.36	846.68	(97)

Space heating requirement for each month

244.17	178.88	145.18	80.87	38.83	0	0	0	0	75.4	160.09	250.8	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

244.17	178.88	145.18	80.87	38.83	0	0	0	0	75.4	160.09	250.8	(98c)

Space heating requirement in kWh/m²/year 16.47 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
269.8	197.66	160.43	89.36	42.91	0	0	0		0	83.31	176.89	277.13		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.77	84.27	83.59	82.57	81.38	79.8	79.8	79.8		79.8	82.41	83.98	84.87		(217)
Fuel for water heating														
292.95	260.58	278.86	247.47	242.92	222.69	219.28	228.23		231.01	250.08	261.74	289.29	3025.1	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1297.48	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3025.1	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			152.66	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													238.66	(231)
Electricity for lighting													169.43	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4730.67	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.23	(240a)
Low-rate fraction	0		47.23	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.23	(241a)
Low-rate fraction	0		47.23	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		47.23	(242a)

Low-rate fraction	0		47.23	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		110.11	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		39.36	(249)
Energy For lighting	0		27.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		316.64	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.98	(257)
SAP rating	84.11	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			272.47	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			635.27	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		907.74	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.11	(267)
Electricity for lighting		24.45	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		965.3	(272)
Dwelling CO2 Emission Rate		13.54	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1466.16	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3418.36	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4884.52	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			361.05	(281)
Electricity for lighting			259.87	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5505.43	(286)
Dwelling PE Rate			77.22	(287)

TER WORKSHEET

Dwelling Reference: B11
Dwelling Type: New Dwelling Design Stage

B11
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.32 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38	4.19	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	(25)

Effective air change rate from PCDB:

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	17.95		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	9.27	1426	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	9.62	748.16	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		142.58	(31)
Party Wall	0	394.2	(32)
Party floor		0	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		39	(33)
Heat capacity Cm = ∑(A x k)		5436.36	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		76.25	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		7.15	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		7.15	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		46.15	(37)

Ventilation heat loss calculated monthly

35.65	35.46	35.26	34.36	34.19	33.4	33.4	33.25	33.7	34.19	34.53	34.89	(38)

Heat transfer coefficient, W/K

81.81	81.61	81.42	80.51	80.34	79.55	79.55	79.41	79.86	80.34	80.68	81.04	(39)

Heat loss parameter (HLP), W/m²K

1.15	1.14	1.14	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.13	1.14	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N — 2.28 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) — 117.19 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82 (45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel — 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.23	219.5	233	204.23	197.58	177.6	174.89	182.02	184.25	205.99	219.72	245.42	2492.43	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.53	25.23	26.42	21.88	20.39	17.45	16.35	17.39	18.05	21.28	24.11	28	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

219.7	194.27	206.58	182.35	177.2	160.16	158.53	164.63	166.2	184.71	195.61	217.42	2227.37	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.32	92.66	99.26	88.99	87.48	80.13	79.93	82.31	82.34	90.28	94.14	103.38	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.07	111.9	101.07	104.44	101.07	104.44	101.07	101.07	104.44	101.07	104.44	101.07	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.21	137.89	133.41	123.59	117.58	111.3	107.44	110.63	114.36	121.34	130.75	138.96	(72)

Total internal gains

501.75	512.34	491.79	474.19	450.74	431.59	415.52	416.63	428.98	446.73	473.59	491.66	(73)

6. Solar gains

Solar gains in watts, calculated for each month

167.39	282.75	382.67	470.56	526.29	522.81	503.86	461.79	412.8	311.17	200.01	143.59	(83)

Total gains – internal and solar (watts)

669.15	795.09	874.46	944.75	977.03	954.4	919.38	878.43	841.78	757.9	673.6	635.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.88	0.84	0.79	0.7	0.6	0.46	0.35	0.38	0.54	0.73	0.84	0.89	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.41	18.84	19.35	19.96	20.44	20.78	20.91	20.9	20.67	20.04	19.14	18.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.96	19.96	19.97	19.98	19.98	19.99	19.99	19.99	19.98	19.98	19.98	19.97	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.87	0.82	0.76	0.67	0.55	0.41	0.28	0.31	0.48	0.69	0.82	0.88	(89)

Roof Mean internal temperature in the rest of dwelling T2

16.97	17.5	18.13	18.87	19.44	19.81	19.94	19.92	19.7	18.98	17.89	16.89	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

17.52	18.01	18.6	19.28	19.82	20.18	20.31	20.29	20.07	19.39	18.37	17.44	(92)

Adjusted mean internal temperature:

17.52	18.01	18.6	19.28	19.82	20.18	20.31	20.29	20.07	19.39	18.37	17.44	(93)

8. Space heating requirement

Utilisation factor for gains,

0.83	0.79	0.73	0.65	0.55	0.42	0.3	0.33	0.49	0.67	0.79	0.85	(94)

Useful gains, mGm , W

558.23	624.59	639.23	613.2	533.14	398.11	279.41	289.78	409.01	506.02	530.67	537.36	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1081.79	1070	984.87	836	652.55	443.73	295.06	309.19	476.84	705.93	909.02	1073.01	(97)

Space heating requirement for each month

389.52	299.32	257.16	160.42	88.84	0	0	0	0	148.73	272.41	398.52	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

389.52	299.32	257.16	160.42	88.84	0	0	0	0	148.73	272.41	398.52	(98c)

Space heating requirement in kWh/m²/year 28.26 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
422.02	324.29	278.61	173.8	96.25	0	0	0		0	161.14	295.14	431.77		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.33	85.03	84.55	83.77	82.6	79.8	79.8	79.8		79.8	83.58	84.8	85.4		(217)
Fuel for water heating														
257.47	228.49	244.33	217.68	214.54	200.7	198.66	206.3		208.26	221	230.67	254.59	2682.69	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			2183.02 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2682.69 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	0 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			86 (231)
Electricity for lighting			169.49 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

19.09	28.29	42.7	50.5	56.64	53.67	53.02	48.96	42.2	33.43	21.47	16.35	466.32	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

7	15.05	30.5	46.69	62.59	63.21	62.47	52.49	37.96	21.81	9.44	5.52	414.72	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4240.15	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		79.46	(240a)
Low-rate fraction	0		79.46	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		79.46	(241a)
Low-rate fraction	0		79.46	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		79.46	(242a)

Low-rate fraction	0		79.46	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		97.65	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		27.95	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-100.09	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		211.15	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.65		(257)
SAP rating	89.4		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			458.43	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			563.36	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1021.8	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		24.46	(268)
energy saved or generated	0	-114.26	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		943.93	(272)
Dwelling CO2 Emission Rate		13.24	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2466.81	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3031.44	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5498.25	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			259.96	(282)
energy saved or generated	0		-887.28	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5001.03	(286)
Dwelling PE Rate			70.14	(287)

DER WORKSHEET

Dwelling Reference: B12
Dwelling Type: New Dwelling Design Stage

B12
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	16.21		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	5.09	1018	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		107.33	(31)
Party Wall	0	394.2	(32)
Party floor		0	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		29.48	(33)
Heat capacity Cm = ∑(A x k)		4229.74	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		83.1	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		34.83	(37)

Ventilation heat loss calculated monthly

10.62	10.49	10.37	9.73	9.61	8.97	8.97	8.84	9.23	9.61	9.86	10.11	(38)

Heat transfer coefficient, W/K

45.45	45.33	45.2	44.56	44.44	43.8	43.8	43.68	44.06	44.44	44.69	44.94	(39)

Heat loss parameter (HLP), W/m²K

0.89	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.87	0.87	0.88	0.88	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.44	83.52	75.44	77.96	75.44	77.96	75.44	75.44	77.96	75.44	77.96	75.44	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

403.51	411.17	395.37	381.22	363.09	347.39	335	336.15	345.75	360.49	381.5	395.84	(73)

6. Solar gains

Solar gains in watts, calculated for each month

93.06	164.5	237.98	311.59	360.74	362.34	347.65	310.97	263.8	185.58	112.63	78.85	(83)

Total gains – internal and solar (watts)

496.57	575.67	633.35	692.82	723.83	709.73	682.65	647.12	609.55	546.07	494.13	474.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.81	0.74	0.64	0.51	0.38	0.28	0.3	0.46	0.67	0.81	0.87	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.36	19.7	20.09	20.51	20.79	20.93	20.98	20.97	20.88	20.52	19.9	19.31	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.17	20.18	20.18	20.19	20.19	20.2	20.2	20.2	20.2	20.19	20.19	20.18	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.8	0.72	0.61	0.48	0.33	0.23	0.25	0.41	0.64	0.79	0.86	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.27	18.68	19.16	19.67	19.98	20.15	20.19	20.19	20.09	19.69	18.95	18.21	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

18.8	19.18	19.61	20.08	20.37	20.53	20.57	20.57	20.48	20.09	19.41	18.74	(92)

Adjusted mean internal temperature:

18.8	19.18	19.61	20.08	20.37	20.53	20.57	20.57	20.48	20.09	19.41	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.82	0.77	0.71	0.6	0.48	0.35	0.25	0.28	0.43	0.63	0.77	0.84	(94)

Useful gains, mGm , W

409.65	444.99	447.96	418.77	350.51	249.49	171.1	178.21	262.28	346.17	381.28	397.26	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

659.12	647.09	592.52	498.05	385.34	259.7	173.98	182.02	280.87	421.88	550.2	653.61	(97)

Space heating requirement for each month

185.6	135.81	107.55	57.09	25.91	0	0	0	0	56.33	121.62	190.73	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

185.6	135.81	107.55	57.09	25.91	0	0	0	0	56.33	121.62	190.73	(98c)

Space heating requirement in kWh/m²/year 17.3 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0				0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0				0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0		0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0				0	
205.09	150.07	118.85	63.08	28.63	0	0	0		0	62.25	134.39	210.75	(211)
Space heating fuel (main heating system 2), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(213)
Space heating fuel (secondary), kWh/month								0				0	
0	0	0	0	0	0	0	0		0	0	0	0	(215)
Output from water heater),								0				79.8	(216)
Efficiency of water heater													
84.39	83.9	83.18	82.13	81.04	79.8	79.8	79.8		79.8	82.09	83.62	84.49	(217)
Fuel for water heating													
258.26	229.88	246.46	219.58	215.88	197.66	195.06	202.65		204.73	221.79	231.43	255.13	2678.52 (219)
Space Cooling													
0	0	0	0	0	0	0	0		0	0	0	0	(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												973.09	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2678.52	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		108.98	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												194.98	(231)
Electricity for lighting												126.51	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3973.1	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		35.42	(240a)
Low-rate fraction	0		35.42	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		35.42	(241a)
Low-rate fraction	0		35.42	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		35.42	(242a)

Low-rate fraction	0		35.42	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		97.5	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		20.86	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		277.93	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.04	(257)
SAP rating		83.09	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			204.35	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			562.49	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		766.84	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		18.26	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		812.14	(272)
Dwelling CO2 Emission Rate		15.96	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1099.59	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3026.73	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4126.32	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			194.04	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4615.33	(286)
Dwelling PE Rate			90.67	(287)

TER WORKSHEET

Dwelling Reference: B12
Dwelling Type: New Dwelling Design Stage

B12
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.31 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37	4.08	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

Effective air change rate from PCDB:

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.1		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	6.62	1018	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.87	611.8	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		107.33	(31)
Party Wall	0	394.2	(32)
Party floor		0	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		28.75	(33)
Heat capacity Cm = ∑(A x k)		4280	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		84.09	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.35	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.35	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		34.1	(37)

Ventilation heat loss calculated monthly

25.27	25.13	25	24.39	24.27	23.74	23.74	23.64	23.95	24.27	24.51	24.75	(38)

Heat transfer coefficient, W/K

59.36	59.23	59.1	58.49	58.37	57.84	57.84	57.74	58.04	58.37	58.6	58.85	(39)

Heat loss parameter (HLP), W/m²K

1.17	1.16	1.16	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91 (45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.71	83.82	75.71	78.24	75.71	78.24	75.71	75.71	78.24	75.71	78.24	75.71	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

403.67	411.36	395.53	381.39	363.25	347.56	335.15	336.31	345.92	360.65	381.67	396	(73)

6. Solar gains

Solar gains in watts, calculated for each month

97.26	171.92	248.7	325.64	376.99	378.67	363.32	324.98	275.69	193.94	117.71	82.41	(83)

Total gains – internal and solar (watts)

500.92	583.27	644.23	707.03	740.24	726.22	698.47	661.29	621.61	554.59	499.38	478.41	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.89	0.85	0.79	0.7	0.59	0.45	0.34	0.37	0.54	0.73	0.85	0.9	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.59	18.98	19.47	20.06	20.52	20.82	20.93	20.91	20.71	20.11	19.27	18.53	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.95	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.88	0.83	0.77	0.67	0.54	0.39	0.27	0.3	0.48	0.7	0.83	0.88	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.18	17.65	18.26	18.98	19.51	19.83	19.93	19.92	19.72	19.05	18.03	17.1	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

17.86	18.29	18.85	19.5	20	20.31	20.42	20.4	20.2	19.57	18.63	17.79	(92)

Adjusted mean internal temperature:

17.86	18.29	18.85	19.5	20	20.31	20.42	20.4	20.2	19.57	18.63	17.79	(93)

8. Space heating requirement

Utilisation factor for gains,

0.84	0.8	0.74	0.65	0.54	0.41	0.3	0.33	0.49	0.68	0.8	0.85	(94)

Useful gains, mGm , W

422.29	466.03	478.7	462.94	403.29	300.24	210.72	218.35	306.78	378	398.96	408.3	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

805.19	793.22	729.8	620.21	484.43	330.12	220.77	231.13	354.21	523.36	675.71	799.8	(97)

Space heating requirement for each month

284.88	219.87	186.82	113.23	60.37	0	0	0	0	108.14	199.26	291.28	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

284.88	219.87	186.82	113.23	60.37	0	0	0	0	108.14	199.26	291.28	(98c)

Space heating requirement in kWh/m²/year 28.76 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
308.65	238.21	202.41	122.68	65.41	0	0	0		0	117.17	215.88	315.58		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.92	84.62	84.11	83.28	82.11	79.8	79.8	79.8		79.8	83.15	84.38	85		(217)
Fuel for water heating														
227.98	202.48	216.94	194.14	191.85	178.97	177.52	184.02		185.4	197.11	204.95	225.51	2386.86	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1			1585.97 (211)
Space heating fuel used, main system 2			0 (213)
Space heating fuel used, secondary			0 (215)
Water heating fuel used			2386.86 (219)
Electricity for instantaneous electric shower(s)			0 (64a)
Space cooling fuel used			0 (221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	0 (230a)
warm air heating system fans			0 (230b)
Heating circulation pump or water pump within warm air heating unit			41 (230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)			0 (230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)			45 (230e)
Maintaining electric keep-hot facility for gas combi boiler			0 (230f)
Pump for solar water heating			0 (230g)
Pump for storage WWHRS			0 (230h)
Total electricity for the above			86 (231)
Electricity for lighting			126.96 (232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.78	20.49	31.06	36.91	41.56	39.47	39.01	35.95	30.87	24.31	15.53	11.79	340.74	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.85	10.44	21.19	32.47	43.56	43.97	43.44	36.47	26.35	15.12	6.54	3.82	288.22	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3556.84	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.73	(240a)
Low-rate fraction	0		57.73	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.73	(241a)
Low-rate fraction	0		57.73	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.73	(242a)

Low-rate fraction	0		57.73	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		86.88	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		20.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.33	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		199.4	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.75		(257)
SAP rating	87.87		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			333.05	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			501.24	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		834.3	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		18.32	(268)
energy saved or generated	0	-81.6	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		782.95	(272)
Dwelling CO2 Emission Rate		15.38	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1792.15	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2697.16	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4489.31	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			194.74	(282)
energy saved or generated	0		-641.37	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4172.78	(286)
Dwelling PE Rate			81.98	(287)

DER WORKSHEET

Dwelling Reference: B13
Dwelling Type: New Dwelling Design Stage

B13
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	8.66	1732	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	12.15	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		187.58	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.37	(33)
Heat capacity Cm = ∑(A x k)		6193	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		71.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		9.4	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		9.4	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.77	(37)

Ventilation heat loss calculated monthly

18.07	17.86	17.64	16.56	16.34	15.26	15.26	15.05	15.7	16.34	16.78	17.21	(38)

Heat transfer coefficient, W/K

70.85	70.63	70.41	69.33	69.12	68.04	68.04	67.82	68.47	69.12	69.55	69.98	(39)

Heat loss parameter (HLP), W/m²K

0.82	0.82	0.81	0.8	0.8	0.79	0.79	0.78	0.79	0.8	0.8	0.81	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		2.58	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	126.61	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.79	97.48	104.32	93.32	91.6	83.75	83.44	86.01	86.14	94.62	98.88	108.78	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.57	145.05	140.21	129.61	123.11	116.32	112.15	115.6	119.64	127.17	137.34	146.21	(72)

Total internal gains

562.76	575.29	551.74	532.11	505.34	484.11	465.74	466.77	480.83	500.38	530.83	551.14	(73)

6. Solar gains

Solar gains in watts, calculated for each month

51.05	99.52	168.8	262.69	342.27	360.69	339.07	276.65	200.91	118.85	63.45	42.19	(83)

Total gains – internal and solar (watts)

613.81	674.81	720.54	794.81	847.6	844.8	804.81	743.43	681.74	619.24	594.28	593.33	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, 1,m (see Table 9a)

0.9	0.88	0.84	0.75	0.62	0.47	0.36	0.4	0.59	0.78	0.87	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.93	19.2	19.62	20.18	20.61	20.87	20.95	20.94	20.75	20.21	19.51	18.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.24	20.24	20.24	20.25	20.25	20.27	20.27	20.27	20.26	20.25	20.25	20.25	(88)

Roof

Utilisation factor for gains for rest of dwelling, 2,m (see Table 9a)

0.9	0.87	0.82	0.72	0.59	0.42	0.3	0.34	0.54	0.75	0.86	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.79	18.13	18.65	19.34	19.85	20.15	20.23	20.22	20.03	19.4	18.53	17.75	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

18.17	18.49	18.97	19.62	20.11	20.39	20.47	20.46	20.27	19.67	18.85	18.13	(92)

Adjusted mean internal temperature:

18.17	18.49	18.97	19.62	20.11	20.39	20.47	20.46	20.27	19.67	18.85	18.13	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.84	0.79	0.7	0.58	0.43	0.32	0.35	0.54	0.73	0.83	0.87	(94)

Useful gains, mGm , W

531.63	564.5	570.39	557.7	491.65	365.11	254.6	263.17	368.6	452.73	492.9	518.39	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

982.43	959.58	878.01	743.52	581.05	393.94	263.59	275.47	422.62	626.78	817.55	974.88	(97)

Space heating requirement for each month

335.4	265.49	228.87	133.78	66.52	0	0	0	0	129.49	233.75	339.63	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

335.4	265.49	228.87	133.78	66.52	0	0	0	0	129.49	233.75	339.63	(98c)

Space heating requirement in kWh/m²/year 20.01 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
370.61	293.36	252.89	147.83	73.5	0	0	0		0	143.09	258.29	375.28		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.45	85.15	84.6	83.57	82.14	79.8	79.8	79.8		79.8	83.47	84.81	85.51		(217)
Fuel for water heating														
309.58	274.63	293.25	259.81	255.45	236.03	232.2	241.86		245.02	262.26	275.73	305.8	3191.64	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1914.85	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3191.64	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			188.85	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													274.85	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)													
	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
	0	0	0	0	0	0	0	0	0	0	0	0	(234a)
Electricity generated by hydro-electric generators													
	0	0	0	0	0	0	0	0	0	0	0	0	(235a)
Electricity used or net electricity generated by micro-CHP													
	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)													
	0	0	0	0	0	0	0	0	0	0	0	0	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
	0	0	0	0	0	0	0	0	0	0	0	0	(234b)
Electricity generated by hydro-electric generators													
	0	0	0	0	0	0	0	0	0	0	0	0	(235b)
Electricity used or net electricity generated by micro-CHP													
	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5579	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		69.7	(240a)
Low-rate fraction	0		69.7	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		69.7	(241a)
Low-rate fraction	0		69.7	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		69.7	(242a)

Low-rate fraction	0		69.7	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		116.18	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		45.32	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		355.79	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.97	(257)
SAP rating		84.22	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			402.12	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			670.24	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1072.36	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		38.13	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1139.02	(272)
Dwelling CO2 Emission Rate		13.15	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2163.78	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3606.56	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5770.33	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			415.8	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			6489.3	(286)
Dwelling PE Rate			74.93	(287)

TER WORKSHEET

Dwelling Reference: B13
Dwelling Type: New Dwelling Design Stage

B13
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor												0.3	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35	3.9	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(24d)
Effective air change rate														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)
Effective air change rate from PCDB:														
	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	11.26	1732	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	14.58	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		187.58	(31)
Party Wall	0	0	(32)
Party floor		0	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		48.4	(33)
Heat capacity Cm = ∑(A x k)		6193	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		71.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		9.4	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		9.4	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		57.8	(37)

Ventilation heat loss calculated monthly

42.48	42.27	42.07	41.12	40.94	40.11	40.11	39.96	40.43	40.94	41.3	41.68	(38)

Heat transfer coefficient, W/K

100.28	100.07	99.87	98.92	98.74	97.91	97.91	97.76	98.23	98.74	99.1	99.48	(39)

Heat loss parameter (HLP), W/m²K

1.16	1.16	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.58 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 126.61 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.43	233.76	247.98	217.02	209.72	188.25	185.19	192.9	195.43	218.8	233.76	261.4	2648.64	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

30.82	27.26	28.54	23.63	22.03	18.85	17.67	18.79	19.5	22.99	26.04	30.25	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

233.61	206.51	219.44	193.39	187.69	169.4	167.53	174.12	175.93	195.81	207.71	231.15	2362.28	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.71	97.4	104.24	93.24	91.51	83.67	83.36	85.92	86.06	94.53	98.8	108.7	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.45	144.94	140.1	129.5	123	116.21	112.04	115.49	119.53	127.06	137.23	146.1	(72)

Total internal gains

562.65	575.18	551.63	532	505.22	484	465.63	466.66	480.71	500.27	530.72	551.03	(73)

6. Solar gains

Solar gains in watts, calculated for each month

71.47	139.32	236.32	367.77	479.17	504.97	474.69	387.32	281.28	166.4	88.83	59.06	(83)

Total gains – internal and solar (watts)

634.12	714.5	787.95	899.77	984.4	988.97	940.32	853.98	761.99	666.67	619.55	610.09	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.89	0.86	0.77	0.66	0.52	0.41	0.46	0.64	0.81	0.89	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

17.91	18.24	18.8	19.57	20.23	20.68	20.87	20.83	20.46	19.62	18.65	17.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.95	19.96	19.96	19.97	19.97	19.98	19.98	19.98	19.97	19.97	19.96	19.96	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.88	0.84	0.75	0.62	0.46	0.33	0.37	0.59	0.79	0.88	0.92	(89)

Roof Mean internal temperature in the rest of dwelling T2

16.36	16.78	17.48	18.43	19.21	19.71	19.89	19.86	19.49	18.51	17.3	16.29	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

16.87	17.27	17.92	18.81	19.55	20.03	20.22	20.18	19.82	18.88	17.75	16.81	(92)

Adjusted mean internal temperature:

16.87	17.27	17.92	18.81	19.55	20.03	20.22	20.18	19.82	18.88	17.75	16.81	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.84	0.8	0.71	0.6	0.46	0.35	0.39	0.58	0.75	0.84	0.88	(94)

Useful gains, mGm , W

552.49	601.56	627.95	640.85	589.74	457.67	326.38	333.26	438.59	500.07	519.99	536.09	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1260.96	1237.78	1140.54	980.26	775.11	532.07	354.13	369.86	561.63	817.33	1055.83	1254.58	(97)

Space heating requirement for each month

527.1	427.54	381.36	244.37	137.91	0	0	0	0	236.04	385.81	534.56	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

527.1	427.54	381.36	244.37	137.91	0	0	0	0	236.04	385.81	534.56	(98c)

Space heating requirement in kWh/m²/year 33.19 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
571.07	463.21	413.18	264.76	149.42	0	0	0		0	255.73	417.99	579.15		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.83	85.65	85.29	84.59	83.38	79.8	79.8	79.8		79.8	84.48	85.43	85.88		(217)
Fuel for water heating														
272.19	241.09	257.3	228.63	225.11	212.28	209.93	218.19		220.46	231.78	243.14	269.16	2829.27	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													3114.5	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2829.27	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

22.99	33.94	51.07	60.18	67.3	63.69	62.89	58.17	50.27	40.01	25.81	19.7	556	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

8.71	18.69	37.84	57.86	77.52	78.28	77.38	65.06	47.08	27.08	11.74	6.86	514.1	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		5157.32	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		113.37	(240a)
Low-rate fraction	0		113.37	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		113.37	(241a)
Low-rate fraction	0		113.37	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		113.37	(242a)

Low-rate fraction	0		113.37	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		102.99	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-120.39	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		234.74	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.64	(257)
SAP rating		89.59	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			654.05	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			594.15	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1248.19	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	-138.75	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1149.9	(272)
Dwelling CO2 Emission Rate		13.28	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			3519.39	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3197.08	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			6716.46	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		-1067.14	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			6082.59	(286)
Dwelling PE Rate			70.24	(287)

DER WORKSHEET

Dwelling Reference: B24
Dwelling Type: New Dwelling Design Stage

B24
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.61		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.67	715.68	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		71.28	(31)
Party Wall	0	394.2	(32)
Party floor		2852	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		30.44	(33)
Heat capacity Cm = ∑(A x k)		6829.88	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		95.79	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		3.55	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		3.55	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		33.99	(37)

Ventilation heat loss calculated monthly

14.88	14.7	14.52	13.63	13.46	12.57	12.57	12.39	12.92	13.46	13.81	14.17	(38)

Heat transfer coefficient, W/K

48.87	48.69	48.51	47.62	47.45	46.56	46.56	46.38	46.91	47.45	47.8	48.16	(39)

Heat loss parameter (HLP), W/m²K

0.69	0.68	0.68	0.67	0.67	0.65	0.65	0.65	0.66	0.67	0.67	0.68	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.28 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 117.19 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82	(45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.4	92.74	99.34	89.07	87.56	80.21	80.02	82.39	82.42	90.36	94.22	103.47	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.03	111.86	101.03	104.4	101.03	104.4	101.03	101.03	104.4	101.03	104.4	101.03	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.32	138	133.52	123.7	117.69	111.41	107.55	110.74	114.48	121.45	130.86	139.07	(72)

Total internal gains

501.83	512.41	491.87	474.27	450.81	431.66	415.6	416.71	429.05	446.81	473.66	491.74	(73)

6. Solar gains

Solar gains in watts, calculated for each month

137.29	231.9	313.84	385.88	431.56	428.7	413.16	378.68	338.53	255.2	164.05	117.78	(83)

Total gains – internal and solar (watts)

639.12	744.31	805.7	860.15	882.37	860.36	828.76	795.39	767.59	702.01	637.71	609.51	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.8	0.73	0.61	0.48	0.34	0.25	0.27	0.41	0.63	0.8	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.08	20.34	20.59	20.82	20.94	20.99	21	21	20.97	20.82	20.46	20.04	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.35	20.36	20.36	20.37	20.37	20.38	20.38	20.38	20.38	20.37	20.37	20.36	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.79	0.71	0.58	0.45	0.31	0.21	0.23	0.38	0.6	0.78	0.87	(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.28	19.6	19.9	20.17	20.31	20.37	20.38	20.38	20.35	20.19	19.75	19.23	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

19.58	19.88	20.16	20.42	20.55	20.61	20.62	20.62	20.59	20.43	20.02	19.54	(92)

Adjusted mean internal temperature:

19.58	19.88	20.16	20.42	20.55	20.61	20.62	20.62	20.59	20.43	20.02	19.54	(93)

8. Space heating requirement

Utilisation factor for gains,

0.84	0.77	0.7	0.59	0.46	0.32	0.22	0.24	0.39	0.61	0.77	0.85	(94)

Useful gains, mGm , W

535.89	576.56	564.71	504.78	404.88	276.7	186.38	194.75	298.34	425.36	492.34	519.39	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

746.84	729.61	662.6	548.54	419.8	279.61	186.96	195.54	304.45	466.42	617.66	738.7	(97)

Space heating requirement for each month

156.95	102.85	72.83	31.51	11.1	0	0	0	0	30.55	90.23	163.16	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

156.95	102.85	72.83	31.51	11.1	0	0	0	0	30.55	90.23	163.16	(98c)

Space heating requirement in kWh/m²/year 9.25 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
173.42	113.64	80.48	34.82	12.26	0	0	0	0	33.76	99.7	180.29		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
83.63	82.93	82.11	81.08	80.3	79.8	79.8	79.8	79.8	81.04	82.64	83.75		(217)
Fuel for water heating													
296.94	264.81	283.89	252.01	246.17	222.69	219.28	228.23	231.01	254.32	265.99	293.15	3058.48	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												728.37	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												3058.48	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside							0		0			152.66	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												238.66	(231)
Electricity for lighting												169.43	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4194.94	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(240a)
Low-rate fraction	0		26.51	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(241a)
Low-rate fraction	0		26.51	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(242a)

Low-rate fraction	0		26.51	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		111.33	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		39.36	(249)
Energy For lighting	0		27.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		297.13	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.92	(257)
SAP rating	85.09	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			152.96	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			642.28	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		795.24	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.11	(267)
Electricity for lighting		24.45	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		852.8	(272)
Dwelling CO2 Emission Rate		11.96	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			823.06	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3456.09	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4279.15	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			361.05	(281)
Electricity for lighting			259.87	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4900.06	(286)
Dwelling PE Rate			68.72	(287)

TER WORKSHEET

Dwelling Reference: B24
Dwelling Type: New Dwelling Design Stage

B24
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.32 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38	4.19	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0		(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0		(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)

Effective air change rate

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)

Effective air change rate from PCDB:

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	17.95		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	9.62	748.16	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		71.28	(31)
Party Wall	0	394.2	(32)
Party floor		2852	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		29.73	(33)
Heat capacity Cm = ∑(A x k)		6862.36	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		96.25	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		3.55	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		3.55	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		33.28	(37)

Ventilation heat loss calculated monthly

35.65	35.46	35.26	34.36	34.19	33.4	33.4	33.25	33.7	34.19	34.53	34.89	(38)

Heat transfer coefficient, W/K

68.94	68.74	68.55	67.64	67.47	66.68	66.68	66.54	66.99	67.47	67.81	68.17	(39)

Heat loss parameter (HLP), W/m²K

0.97	0.96	0.96	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.95	0.96	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.28 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 117.19 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82 (45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.23	219.5	233	204.23	197.58	177.6	174.89	182.02	184.25	205.99	219.72	245.42	2492.43	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.53	25.23	26.42	21.88	20.39	17.45	16.35	17.39	18.05	21.28	24.11	28	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

219.7	194.27	206.58	182.35	177.2	160.16	158.53	164.63	166.2	184.71	195.61	217.42	2227.37	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.32	92.66	99.26	88.99	87.48	80.13	79.93	82.31	82.34	90.28	94.14	103.38	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.07	111.9	101.07	104.44	101.07	104.44	101.07	101.07	104.44	101.07	104.44	101.07	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.21	137.89	133.41	123.59	117.58	111.3	107.44	110.63	114.36	121.34	130.75	138.96	(72)

Total internal gains

501.75	512.34	491.79	474.19	450.74	431.59	415.52	416.63	428.98	446.73	473.59	491.66	(73)

6. Solar gains

Solar gains in watts, calculated for each month

167.39	282.75	382.67	470.56	526.29	522.81	503.86	461.79	412.8	311.17	200.01	143.59	(83)

Total gains – internal and solar (watts)

669.15	795.09	874.46	944.75	977.03	954.4	919.38	878.43	841.78	757.9	673.6	635.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.85	0.79	0.69	0.56	0.42	0.31	0.34	0.5	0.71	0.85	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.28	19.64	20.04	20.47	20.76	20.92	20.98	20.97	20.87	20.49	19.84	19.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.11	20.11	20.12	20.13	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.83	0.76	0.66	0.52	0.37	0.25	0.28	0.45	0.68	0.83	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.12	18.57	19.05	19.56	19.9	20.08	20.12	20.12	20.03	19.61	18.82	18.04	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

18.56	18.98	19.43	19.91	20.23	20.4	20.45	20.44	20.35	19.95	19.21	18.49	(92)

Adjusted mean internal temperature:

18.56	18.98	19.43	19.91	20.23	20.4	20.45	20.44	20.35	19.95	19.21	18.49	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.81	0.75	0.65	0.53	0.39	0.27	0.3	0.46	0.67	0.81	0.87	(94)

Useful gains, mGm , W

576.42	642.35	651.81	612.74	516.41	369.64	252.11	263.1	388.82	508.44	545.74	554.91	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

982.94	967.72	886.06	744.6	575.31	386.82	256.68	269.13	418.58	630.54	821.14	974.19	(97)

Space heating requirement for each month

302.45	218.65	174.28	94.94	43.82	0	0	0	0	90.84	198.29	311.95	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

302.45	218.65	174.28	94.94	43.82	0	0	0	0	90.84	198.29	311.95	(98c)

Space heating requirement in kWh/m²/year 20.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
327.68	236.89	188.82	102.86	47.48	0	0	0		0	98.42	214.84	337.97		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.78	84.33	83.68	82.67	81.44	79.8	79.8	79.8		79.8	82.56	84.09	84.87		(217)
Fuel for water heating														
259.15	230.39	246.87	220.58	217.59	200.7	198.66	206.3		208.26	223.73	232.62	256.18	2701.05	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1554.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2701.05	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													169.49	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

19.09	28.29	42.7	50.5	56.64	53.67	53.02	48.96	42.2	33.43	21.47	16.35	466.32	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

7	15.05	30.5	46.69	62.59	63.21	62.47	52.49	37.96	21.81	9.44	5.52	414.72	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3630.44	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(240a)
Low-rate fraction	0		56.6	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(241a)
Low-rate fraction	0		56.6	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(242a)

Low-rate fraction	0		56.6	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		27.95	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-100.09	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		188.96	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.58		(257)
SAP rating	90.52		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			326.54	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.22	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		893.76	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		24.46	(268)
energy saved or generated	0	-114.26	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		815.89	(272)
Dwelling CO2 Emission Rate		11.44	(273)
EI rating		91	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1757.1	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.18	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4809.28	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			259.96	(282)
energy saved or generated	0		-887.28	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4312.07	(286)
Dwelling PE Rate			60.48	(287)

DER WORKSHEET

Dwelling Reference: B25
Dwelling Type: New Dwelling Design Stage

B25
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	16.21		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		56.43	(31)
Party Wall	0	394.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		24.39	(33)
Heat capacity Cm = ∑(A x k)		5247.74	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		103.1	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		27.19	(37)

Ventilation heat loss calculated monthly

10.62	10.49	10.37	9.73	9.61	8.97	8.97	8.84	9.23	9.61	9.86	10.11	(38)

Heat transfer coefficient, W/K

37.81	37.69	37.56	36.92	36.8	36.16	36.16	36.04	36.42	36.8	37.05	37.3	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.74	0.73	0.72	0.71	0.71	0.71	0.72	0.72	0.73	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.72 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 99.53 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	(45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.44	83.52	75.44	77.96	75.44	77.96	75.44	75.44	77.96	75.44	77.96	75.44	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

403.51	411.17	395.37	381.22	363.09	347.39	335	336.15	345.75	360.49	381.5	395.84	(73)

6. Solar gains

Solar gains in watts, calculated for each month

93.06	164.5	237.98	311.59	360.74	362.34	347.65	310.97	263.8	185.58	112.63	78.85	(83)

Total gains – internal and solar (watts)

496.57	575.67	633.35	692.82	723.83	709.73	682.65	647.12	609.55	546.07	494.13	474.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.8	0.72	0.59	0.46	0.32	0.23	0.25	0.4	0.63	0.8	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.08	20.34	20.59	20.83	20.94	20.99	21	21	20.97	20.82	20.45	20.03	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.3	20.31	20.31	20.32	20.32	20.33	20.33	20.33	20.33	20.32	20.32	20.31	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.78	0.7	0.56	0.43	0.29	0.2	0.22	0.37	0.6	0.78	0.86	(89)

Roof Mean internal temperature in the rest of dwelling T2

19.23	19.55	19.86	20.14	20.27	20.32	20.33	20.33	20.3	20.14	19.7	19.19	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

19.64	19.93	20.22	20.47	20.6	20.65	20.65	20.65	20.63	20.47	20.06	19.6	(92)

Adjusted mean internal temperature:

19.64	19.93	20.22	20.47	20.6	20.65	20.65	20.65	20.63	20.47	20.06	19.6	(93)

8. Space heating requirement

Utilisation factor for gains,

0.84	0.78	0.7	0.57	0.44	0.31	0.21	0.24	0.38	0.61	0.77	0.85	(94)

Useful gains, mGm , W

415.88	446.3	440.31	395.67	317.1	216.64	146.2	152.72	233.12	330.75	381.7	403.8	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

580.14	566.48	515.13	427.38	327.33	218.62	146.6	153.3	237.76	363.19	480.35	574.5	(97)

Space heating requirement for each month

122.21	80.76	55.67	22.83	7.61	0	0	0	0	24.14	71.03	126.99	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

122.21	80.76	55.67	22.83	7.61	0	0	0	0	24.14	71.03	126.99	(98c)

Space heating requirement in kWh/m²/year 10.04 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
135.04	89.24	61.51	25.23	8.41	0	0	0		0	26.67	78.48	140.32		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
83.34	82.69	81.87	80.87	80.2	79.8	79.8	79.8		79.8	80.92	82.42	83.46		(217)
Fuel for water heating														
261.51	233.25	250.43	223	218.14	197.66	195.06	202.65		204.73	225.01	234.79	258.29	2704.53	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													564.9	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2704.53	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			108.98	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													194.98	(231)
Electricity for lighting													126.51	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3590.92	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(240a)
Low-rate fraction	0		20.56	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(241a)
Low-rate fraction	0		20.56	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(242a)

Low-rate fraction	0		20.56	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.44	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		20.86	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		264.02	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.99	(257)
SAP rating		83.93	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			118.63	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.95	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		686.58	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		18.26	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		731.89	(272)
Dwelling CO2 Emission Rate		14.38	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			638.34	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3056.12	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3694.46	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			194.04	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4183.47	(286)
Dwelling PE Rate			82.19	(287)

TER WORKSHEET

Dwelling Reference: B25
Dwelling Type: New Dwelling Design Stage

B25
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.31 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37	4.08	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0		(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0		(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)

Effective air change rate

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)

Effective air change rate from PCDB:

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.1		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.87	611.8	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		56.43	(31)
Party Wall	0	394.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		22.13	(33)
Heat capacity Cm = ∑(A x k)		5298	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		104.09	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		24.93	(37)

Ventilation heat loss calculated monthly

25.27	25.13	25	24.39	24.27	23.74	23.74	23.64	23.95	24.27	24.51	24.75	(38)

Heat transfer coefficient, W/K

50.2	50.06	49.93	49.32	49.2	48.67	48.67	48.57	48.88	49.2	49.44	49.68	(39)

Heat loss parameter (HLP), W/m²K

0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.96	0.97	0.97	0.98	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91	(45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.71	83.82	75.71	78.24	75.71	78.24	75.71	75.71	78.24	75.71	78.24	75.71	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

403.67	411.36	395.53	381.39	363.25	347.56	335.15	336.31	345.92	360.65	381.67	396	(73)

6. Solar gains

Solar gains in watts, calculated for each month

97.26	171.92	248.7	325.64	376.99	378.67	363.32	324.98	275.69	193.94	117.71	82.41	(83)

Total gains – internal and solar (watts)

500.92	583.27	644.23	707.03	740.24	726.22	698.47	661.29	621.61	554.59	499.38	478.41	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.85	0.79	0.68	0.55	0.41	0.3	0.33	0.5	0.72	0.85	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.39	19.72	20.11	20.52	20.8	20.94	20.98	20.98	20.89	20.53	19.91	19.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.12	20.12	20.11	20.11	20.1	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.84	0.77	0.65	0.51	0.36	0.24	0.27	0.45	0.68	0.83	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.24	18.65	19.12	19.62	19.92	20.07	20.11	20.11	20.02	19.63	18.9	18.18	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

18.8	19.17	19.6	20.06	20.35	20.49	20.53	20.53	20.44	20.07	19.39	18.74	(92)

Adjusted mean internal temperature:

18.8	19.17	19.6	20.06	20.35	20.49	20.53	20.53	20.44	20.07	19.39	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.82	0.75	0.65	0.52	0.38	0.27	0.3	0.47	0.68	0.82	0.88	(94)

Useful gains, mGm , W

433.84	476.84	485.33	459.02	386.75	276.07	188.61	196.72	289.6	377.69	408.06	419.55	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

727.91	714.32	653.94	550.23	425.45	286.87	191.43	200.55	310.04	465.86	607.65	722.43	(97)

Space heating requirement for each month

218.79	159.59	125.44	65.68	28.79	0	0	0	0	65.6	143.7	225.34	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

218.79	159.59	125.44	65.68	28.79	0	0	0	0	65.6	143.7	225.34	(98c)

Space heating requirement in kWh/m²/year 20.29 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
237.04	172.9	135.91	71.16	31.2	0	0	0		0	71.07	155.69	244.14		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.33	83.9	83.24	82.21	81.07	79.8	79.8	79.8		79.8	82.18	83.65	84.42		(217)
Fuel for water heating														
229.58	204.22	219.22	196.66	194.3	178.97	177.52	184.02		185.4	199.44	206.74	227.04	2403.1	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1119.1	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2403.1	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													126.96	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.78	20.49	31.06	36.91	41.56	39.47	39.01	35.95	30.87	24.31	15.53	11.79	340.74	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.85	10.44	21.19	32.47	43.56	43.97	43.44	36.47	26.35	15.12	6.54	3.82	288.22	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3106.19	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(240a)
Low-rate fraction	0		40.74	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(241a)
Low-rate fraction	0		40.74	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(242a)

Low-rate fraction	0		40.74	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.47	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		20.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.33	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		182.99	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.69	(257)
SAP rating		88.86	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			235.01	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			504.65	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		739.66	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		18.32	(268)
energy saved or generated	0	-81.6	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		688.32	(272)
Dwelling CO2 Emission Rate		13.52	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1264.58	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2715.5	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3980.08	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			194.74	(282)
energy saved or generated	0		-641.37	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3663.55	(286)
Dwelling PE Rate			71.98	(287)

DER WORKSHEET

Dwelling Reference: B26
Dwelling Type: New Dwelling Design Stage

B26
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	12.15	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		100.98	(31)
Party Wall	0	0	(32)
Party floor		3464	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		34.71	(33)
Heat capacity Cm = ∑(A x k)		7925	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		91.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.05	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.05	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		39.76	(37)

Ventilation heat loss calculated monthly

18.07	17.86	17.64	16.56	16.34	15.26	15.26	15.05	15.7	16.34	16.78	17.21	(38)

Heat transfer coefficient, W/K

57.84	57.62	57.4	56.32	56.11	55.03	55.03	54.81	55.46	56.11	56.54	56.97	(39)

Heat loss parameter (HLP), W/m²K

0.67	0.67	0.66	0.65	0.65	0.64	0.64	0.63	0.64	0.65	0.65	0.66	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		2.58	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	126.61	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.79	97.48	104.32	93.32	91.6	83.75	83.44	86.01	86.14	94.62	98.88	108.78	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.57	145.05	140.21	129.61	123.11	116.32	112.15	115.6	119.64	127.17	137.34	146.21	(72)

Total internal gains

562.76	575.29	551.74	532.11	505.34	484.11	465.74	466.77	480.83	500.38	530.83	551.14	(73)

6. Solar gains

Solar gains in watts, calculated for each month

51.05	99.52	168.8	262.69	342.27	360.69	339.07	276.65	200.91	118.85	63.45	42.19	(83)

Total gains – internal and solar (watts)

613.81	674.81	720.54	794.81	847.6	844.8	804.81	743.43	681.74	619.24	594.28	593.33	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.88	0.83	0.72	0.57	0.41	0.3	0.33	0.53	0.76	0.88	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.78	20	20.3	20.67	20.88	20.97	20.99	20.99	20.93	20.66	20.2	19.76	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.37	20.37	20.37	20.38	20.39	20.4	20.4	20.4	20.39	20.39	20.38	20.38	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.87	0.82	0.7	0.54	0.37	0.26	0.29	0.49	0.73	0.86	0.91	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.93	19.2	19.57	20.02	20.27	20.38	20.39	20.39	20.33	20.02	19.46	18.91	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

19.22	19.47	19.81	20.24	20.47	20.58	20.59	20.59	20.53	20.23	19.7	19.19	(92)

Adjusted mean internal temperature:

19.22	19.47	19.81	20.24	20.47	20.58	20.59	20.59	20.53	20.23	19.7	19.19	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.8	0.69	0.54	0.38	0.27	0.31	0.5	0.73	0.85	0.9	(94)

Useful gains, mGm , W

546.27	577.9	578.56	548.75	460.76	322.45	218.42	227.69	339.92	450.28	503.52	532.64	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

862.67	839.58	764.31	638.5	492.26	328.84	219.79	229.82	356.8	540.39	712.64	854.15	(97)

Space heating requirement for each month

235.4	175.84	138.2	64.62	23.43	0	0	0	0	67.04	150.57	239.2	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

235.4	175.84	138.2	64.62	23.43	0	0	0	0	67.04	150.57	239.2	(98c)

Space heating requirement in kWh/m²/year 12.64 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
260.11	194.3	152.71	71.41	25.89	0	0	0		0	74.08	166.37	264.31		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.5	84.07	83.32	82.02	80.76	79.8	79.8	79.8		79.8	82.08	83.67	84.58		(217)
Fuel for water heating														
313.04	278.18	297.73	264.7	259.81	236.03	232.2	241.86		245.02	266.71	279.48	309.18	3223.96	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1209.17	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3223.96	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			188.85	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													274.85	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4905.65	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(240a)
Low-rate fraction	0		44.01	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(241a)
Low-rate fraction	0		44.01	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(242a)

Low-rate fraction	0		44.01	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		117.35	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		45.32	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		331.28	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.91	(257)
SAP rating	85.31	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			253.93	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			677.03	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		930.96	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		38.13	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		997.61	(272)
Dwelling CO2 Emission Rate		11.52	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1366.37	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3643.08	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5009.45	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			415.8	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5728.41	(286)
Dwelling PE Rate			66.15	(287)

TER WORKSHEET

Dwelling Reference: B26
Dwelling Type: New Dwelling Design Stage

B26
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.3 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35	3.9	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)

Effective air change rate

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

Effective air change rate from PCDB:

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	14.58	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		100.98	(31)
Party Wall	0	0	(32)
Party floor		3464	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		37.14	(33)
Heat capacity Cm = ∑(A x k)		7925	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		91.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.05	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.05	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		42.19	(37)

Ventilation heat loss calculated monthly

42.48	42.27	42.07	41.12	40.94	40.11	40.11	39.96	40.43	40.94	41.3	41.68	(38)

Heat transfer coefficient, W/K

84.67	84.47	84.26	83.31	83.13	82.3	82.3	82.15	82.62	83.13	83.49	83.87	(39)

Heat loss parameter (HLP), W/m²K

0.98	0.98	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	0.96	0.97	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.58	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	126.61	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.43	233.76	247.98	217.02	209.72	188.25	185.19	192.9	195.43	218.8	233.76	261.4	2648.64	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

30.82	27.26	28.54	23.63	22.03	18.85	17.67	18.79	19.5	22.99	26.04	30.25	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

233.61	206.51	219.44	193.39	187.69	169.4	167.53	174.12	175.93	195.81	207.71	231.15	2362.28	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.71	97.4	104.24	93.24	91.51	83.67	83.36	85.92	86.06	94.53	98.8	108.7	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.45	144.94	140.1	129.5	123	116.21	112.04	115.49	119.53	127.06	137.23	146.1	(72)

Total internal gains

562.65	575.18	551.63	532	505.22	484	465.63	466.66	480.71	500.27	530.72	551.03	(73)

6. Solar gains

Solar gains in watts, calculated for each month

71.47	139.32	236.32	367.77	479.17	504.97	474.69	387.32	281.28	166.4	88.83	59.06	(83)

Total gains – internal and solar (watts)

634.12	714.5	787.95	899.77	984.4	988.97	940.32	853.98	761.99	666.67	619.55	610.09	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.94	0.91	0.87	0.77	0.64	0.49	0.37	0.42	0.62	0.82	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.83	19.12	19.57	20.17	20.62	20.87	20.96	20.94	20.74	20.15	19.41	18.78	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.1	20.1	20.11	20.12	20.12	20.12	20.12	20.13	20.12	20.12	20.11	20.11	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.93	0.9	0.85	0.75	0.6	0.43	0.3	0.35	0.57	0.79	0.9	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.55	17.92	18.49	19.22	19.74	20.02	20.1	20.09	19.9	19.22	18.3	17.5	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

17.98	18.32	18.85	19.54	20.04	20.31	20.38	20.37	20.18	19.53	18.67	17.93	(92)

Adjusted mean internal temperature:

17.98	18.32	18.85	19.54	20.04	20.31	20.38	20.37	20.18	19.53	18.67	17.93	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.87	0.82	0.73	0.6	0.44	0.32	0.37	0.57	0.77	0.87	0.91	(94)

Useful gains, mGm , W

572.29	623.67	649.97	655.56	587.05	436.66	301.74	312.06	434.32	515.1	539.11	554.98	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1158.16	1133.71	1040.63	886.27	693.06	469.68	311.52	326.24	502.17	742.56	965.95	1151.39	(97)

Space heating requirement for each month

435.89	342.75	290.65	166.11	78.87	0	0	0	0	169.23	307.32	443.73	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

435.89	342.75	290.65	166.11	78.87	0	0	0	0	169.23	307.32	443.73	(98c)

Space heating requirement in kWh/m²/year 25.8 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
472.25	371.34	314.9	179.97	85.45	0	0	0		0	183.34	332.96	480.75		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.44	85.19	84.69	83.72	82.27	79.8	79.8	79.8		79.8	83.73	84.94	85.5		(217)
Fuel for water heating														
273.43	242.41	259.11	230.99	228.15	212.28	209.93	218.19		220.46	233.85	244.55	270.35	2843.71	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2420.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2843.71	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

22.99	33.94	51.07	60.18	67.3	63.69	62.89	58.17	50.27	40.01	25.81	19.7	556	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

8.71	18.69	37.84	57.86	77.52	78.28	77.38	65.06	47.08	27.08	11.74	6.86	514.1	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4478.22	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(240a)
Low-rate fraction	0		88.12	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(241a)
Low-rate fraction	0		88.12	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(242a)

Low-rate fraction	0		88.12	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.51	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-120.39	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		210.02	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.57		(257)
SAP rating	90.69		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			508.4	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			597.18	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1105.58	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	-138.75	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1007.29	(272)
Dwelling CO2 Emission Rate		11.63	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2735.69	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3213.39	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5949.08	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		-1067.14	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5315.21	(286)
Dwelling PE Rate			61.38	(287)

DER WORKSHEET

Dwelling Reference: B37
Dwelling Type: New Dwelling Design Stage

B37
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.61		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.67	715.68	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		71.28	(31)
Party Wall	0	394.2	(32)
Party floor		2852	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		30.44	(33)
Heat capacity Cm = ∑(A x k)		6829.88	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		95.79	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		3.55	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		3.55	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		33.99	(37)

Ventilation heat loss calculated monthly

14.88	14.7	14.52	13.63	13.46	12.57	12.57	12.39	12.92	13.46	13.81	14.17	(38)

Heat transfer coefficient, W/K

48.87	48.69	48.51	47.62	47.45	46.56	46.56	46.38	46.91	47.45	47.8	48.16	(39)

Heat loss parameter (HLP), W/m²K

0.69	0.68	0.68	0.67	0.67	0.65	0.65	0.65	0.66	0.67	0.67	0.68	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.28 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 117.19 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82	(45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

248.33	219.6	233.11	204.33	197.69	177.7	174.99	182.12	184.35	206.09	219.82	245.52	2493.65	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.4	92.74	99.34	89.07	87.56	80.21	80.02	82.39	82.42	90.36	94.22	103.47	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.03	111.86	101.03	104.4	101.03	104.4	101.03	101.03	104.4	101.03	104.4	101.03	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.32	138	133.52	123.7	117.69	111.41	107.55	110.74	114.48	121.45	130.86	139.07	(72)

Total internal gains

501.83	512.41	491.87	474.27	450.81	431.66	415.6	416.71	429.05	446.81	473.66	491.74	(73)

6. Solar gains

Solar gains in watts, calculated for each month

137.29	231.9	313.84	385.88	431.56	428.7	413.16	378.68	338.53	255.2	164.05	117.78	(83)

Total gains – internal and solar (watts)

639.12	744.31	805.7	860.15	882.37	860.36	828.76	795.39	767.59	702.01	637.71	609.51	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.8	0.73	0.61	0.48	0.34	0.25	0.27	0.41	0.63	0.8	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.08	20.34	20.59	20.82	20.94	20.99	21	21	20.97	20.82	20.46	20.04	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.35	20.36	20.36	20.37	20.37	20.38	20.38	20.38	20.38	20.37	20.37	20.36	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.79	0.71	0.58	0.45	0.31	0.21	0.23	0.38	0.6	0.78	0.87	(89)

Roof

Mean internal temperature in the rest of dwelling T2

19.28	19.6	19.9	20.17	20.31	20.37	20.38	20.38	20.35	20.19	19.75	19.23	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

19.58	19.88	20.16	20.42	20.55	20.61	20.62	20.62	20.59	20.43	20.02	19.54	(92)

Adjusted mean internal temperature:

19.58	19.88	20.16	20.42	20.55	20.61	20.62	20.62	20.59	20.43	20.02	19.54	(93)

8. Space heating requirement

Utilisation factor for gains,

0.84	0.77	0.7	0.59	0.46	0.32	0.22	0.24	0.39	0.61	0.77	0.85	(94)

Useful gains, mGm , W

535.89	576.56	564.71	504.78	404.88	276.7	186.38	194.75	298.34	425.36	492.34	519.39	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

746.84	729.61	662.6	548.54	419.8	279.61	186.96	195.54	304.45	466.42	617.66	738.7	(97)

Space heating requirement for each month

156.95	102.85	72.83	31.51	11.1	0	0	0	0	30.55	90.23	163.16	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

156.95	102.85	72.83	31.51	11.1	0	0	0	0	30.55	90.23	163.16	(98c)

Space heating requirement in kWh/m²/year 9.25 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												90.5	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
173.42	113.64	80.48	34.82	12.26	0	0	0	0	33.76	99.7	180.29		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
83.63	82.93	82.11	81.08	80.3	79.8	79.8	79.8	79.8	81.04	82.64	83.75		(217)
Fuel for water heating													
296.94	264.81	283.89	252.01	246.17	222.69	219.28	228.23	231.01	254.32	265.99	293.15	3058.48	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												728.37	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												3058.48	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside							0		0			152.66	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												238.66	(231)
Electricity for lighting												169.43	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4194.94	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(240a)
Low-rate fraction	0		26.51	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(241a)
Low-rate fraction	0		26.51	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		26.51	(242a)

Low-rate fraction	0		26.51	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		111.33	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		39.36	(249)
Energy For lighting	0		27.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		297.13	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.92	(257)
SAP rating	85.09	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			152.96	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			642.28	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		795.24	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.11	(267)
Electricity for lighting		24.45	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		852.8	(272)
Dwelling CO2 Emission Rate		11.96	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			823.06	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3456.09	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4279.15	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			361.05	(281)
Electricity for lighting			259.87	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4900.06	(286)
Dwelling PE Rate			68.72	(287)

TER WORKSHEET

Dwelling Reference: B37
Dwelling Type: New Dwelling Design Stage

B37
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	71.3	(1a) x	2.6	(2a) =	185.38	(3a)
Total floor area TFA					71.3	(4)
Dwelling volume					185.38	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.32 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38	4.19	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0		(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0		(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)

Effective air change rate

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)

Effective air change rate from PCDB:

0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	17.95		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	9.62	748.16	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		71.28	(31)
Party Wall	0	394.2	(32)
Party floor		2852	(32a)
Party ceiling		2139	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		29.73	(33)
Heat capacity Cm = ∑(A x k)		6862.36	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		96.25	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		3.55	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		3.55	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		33.28	(37)

Ventilation heat loss calculated monthly

35.65	35.46	35.26	34.36	34.19	33.4	33.4	33.25	33.7	34.19	34.53	34.89	(38)

Heat transfer coefficient, W/K

68.94	68.74	68.55	67.64	67.47	66.68	66.68	66.54	66.99	67.47	67.81	68.17	(39)

Heat loss parameter (HLP), W/m²K

0.97	0.96	0.96	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.95	0.96	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.28 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

62.4	61.46	60.1	57.48	55.55	53.4	52.18	53.53	55.02	57.33	60	62.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

26.96	26.56	25.99	24.95	24.18	23.31	22.85	23.41	24.02	24.94	26	26.87	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

37.95	36.57	35.19	33.81	32.43	31.05	31.05	32.43	33.81	35.19	36.57	37.95	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 117.19 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

127.31	124.59	121.28	116.25	112.16	107.77	106.08	109.37	112.85	117.46	122.57	126.98	1404.68 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

201.63	177.42	186.41	159.14	150.99	132.51	128.29	135.43	139.15	159.4	174.63	198.82	1943.82 (45)

Distribution loss (46) = 0.15 x (45)

30.24	26.61	27.96	23.87	22.65	19.88	19.24	20.31	20.87	23.91	26.19	29.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

248.23	219.5	233	204.23	197.58	177.6	174.89	182.02	184.25	205.99	219.72	245.42	2492.43	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.53	25.23	26.42	21.88	20.39	17.45	16.35	17.39	18.05	21.28	24.11	28	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

219.7	194.27	206.58	182.35	177.2	160.16	158.53	164.63	166.2	184.71	195.61	217.42	2227.37	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

104.32	92.66	99.26	88.99	87.48	80.13	79.93	82.31	82.34	90.28	94.14	103.38	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	113.86	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

101.07	111.9	101.07	104.44	101.07	104.44	101.07	101.07	104.44	101.07	104.44	101.07	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

200.31	202.39	197.15	186	171.93	158.7	149.86	147.78	153.02	164.17	178.24	191.47	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	34.39	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	-91.09	(71)

Water heating gains (Table 5)

140.21	137.89	133.41	123.59	117.58	111.3	107.44	110.63	114.36	121.34	130.75	138.96	(72)

Total internal gains

501.75	512.34	491.79	474.19	450.74	431.59	415.52	416.63	428.98	446.73	473.59	491.66	(73)

6. Solar gains

Solar gains in watts, calculated for each month

167.39	282.75	382.67	470.56	526.29	522.81	503.86	461.79	412.8	311.17	200.01	143.59	(83)

Total gains – internal and solar (watts)

669.15	795.09	874.46	944.75	977.03	954.4	919.38	878.43	841.78	757.9	673.6	635.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.85	0.79	0.69	0.56	0.42	0.31	0.34	0.5	0.71	0.85	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.28	19.64	20.04	20.47	20.76	20.92	20.98	20.97	20.87	20.49	19.84	19.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.11	20.11	20.12	20.13	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.83	0.76	0.66	0.52	0.37	0.25	0.28	0.45	0.68	0.83	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.12	18.57	19.05	19.56	19.9	20.08	20.12	20.12	20.03	19.61	18.82	18.04	(90)

Living area fraction 0.38 (91)

Mean internal temperature (for the whole dwelling)

18.56	18.98	19.43	19.91	20.23	20.4	20.45	20.44	20.35	19.95	19.21	18.49	(92)

Adjusted mean internal temperature:

18.56	18.98	19.43	19.91	20.23	20.4	20.45	20.44	20.35	19.95	19.21	18.49	(93)

8. Space heating requirement

Utilisation factor for gains,

0.86	0.81	0.75	0.65	0.53	0.39	0.27	0.3	0.46	0.67	0.81	0.87	(94)

Useful gains, mGm , W

576.42	642.35	651.81	612.74	516.41	369.64	252.11	263.1	388.82	508.44	545.74	554.91	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

982.94	967.72	886.06	744.6	575.31	386.82	256.68	269.13	418.58	630.54	821.14	974.19	(97)

Space heating requirement for each month

302.45	218.65	174.28	94.94	43.82	0	0	0	0	90.84	198.29	311.95	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

302.45	218.65	174.28	94.94	43.82	0	0	0	0	90.84	198.29	311.95	(98c)

Space heating requirement in kWh/m²/year 20.13 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
327.68	236.89	188.82	102.86	47.48	0	0	0		0	98.42	214.84	337.97		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.78	84.33	83.68	82.67	81.44	79.8	79.8	79.8		79.8	82.56	84.09	84.87		(217)
Fuel for water heating														
259.15	230.39	246.87	220.58	217.59	200.7	198.66	206.3		208.26	223.73	232.62	256.18	2701.05	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1554.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2701.05	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													169.49	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

19.09	28.29	42.7	50.5	56.64	53.67	53.02	48.96	42.2	33.43	21.47	16.35	466.32	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

7	15.05	30.5	46.69	62.59	63.21	62.47	52.49	37.96	21.81	9.44	5.52	414.72	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3630.44	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(240a)
Low-rate fraction	0		56.6	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(241a)
Low-rate fraction	0		56.6	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.6	(242a)

Low-rate fraction	0		56.6	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.32	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		27.95	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-100.09	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		188.96	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.58		(257)
SAP rating	90.52		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			326.54	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.22	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		893.76	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		24.46	(268)
energy saved or generated	0	-114.26	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		815.89	(272)
Dwelling CO2 Emission Rate		11.44	(273)
EI rating		91	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1757.1	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3052.18	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4809.28	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			259.96	(282)
energy saved or generated	0		-887.28	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4312.07	(286)
Dwelling PE Rate			60.48	(287)

DER WORKSHEET

Dwelling Reference: B38
Dwelling Type: New Dwelling Design Stage

B38
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80	=	0 (6a)
Open chimneys	0	x	20	=	0 (6b)
Chimneys / flues attached to closed fire	0	x	10	=	0 (6c)
Flues attached to solid fuel boiler	0	x	20	=	0 (6d)
Flues attached to other heater	0	x	35	=	0 (6e)
Number of blocked chimneys	0	x	20	=	0 (6f)
Number of intermittent extract fans	0	x	10	=	0 (7a)
Number of passive vents	0	x	10	=	0 (7b)
Number of flueless gas fires	0	x	40	=	0 (7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	16.21		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	6.02	561.54	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		56.43	(31)
Party Wall	0	394.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		24.39	(33)
Heat capacity Cm = ∑(A x k)		5247.74	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		103.1	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		27.19	(37)

Ventilation heat loss calculated monthly

10.62	10.49	10.37	9.73	9.61	8.97	8.97	8.84	9.23	9.61	9.86	10.11	(38)

Heat transfer coefficient, W/K

37.81	37.69	37.56	36.92	36.8	36.16	36.16	36.04	36.42	36.8	37.05	37.3	(39)

Heat loss parameter (HLP), W/m²K

0.74	0.74	0.74	0.73	0.72	0.71	0.71	0.71	0.72	0.72	0.73	0.73	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.72 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 99.53 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	(45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

217.95	192.86	205.02	180.35	174.94	157.74	155.66	161.72	163.38	182.08	193.51	215.56	2200.75	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.3	83.85	90	81.09	80	73.57	73.59	75.6	75.45	82.37	85.47	93.51	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.44	83.52	75.44	77.96	75.44	77.96	75.44	75.44	77.96	75.44	77.96	75.44	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.75	124.77	120.97	112.63	107.52	102.19	98.91	101.62	104.79	110.71	118.71	125.68	(72)

Total internal gains

403.51	411.17	395.37	381.22	363.09	347.39	335	336.15	345.75	360.49	381.5	395.84	(73)

6. Solar gains

Solar gains in watts, calculated for each month

93.06	164.5	237.98	311.59	360.74	362.34	347.65	310.97	263.8	185.58	112.63	78.85	(83)

Total gains – internal and solar (watts)

496.57	575.67	633.35	692.82	723.83	709.73	682.65	647.12	609.55	546.07	494.13	474.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.86	0.8	0.72	0.59	0.46	0.32	0.23	0.25	0.4	0.63	0.8	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

20.08	20.34	20.59	20.83	20.94	20.99	21	21	20.97	20.82	20.45	20.03	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.3	20.31	20.31	20.32	20.32	20.33	20.33	20.33	20.33	20.32	20.32	20.31	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.85	0.78	0.7	0.56	0.43	0.29	0.2	0.22	0.37	0.6	0.78	0.86	(89)

Roof Mean internal temperature in the rest of dwelling T2

19.23	19.55	19.86	20.14	20.27	20.32	20.33	20.33	20.3	20.14	19.7	19.19	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

19.64	19.93	20.22	20.47	20.6	20.65	20.65	20.65	20.63	20.47	20.06	19.6	(92)

Adjusted mean internal temperature:

19.64	19.93	20.22	20.47	20.6	20.65	20.65	20.65	20.63	20.47	20.06	19.6	(93)

8. Space heating requirement

Utilisation factor for gains,

0.84	0.78	0.7	0.57	0.44	0.31	0.21	0.24	0.38	0.61	0.77	0.85	(94)

Useful gains, mGm , W

415.88	446.3	440.31	395.67	317.1	216.64	146.2	152.72	233.12	330.75	381.7	403.8	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

580.14	566.48	515.13	427.38	327.33	218.62	146.6	153.3	237.76	363.19	480.35	574.5	(97)

Space heating requirement for each month

122.21	80.76	55.67	22.83	7.61	0	0	0	0	24.14	71.03	126.99	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

122.21	80.76	55.67	22.83	7.61	0	0	0	0	24.14	71.03	126.99	(98c)

Space heating requirement in kWh/m²/year 10.04 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
135.04	89.24	61.51	25.23	8.41	0	0	0		0	26.67	78.48	140.32		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
83.34	82.69	81.87	80.87	80.2	79.8	79.8	79.8		79.8	80.92	82.42	83.46		(217)
Fuel for water heating														
261.51	233.25	250.43	223	218.14	197.66	195.06	202.65		204.73	225.01	234.79	258.29	2704.53	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													564.9	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2704.53	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			108.98	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													194.98	(231)
Electricity for lighting													126.51	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			3590.92	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(240a)
Low-rate fraction	0		20.56	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(241a)
Low-rate fraction	0		20.56	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		20.56	(242a)

Low-rate fraction	0		20.56	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.44	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.15	(249)
Energy For lighting	0		20.86	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		264.02	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.99	(257)
SAP rating		83.93	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			118.63	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			567.95	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		686.58	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.05	(267)
Electricity for lighting		18.26	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		731.89	(272)
Dwelling CO2 Emission Rate		14.38	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			638.34	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3056.12	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3694.46	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			294.97	(281)
Electricity for lighting			194.04	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4183.47	(286)
Dwelling PE Rate			82.19	(287)

TER WORKSHEET

Dwelling Reference: B38
Dwelling Type: New Dwelling Design Stage

B38
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	50.9	(1a) x	2.6	(2a) =	132.34	(3a)
Total floor area TFA					50.9	(4)
Dwelling volume					132.34	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.31 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37	4.08	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0		(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0		(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)

Effective air change rate

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)

Effective air change rate from PCDB:

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.1		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	7.87	611.8	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		56.43	(31)
Party Wall	0	394.2	(32)
Party floor		2036	(32a)
Party ceiling		1527	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		22.13	(33)
Heat capacity Cm = ∑(A x k)		5298	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		104.09	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		2.8	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		2.8	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		24.93	(37)

Ventilation heat loss calculated monthly

25.27	25.13	25	24.39	24.27	23.74	23.74	23.64	23.95	24.27	24.51	24.75	(38)

Heat transfer coefficient, W/K

50.2	50.06	49.93	49.32	49.2	48.67	48.67	48.57	48.88	49.2	49.44	49.68	(39)

Heat loss parameter (HLP), W/m²K

0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.96	0.97	0.97	0.98	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		1.72	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53	52.21	51.04	48.82	47.18	45.36	44.32	45.47	46.73	48.7	50.96	52.8	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

22.92	22.58	22.1	21.21	20.55	19.82	19.42	19.9	20.41	21.2	22.1	22.84	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.21	31.04	29.87	28.7	27.52	26.35	26.35	27.52	28.7	29.87	31.04	32.21	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	99.53	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

108.13	105.82	103.01	98.73	95.26	91.53	90.09	92.89	95.84	99.76	104.1	107.85	1193.02	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

171.25	150.68	158.32	135.16	128.24	112.54	108.96	115.02	118.19	135.38	148.32	168.86	1650.91	(45)

Distribution loss (46) = 0.15 x (45)

25.69	22.6	23.75	20.27	19.24	16.88	16.34	17.25	17.73	20.31	22.25	25.33	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

217.84	192.77	204.91	180.25	174.83	157.64	155.55	161.61	163.28	181.97	193.41	215.46	2199.53	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.23	21.43	22.44	18.58	17.32	14.82	13.89	14.77	15.33	18.07	20.48	23.78	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

193.61	171.34	182.47	161.67	157.52	142.82	141.66	146.84	147.95	163.9	172.93	191.68	1974.39	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

94.22	83.77	89.92	81.01	79.92	73.49	73.5	75.52	75.37	82.29	85.39	93.42	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	85.83	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

75.71	83.82	75.71	78.24	75.71	78.24	75.71	75.71	78.24	75.71	78.24	75.71	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

149.57	151.12	147.21	138.89	128.37	118.5	111.9	110.34	114.26	122.58	133.09	142.97	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	-68.66	(71)

Water heating gains (Table 5)

126.63	124.66	120.86	112.52	107.41	102.08	98.8	101.51	104.68	110.6	118.59	125.57	(72)

Total internal gains

403.67	411.36	395.53	381.39	363.25	347.56	335.15	336.31	345.92	360.65	381.67	396	(73)

6. Solar gains

Solar gains in watts, calculated for each month

97.26	171.92	248.7	325.64	376.99	378.67	363.32	324.98	275.69	193.94	117.71	82.41	(83)

Total gains – internal and solar (watts)

500.92	583.27	644.23	707.03	740.24	726.22	698.47	661.29	621.61	554.59	499.38	478.41	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.9	0.85	0.79	0.68	0.55	0.41	0.3	0.33	0.5	0.72	0.85	0.91	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.39	19.72	20.11	20.52	20.8	20.94	20.98	20.98	20.89	20.53	19.91	19.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.12	20.12	20.11	20.11	20.1	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.89	0.84	0.77	0.65	0.51	0.36	0.24	0.27	0.45	0.68	0.83	0.9	(89)

Roof

Mean internal temperature in the rest of dwelling T2

18.24	18.65	19.12	19.62	19.92	20.07	20.11	20.11	20.02	19.63	18.9	18.18	(90)

Living area fraction 0.49 (91)

Mean internal temperature (for the whole dwelling)

18.8	19.17	19.6	20.06	20.35	20.49	20.53	20.53	20.44	20.07	19.39	18.74	(92)

Adjusted mean internal temperature:

18.8	19.17	19.6	20.06	20.35	20.49	20.53	20.53	20.44	20.07	19.39	18.74	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.82	0.75	0.65	0.52	0.38	0.27	0.3	0.47	0.68	0.82	0.88	(94)

Useful gains, mGm , W

433.84	476.84	485.33	459.02	386.75	276.07	188.61	196.72	289.6	377.69	408.06	419.55	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

727.91	714.32	653.94	550.23	425.45	286.87	191.43	200.55	310.04	465.86	607.65	722.43	(97)

Space heating requirement for each month

218.79	159.59	125.44	65.68	28.79	0	0	0	0	65.6	143.7	225.34	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

218.79	159.59	125.44	65.68	28.79	0	0	0	0	65.6	143.7	225.34	(98c)

Space heating requirement in kWh/m²/year 20.29 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
237.04	172.9	135.91	71.16	31.2	0	0	0		0	71.07	155.69	244.14		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.33	83.9	83.24	82.21	81.07	79.8	79.8	79.8		79.8	82.18	83.65	84.42		(217)
Fuel for water heating														
229.58	204.22	219.22	196.66	194.3	178.97	177.52	184.02		185.4	199.44	206.74	227.04	2403.1	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1119.1	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2403.1	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													126.96	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

13.78	20.49	31.06	36.91	41.56	39.47	39.01	35.95	30.87	24.31	15.53	11.79	340.74	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

4.85	10.44	21.19	32.47	43.56	43.97	43.44	36.47	26.35	15.12	6.54	3.82	288.22	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		3106.19	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(240a)
Low-rate fraction	0		40.74	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(241a)
Low-rate fraction	0		40.74	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		40.74	(242a)

Low-rate fraction	0		40.74	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.47	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		20.94	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-72.33	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		182.99	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.69	(257)
SAP rating		88.86	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			235.01	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			504.65	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		739.66	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		18.32	(268)
energy saved or generated	0	-81.6	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		688.32	(272)
Dwelling CO2 Emission Rate		13.52	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1264.58	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2715.5	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			3980.08	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			194.74	(282)
energy saved or generated	0		-641.37	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			3663.55	(286)
Dwelling PE Rate			71.98	(287)

DER WORKSHEET

Dwelling Reference: B39
Dwelling Type: New Dwelling Design Stage

B39
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	12.15	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		100.98	(31)
Party Wall	0	0	(32)
Party floor		3464	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		34.71	(33)
Heat capacity Cm = ∑(A x k)		7925	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		91.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.05	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.05	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		39.76	(37)

Ventilation heat loss calculated monthly

18.07	17.86	17.64	16.56	16.34	15.26	15.26	15.05	15.7	16.34	16.78	17.21	(38)

Heat transfer coefficient, W/K

57.84	57.62	57.4	56.32	56.11	55.03	55.03	54.81	55.46	56.11	56.54	56.97	(39)

Heat loss parameter (HLP), W/m²K

0.67	0.67	0.66	0.65	0.65	0.64	0.64	0.63	0.64	0.65	0.65	0.66	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N		2.58	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	126.61	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

264.53	233.86	248.09	217.12	209.82	188.35	185.3	193.01	195.53	218.9	233.86	261.5	2649.86	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.79	97.48	104.32	93.32	91.6	83.75	83.44	86.01	86.14	94.62	98.88	108.78	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.57	145.05	140.21	129.61	123.11	116.32	112.15	115.6	119.64	127.17	137.34	146.21	(72)

Total internal gains

562.76	575.29	551.74	532.11	505.34	484.11	465.74	466.77	480.83	500.38	530.83	551.14	(73)

6. Solar gains

Solar gains in watts, calculated for each month

51.05	99.52	168.8	262.69	342.27	360.69	339.07	276.65	200.91	118.85	63.45	42.19	(83)

Total gains – internal and solar (watts)

613.81	674.81	720.54	794.81	847.6	844.8	804.81	743.43	681.74	619.24	594.28	593.33	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.88	0.83	0.72	0.57	0.41	0.3	0.33	0.53	0.76	0.88	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.78	20	20.3	20.67	20.88	20.97	20.99	20.99	20.93	20.66	20.2	19.76	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.37	20.37	20.37	20.38	20.39	20.4	20.4	20.4	20.39	20.39	20.38	20.38	(88)

Roof Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.87	0.82	0.7	0.54	0.37	0.26	0.29	0.49	0.73	0.86	0.91	(89)

Roof Mean internal temperature in the rest of dwelling T2

18.93	19.2	19.57	20.02	20.27	20.38	20.39	20.39	20.33	20.02	19.46	18.91	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

19.22	19.47	19.81	20.24	20.47	20.58	20.59	20.59	20.53	20.23	19.7	19.19	(92)

Adjusted mean internal temperature:

19.22	19.47	19.81	20.24	20.47	20.58	20.59	20.59	20.53	20.23	19.7	19.19	(93)

8. Space heating requirement

Utilisation factor for gains,

0.89	0.86	0.8	0.69	0.54	0.38	0.27	0.31	0.5	0.73	0.85	0.9	(94)

Useful gains, mGm , W

546.27	577.9	578.56	548.75	460.76	322.45	218.42	227.69	339.92	450.28	503.52	532.64	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

862.67	839.58	764.31	638.5	492.26	328.84	219.79	229.82	356.8	540.39	712.64	854.15	(97)

Space heating requirement for each month

235.4	175.84	138.2	64.62	23.43	0	0	0	0	67.04	150.57	239.2	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

235.4	175.84	138.2	64.62	23.43	0	0	0	0	67.04	150.57	239.2	(98c)

Space heating requirement in kWh/m²/year 12.64 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
260.11	194.3	152.71	71.41	25.89	0	0	0		0	74.08	166.37	264.31		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
84.5	84.07	83.32	82.02	80.76	79.8	79.8	79.8		79.8	82.08	83.67	84.58		(217)
Fuel for water heating														
313.04	278.18	297.73	264.7	259.81	236.03	232.2	241.86		245.02	266.71	279.48	309.18	3223.96	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1209.17	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													3223.96	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			188.85	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													274.85	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4905.65	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(240a)
Low-rate fraction	0		44.01	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(241a)
Low-rate fraction	0		44.01	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		44.01	(242a)

Low-rate fraction	0		44.01	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		117.35	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		45.32	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		331.28	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	0.91	(257)
SAP rating	85.31	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			253.93	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			677.03	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		930.96	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		38.13	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		997.61	(272)
Dwelling CO2 Emission Rate		11.52	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1366.37	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3643.08	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5009.45	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			415.8	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5728.41	(286)
Dwelling PE Rate			66.15	(287)

TER WORKSHEET

Dwelling Reference: B39
Dwelling Type: New Dwelling Design Stage

B39
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	86.6	(1a) x	2.6	(2a) =	225.16	(3a)
Total floor area TFA					86.6	(4)
Dwelling volume					225.16	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.13	0.13	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.38	0.38	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.3 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35	3.9	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)

Effective air change rate

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

Effective air change rate from PCDB:

0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	20.4		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	14.58	1134	(29a)
Roof	0	0	(30)

Total area of external elements ∑A, m²		100.98	(31)
Party Wall	0	0	(32)
Party floor		3464	(32a)
Party ceiling		2598	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		37.14	(33)
Heat capacity Cm = ∑(A x k)		7925	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		91.51	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		5.05	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		5.05	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		42.19	(37)

Ventilation heat loss calculated monthly

42.48	42.27	42.07	41.12	40.94	40.11	40.11	39.96	40.43	40.94	41.3	41.68	(38)

Heat transfer coefficient, W/K

84.67	84.47	84.26	83.31	83.13	82.3	82.3	82.15	82.62	83.13	83.49	83.87	(39)

Heat loss parameter (HLP), W/m²K

0.98	0.98	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	0.96	0.97	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.58	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

67.42	66.4	64.93	62.1	60.02	57.69	56.37	57.84	59.44	61.94	64.82	67.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

29.11	28.68	28.07	26.95	26.11	25.18	24.67	25.28	25.94	26.93	28.08	29.02	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

41.01	39.52	38.03	36.54	35.05	33.56	33.56	35.05	36.54	38.03	39.52	41.01	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	126.61	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

137.54	134.61	131.03	125.59	121.17	116.43	114.6	118.16	121.92	126.9	132.43	137.19	1517.56	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

217.83	191.68	201.39	171.93	163.12	143.16	138.6	146.31	150.34	172.21	188.66	214.8	2100.02	(45)

Distribution loss (46) = 0.15 x (45)

32.68	28.75	30.21	25.79	24.47	21.47	20.79	21.95	22.55	25.83	28.3	32.22	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)
Water storage loss (or HIU loss)		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

264.43	233.76	247.98	217.02	209.72	188.25	185.19	192.9	195.43	218.8	233.76	261.4	2648.64	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

30.82	27.26	28.54	23.63	22.03	18.85	17.67	18.79	19.5	22.99	26.04	30.25	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

233.61	206.51	219.44	193.39	187.69	169.4	167.53	174.12	175.93	195.81	207.71	231.15	2362.28	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

109.71	97.4	104.24	93.24	91.51	83.67	83.36	85.92	86.06	94.53	98.8	108.7	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

117.87	130.5	117.87	121.8	117.87	121.8	117.87	117.87	121.8	117.87	121.8	117.87	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	(71)

Water heating gains (Table 5)

147.45	144.94	140.1	129.5	123	116.21	112.04	115.49	119.53	127.06	137.23	146.1	(72)

Total internal gains

562.65	575.18	551.63	532	505.22	484	465.63	466.66	480.71	500.27	530.72	551.03	(73)

6. Solar gains

Solar gains in watts, calculated for each month

71.47	139.32	236.32	367.77	479.17	504.97	474.69	387.32	281.28	166.4	88.83	59.06	(83)

Total gains – internal and solar (watts)

634.12	714.5	787.95	899.77	984.4	988.97	940.32	853.98	761.99	666.67	619.55	610.09	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.94	0.91	0.87	0.77	0.64	0.49	0.37	0.42	0.62	0.82	0.91	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.83	19.12	19.57	20.17	20.62	20.87	20.96	20.94	20.74	20.15	19.41	18.78	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.1	20.1	20.11	20.12	20.12	20.12	20.12	20.13	20.12	20.12	20.11	20.11	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.93	0.9	0.85	0.75	0.6	0.43	0.3	0.35	0.57	0.79	0.9	0.93	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.55	17.92	18.49	19.22	19.74	20.02	20.1	20.09	19.9	19.22	18.3	17.5	(90)

Living area fraction 0.33 (91)

Mean internal temperature (for the whole dwelling)

17.98	18.32	18.85	19.54	20.04	20.31	20.38	20.37	20.18	19.53	18.67	17.93	(92)

Adjusted mean internal temperature:

17.98	18.32	18.85	19.54	20.04	20.31	20.38	20.37	20.18	19.53	18.67	17.93	(93)

8. Space heating requirement

Utilisation factor for gains,

0.9	0.87	0.82	0.73	0.6	0.44	0.32	0.37	0.57	0.77	0.87	0.91	(94)

Useful gains, mGm , W

572.29	623.67	649.97	655.56	587.05	436.66	301.74	312.06	434.32	515.1	539.11	554.98	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1158.16	1133.71	1040.63	886.27	693.06	469.68	311.52	326.24	502.17	742.56	965.95	1151.39	(97)

Space heating requirement for each month

435.89	342.75	290.65	166.11	78.87	0	0	0	0	169.23	307.32	443.73	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

435.89	342.75	290.65	166.11	78.87	0	0	0	0	169.23	307.32	443.73	(98c)

Space heating requirement in kWh/m²/year 25.8 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													92.3	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
472.25	371.34	314.9	179.97	85.45	0	0	0		0	183.34	332.96	480.75		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.44	85.19	84.69	83.72	82.27	79.8	79.8	79.8		79.8	83.73	84.94	85.5		(217)
Fuel for water heating														
273.43	242.41	259.11	230.99	228.15	212.28	209.93	218.19		220.46	233.85	244.55	270.35	2843.71	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													2420.96	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2843.71	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			0	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													86	(231)
Electricity for lighting													197.66	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

22.99	33.94	51.07	60.18	67.3	63.69	62.89	58.17	50.27	40.01	25.81	19.7	556	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

8.71	18.69	37.84	57.86	77.52	78.28	77.38	65.06	47.08	27.08	11.74	6.86	514.1	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4478.22	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(240a)
Low-rate fraction	0		88.12	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(241a)
Low-rate fraction	0		88.12	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.12	(242a)

Low-rate fraction	0		88.12	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		103.51	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		32.59	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-120.39	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		210.02	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36		(256)
Energy cost factor (ECF)	0.57		(257)
SAP rating	90.69		(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			508.4	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			597.18	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1105.58	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		28.53	(268)
energy saved or generated	0	-138.75	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1007.29	(272)
Dwelling CO2 Emission Rate		11.63	(273)
EI rating		90	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2735.69	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3213.39	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5949.08	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			303.17	(282)
energy saved or generated	0		-1067.14	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5315.21	(286)
Dwelling PE Rate			61.38	(287)

DER WORKSHEET

Dwelling Reference: B410
Dwelling Type: New Dwelling Design Stage

B410
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.9	(1a) x	2.6	(2a) =	192.14	(3a)
Total floor area TFA					73.9	(4)
Dwelling volume					192.14	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	22.19		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	11.67	1089.48	(29a)
Roof	7.39	665.1	(30)

Total area of external elements ∑A, m²		173.26	(31)
Party Wall	0	0	(32)
Party floor		2956	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.41	(33)
Heat capacity Cm = ∑(A x k)		5439.58	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		73.61	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.06	(37)

Ventilation heat loss calculated monthly

15.42	15.24	15.05	14.13	13.95	13.03	13.03	12.84	13.39	13.95	14.32	14.68	(38)

Heat transfer coefficient, W/K

67.49	67.3	67.12	66.2	66.01	65.09	65.09	64.91	65.46	66.01	66.38	66.75	(39)

Heat loss parameter (HLP), W/m²K

0.91	0.91	0.91	0.9	0.89	0.88	0.88	0.88	0.89	0.89	0.9	0.9	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N	2.34	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.4	62.45	61.06	58.41	56.44	54.26	53.02	54.39	55.9	58.25	60.97	63.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.39	26.98	26.41	25.35	24.56	23.69	23.21	23.78	24.4	25.34	26.42	27.3	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.56	37.16	35.76	34.36	32.95	31.55	31.55	32.95	34.36	35.76	37.16	38.56	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	119.07	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

129.35	126.59	123.23	118.11	113.96	109.49	107.78	111.13	114.66	119.35	124.54	129.02	1427.22	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.87	180.27	189.4	161.69	153.41	134.64	130.35	137.6	141.39	161.95	177.43	202.01	1975.01	(45)

Distribution loss (46) = 0.15 x (45)

30.73	27.04	28.41	24.25	23.01	20.2	19.55	20.64	21.21	24.29	26.61	30.3	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	1.4	(48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

251.56	222.45	236.1	206.88	200.11	179.83	177.05	184.3	186.58	208.65	222.62	248.71	2524.84	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

251.56	222.45	236.1	206.88	200.11	179.83	177.05	184.3	186.58	208.65	222.62	248.71	2524.84	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.48	93.68	100.33	89.92	88.37	80.92	80.7	83.11	83.16	91.21	95.15	104.53	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

104.02	115.16	104.02	107.48	104.02	107.48	104.02	104.02	107.48	104.02	107.48	104.02		(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

206.22	208.36	202.97	191.49	177	163.38	154.28	152.14	157.53	169.01	183.5	197.12		(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68		(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3		(70)

Losses e.g. evaporation (negative values) (Table 5

-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48		(71)

Water heating gains (Table 5)

141.77	139.41	134.86	124.88	118.77	112.39	108.47	111.71	115.51	122.59	132.15	140.49		(72)

Total internal gains

513.06	523.99	502.9	484.91	460.84	441.31	424.82	425.92	438.58	456.67	484.19	502.69		(73)

6. Solar gains

Solar gains in watts, calculated for each month

157.19	265.35	357.91	436.87	484.8	479.69	463.11	427.34	385.11	291.76	187.81	134.85		(83)

Total gains – internal and solar (watts)

670.26	789.33	860.8	921.78	945.64	921	887.93	853.26	823.69	748.43	672.01	637.53		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.87	0.82	0.76	0.66	0.55	0.42	0.31	0.33	0.49	0.68	0.82	0.88		(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

19.02	19.4	19.83	20.31	20.66	20.88	20.96	20.95	20.81	20.36	19.64	18.95		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.16	20.16	20.16	20.17	20.17	20.18	20.18	20.19	20.18	20.17	20.17	20.16		(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.86	0.8	0.74	0.64	0.52	0.37	0.26	0.28	0.44	0.65	0.8	0.87		(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.84	18.31	18.84	19.42	19.83	20.08	20.16	20.15	20.01	19.5	18.62	17.76		(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

18.27	18.72	19.2	19.75	20.14	20.38	20.45	20.45	20.31	19.82	18.99	18.2		(92)

Adjusted mean internal temperature:

18.27	18.72	19.2	19.75	20.14	20.38	20.45	20.45	20.31	19.82	18.99	18.2		(93)

8. Space heating requirement

Utilisation factor for gains,

0.82	0.77	0.71	0.62	0.51	0.38	0.27	0.3	0.45	0.64	0.77	0.84	(94)

Useful gains, mGm , W

551.43	607.63	611.98	573.67	485.96	352.36	243.53	253.48	369.14	478.33	517.96	532.48	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

943.07	929.82	852.64	718.28	557.12	376.07	250.8	262.61	406.47	608.57	789.59	934.6	(97)

Space heating requirement for each month

291.38	216.51	179.05	104.12	52.95	0	0	0	0	96.9	195.57	299.18	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

291.38	216.51	179.05	104.12	52.95	0	0	0	0	96.9	195.57	299.18	(98c)

Space heating requirement in kWh/m²/year 19.43 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0			(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
321.97	239.24	197.84	115.04	58.51	0	0	0		0	107.07	216.1	330.58		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.21	84.74	84.09	83.09	81.82	79.8	79.8	79.8		79.8	82.91	84.47	85.31		(217)
Fuel for water heating														
295.24	262.5	280.77	248.99	244.56	225.35	221.86	230.95		233.81	251.67	263.55	291.55	3050.8	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		1586.35	(211)
Space heating fuel used, main system 2		0	(213)
Space heating fuel used, secondary		0	(215)
Water heating fuel used		3050.8	(219)
Electricity for instantaneous electric shower(s)		0	(64a)
Space cooling fuel used		0	(221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	158.23	(230a)
warm air heating system fans		0	(230b)
Heating circulation pump or water pump within warm air heating unit		41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)		0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)		45	(230e)
Maintaining electric keep-hot facility for gas combi boiler		0	(230f)
Pump for solar water heating		0	(230g)
Pump for storage WWHRS		0	(230h)
Total electricity for the above		244.23	(231)
Electricity for lighting		174.42	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			5055.8	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.74	(240a)
Low-rate fraction	0		57.74	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.74	(241a)
Low-rate fraction	0		57.74	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		57.74	(242a)

Low-rate fraction	0		57.74	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		111.05	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.27	(249)
Energy For lighting	0		28.76	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		329.83	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1	(257)
SAP rating		83.81	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			333.13	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			640.67	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		973.8	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		33.88	(267)
Electricity for lighting		25.17	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		1032.85	(272)
Dwelling CO2 Emission Rate		13.98	(273)
EI rating		88	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1792.57	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3447.41	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5239.98	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			369.47	(281)
Electricity for lighting			267.54	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5876.98	(286)
Dwelling PE Rate			79.53	(287)

TER WORKSHEET

Dwelling Reference: B410
Dwelling Type: New Dwelling Design Stage

B410
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	73.9	(1a) x	2.6	(2a) =	192.14	(3a)
Total floor area TFA					73.9	(4)
Dwelling volume					192.14	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	3	x	10 =	30	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.16	0.16	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.41	0.41	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.31 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37	4.13	(22b)

Calculate effective air change rate for the applicable case:

0 (23a)

0 (23b)

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

Effective air change rate from PCDB:

0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	18.7		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	14.56	1132.18	(29a)
Roof	8.13	665.1	(30)

Total area of external elements ∑A, m²		173.26	(31)
Party Wall	0	0	(32)
Party floor		2956	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		43.54	(33)
Heat capacity Cm = ∑(A x k)		5482.28	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		74.19	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.65	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.65	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		52.19	(37)

Ventilation heat loss calculated monthly

36.81	36.61	36.42	35.5	35.33	34.54	34.54	34.39	34.84	35.33	35.68	36.04	(38)

Heat transfer coefficient, W/K

89	88.8	88.61	87.7	87.53	86.73	86.73	86.58	87.04	87.53	87.87	88.23	(39)

Heat loss parameter (HLP), W/m²K

1.2	1.2	1.2	1.19	1.18	1.17	1.17	1.17	1.18	1.18	1.19	1.19	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 2.34 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

63.4	62.45	61.06	58.41	56.44	54.26	53.02	54.39	55.9	58.25	60.97	63.16	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

27.39	26.98	26.41	25.35	24.56	23.69	23.21	23.78	24.4	25.34	26.42	27.3	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

38.56	37.16	35.76	34.36	32.95	31.55	31.55	32.95	34.36	35.76	37.16	38.56	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 119.07 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

129.35	126.59	123.23	118.11	113.96	109.49	107.78	111.13	114.66	119.35	124.54	129.02	1427.22	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

204.87	180.27	189.4	161.69	153.41	134.64	130.35	137.6	141.39	161.95	177.43	202.01	1975.01	(45)

Distribution loss (46) = 0.15 x (45)

30.73	27.04	28.41	24.25	23.01	20.2	19.55	20.64	21.21	24.29	26.61	30.3	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

251.46	222.35	235.99	206.78	200.01	179.73	176.94	184.19	186.48	208.55	222.52	248.61	2523.62	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

28.99	25.63	26.84	22.23	20.71	17.73	16.62	17.67	18.34	21.62	24.49	28.45	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

222.48	196.72	209.15	184.56	179.29	162	160.33	166.53	168.14	186.93	198.03	220.16	2254.3	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

105.39	93.61	100.25	89.84	88.29	80.84	80.62	83.03	83.08	91.13	95.07	104.45	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	116.85	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

	104.04	115.18	104.04	107.51	104.04	107.51	104.04	104.04	107.51	104.04	107.51	104.04	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

	206.22	208.36	202.97	191.49	177	163.38	154.28	152.14	157.53	169.01	183.5	197.12	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	34.68	(69)

Pumps and fans gains (Table 5a)

	3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	-93.48	(71)

Water heating gains (Table 5)

	141.66	139.3	134.75	124.77	118.66	112.28	108.36	111.6	115.4	122.48	132.04	140.38	(72)

Total internal gains

	512.97	523.9	502.81	484.82	460.75	441.22	424.73	425.83	438.49	456.59	484.11	502.6	(73)

6. Solar gains

Solar gains in watts, calculated for each month

	185.44	313.03	422.22	515.37	571.9	565.88	546.32	504.12	454.31	344.18	221.56	159.08	(83)

Total gains – internal and solar (watts)

	698.42	836.93	925.03	1000.19	1032.65	1007.09	971.04	929.95	892.8	800.77	705.67	661.68	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

	0.88	0.84	0.79	0.7	0.6	0.47	0.36	0.39	0.54	0.73	0.84	0.89	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

	18.22	18.67	19.21	19.85	20.37	20.74	20.9	20.87	20.62	19.94	18.98	18.14	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

	19.92	19.92	19.92	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.93	19.92	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

	0.87	0.82	0.76	0.67	0.56	0.41	0.28	0.31	0.48	0.69	0.82	0.88	(89)

Roof

Mean internal temperature in the rest of dwelling T2

	16.72	17.28	17.94	18.71	19.33	19.73	19.88	19.86	19.62	18.84	17.68	16.63	(90)

Living area fraction 0.37 (91)

Mean internal temperature (for the whole dwelling)

	17.28	17.79	18.41	19.13	19.71	20.1	20.25	20.24	19.99	19.25	18.16	17.19	(92)

Adjusted mean internal temperature:

	17.28	17.79	18.41	19.13	19.71	20.1	20.25	20.24	19.99	19.25	18.16	17.19	(93)

8. Space heating requirement

Utilisation factor for gains,

0.83	0.78	0.73	0.65	0.55	0.42	0.31	0.33	0.49	0.66	0.78	0.84	(94)

Useful gains, mGm , W

579.97	653.32	671.38	645.71	563	422.54	297.61	308.52	433.29	531.83	553.22	557.35	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

1155.04	1144.79	1055.35	897.45	701.24	477.34	316.96	332.25	512.57	757.04	972.17	1145.79	(97)

Space heating requirement for each month

427.86	330.27	285.67	181.25	102.85	0	0	0	0	167.56	301.64	437.8	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

427.86	330.27	285.67	181.25	102.85	0	0	0	0	167.56	301.64	437.8	(98c)

Space heating requirement in kWh/m²/year 30.24 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
463.55	357.82	309.5	196.38	111.43	0	0	0	0	181.54	326.81	474.32		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
85.5	85.21	84.76	84.02	82.86	79.8	79.8	79.8	79.8	83.82	85	85.57		(217)
Fuel for water heating													
260.2	230.85	246.76	219.66	216.38	203.01	200.91	208.68	210.7	223.02	232.98	257.28	2710.43	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		2421.35	(211)
Space heating fuel used, main system 2		0	(213)
Space heating fuel used, secondary		0	(215)
Water heating fuel used		2710.43	(219)
Electricity for instantaneous electric shower(s)		0	(64a)
Space cooling fuel used		0	(221)
Electricity for pumps, fans and electric keep-hot			
Mechanical vent fans - balanced, extract or positive input from outside	0	0	(230a)
warm air heating system fans		0	(230b)
Heating circulation pump or water pump within warm air heating unit		41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)		0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)		45	(230e)
Maintaining electric keep-hot facility for gas combi boiler		0	(230f)
Pump for solar water heating		0	(230g)
Pump for storage WWHRS		0	(230h)
Total electricity for the above		86	(231)
Electricity for lighting		174.46	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

19.76	29.26	44.15	52.18	58.5	55.42	54.74	50.57	43.6	34.56	22.22	16.93	481.89	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

7.29	15.65	31.72	48.55	65.08	65.72	64.95	54.59	39.48	22.68	9.83	5.74	431.28	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4479.07	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.14	(240a)
Low-rate fraction	0		88.14	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.14	(241a)
Low-rate fraction	0		88.14	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		88.14	(242a)

Low-rate fraction	0		88.14	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		98.66	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		28.77	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-103.55	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		218.19	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.66	(257)
SAP rating		89.29	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			508.48	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			569.19	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		1077.68	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		25.18	(268)
energy saved or generated	0	-118.43	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		996.36	(272)
Dwelling CO2 Emission Rate		13.48	(273)
EI rating		89	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2736.13	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3062.79	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5798.92	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			267.6	(282)
energy saved or generated	0		-918.17	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5278.44	(286)
Dwelling PE Rate			71.43	(287)

DER WORKSHEET

Dwelling Reference: B411
Dwelling Type: New Dwelling Design Stage

B411
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	52.7	(1a) x	2.6	(2a) =	137.02	(3a)
Total floor area TFA					52.7	(4)
Dwelling volume					137.02	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	0	x	10 =	0	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	3	3	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.15	0.15	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor 0.12 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1.53	(22b)

Calculate effective air change rate for the applicable case:

0.5 (23a)

0.5 (23b)

81 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR)

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23		(24a)

b) If balanced mechanical ventilation without heat recovery (MV)

0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

Effective air change rate from PCDB:

0.24	0.24	0.24	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.23	0.23	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	13.81		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	14.19	1324.26	(29a)
Roof	5.27	474.3	(30)

Total area of external elements ∑A, m²		161.51	(31)
Party Wall	0	0	(32)
Party floor		2108	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		35.43	(33)
Heat capacity Cm = ∑(A x k)		4635.56	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		87.96	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.1	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.1	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		43.53	(37)

Ventilation heat loss calculated monthly

11	10.87	10.73	10.08	9.95	9.29	9.29	9.16	9.55	9.95	10.21	10.47		(38)

Heat transfer coefficient, W/K

54.53	54.39	54.26	53.61	53.47	52.82	52.82	52.69	53.08	53.47	53.74	54		(39)

Heat loss parameter (HLP), W/m²K

1.03	1.03	1.03	1.02	1.01	1	1	1	1.01	1.01	1.02	1.02		(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Water heating energy requirement

Assumed occupancy, N 1.77 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53.89	53.08	51.9	49.64	47.98	46.12	45.06	46.23	47.52	49.51	51.82	53.69		(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

23.3	22.95	22.47	21.57	20.89	20.15	19.75	20.23	20.76	21.55	22.47	23.22		(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.75	31.56	30.37	29.18	27.99	26.8	26.8	27.99	29.18	30.37	31.56	32.75		(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 101.21 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

109.94	107.6	104.74	100.39	96.86	93.07	91.61	94.45	97.45	101.44	105.85	109.66	1213.06	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

174.12	153.22	160.98	137.43	130.39	114.44	110.79	116.95	120.17	137.65	150.81	171.7	1678.65	(45)

Distribution loss (46) = 0.15 x (45)

26.12	22.98	24.15	20.61	19.56	17.17	16.62	17.54	18.03	20.65	22.62	25.75		(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.4 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.76	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.76	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.44	21.17	23.44	22.68	23.44	22.68	23.44	23.44	22.68	23.44	22.68	23.44	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

220.82	195.4	207.68	182.62	177.09	159.63	157.49	163.65	165.36	184.35	196	218.4	2228.49	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

220.82	195.4	207.68	182.62	177.09	159.63	157.49	163.65	165.36	184.35	196	218.4	2228.49	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

95.26	84.69	90.88	81.85	80.71	74.2	74.2	76.25	76.11	83.13	86.3	94.45	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

77.8	86.13	77.8	80.39	77.8	80.39	77.8	77.8	80.39	77.8	80.39	77.8	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

154.24	155.84	151.81	143.22	132.38	122.2	115.39	113.79	117.82	126.41	137.25	147.44	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	(71)

Water heating gains (Table 5)

128.03	126.02	122.16	113.68	108.49	103.06	99.73	102.48	105.71	111.73	119.86	126.95	(72)

Total internal gains

412.61	420.54	404.31	389.84	371.21	355.19	342.46	343.61	353.47	368.48	390.04	404.72	(73)

6. Solar gains

Solar gains in watts, calculated for each month

34.72	67.01	112.36	173.5	225.35	237.29	223.13	182.42	133.24	79.66	43.02	28.78	(83)

Total gains – internal and solar (watts)

447.33	487.55	516.67	563.34	596.56	592.48	565.59	526.04	486.71	448.14	433.06	433.5	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.91	0.89	0.85	0.77	0.65	0.51	0.39	0.43	0.61	0.8	0.88	0.92	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

18.81	19.07	19.48	20.06	20.53	20.83	20.94	20.92	20.7	20.12	19.4	18.77	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

20.05	20.06	20.06	20.07	20.07	20.08	20.08	20.08	20.08	20.07	20.07	20.06	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.9	0.88	0.83	0.74	0.61	0.45	0.31	0.35	0.56	0.77	0.87	0.91	(89)

Roof

Mean internal temperature in the rest of dwelling T2

17.5	17.83	18.35	19.06	19.61	19.94	20.04	20.03	19.82	19.15	18.26	17.46	(90)

Living area fraction 0.41 (91)

Mean internal temperature (for the whole dwelling)

18.04	18.34	18.81	19.47	19.98	20.31	20.41	20.39	20.18	19.55	18.72	17.99	(92)

Adjusted mean internal temperature:

18.04	18.34	18.81	19.47	19.98	20.31	20.41	20.39	20.18	19.55	18.72	17.99	(93)

8. Space heating requirement

Utilisation factor for gains,

0.87	0.85	0.81	0.72	0.61	0.46	0.34	0.38	0.56	0.75	0.84	0.88	(94)

Useful gains, mGm , W

390.53	412.84	416.45	408.02	363.2	273.87	192.39	198.66	274.78	334.23	362.99	381.45	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

748.95	730.81	668.08	566.41	443.01	301.34	201.19	210.43	322.72	478.4	624.52	744.92	(97)

Space heating requirement for each month

266.67	213.68	187.21	114.04	59.38	0	0	0	0	107.26	188.3	270.42	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

266.67	213.68	187.21	114.04	59.38	0	0	0	0	107.26	188.3	270.42	(98c)

Space heating requirement in kWh/m²/year 26.7 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,								0					0	(201)
Fraction of space heat from main system(s),													1	(202)
Fraction of main heating from main system 2,													0	(203)
Fraction of total space heat from main system 1,													1	(204)
Fraction of total space heat from main system 2,													0	(205)
Efficiency of main space heating system 1 (in %),													90.5	(206)
Efficiency of main space heating system 2 (in %),													0	(207)
Efficiency of secondary/supplementary heating system, %,													0	(208)
Cooling System Seasonal Energy Efficiency Ratio,								0					0	(209)
Space heating requirement (calculated above),														
0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month								0					0	
294.66	236.11	206.86	126.01	65.61	0	0	0		0	118.52	208.06	298.81		(211)
Space heating fuel (main heating system 2), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space heating fuel (secondary), kWh/month								0					0	
0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output from water heater),								0					79.8	(216)
Efficiency of water heater														
85.32	85.05	84.54	83.6	82.24	79.8	79.8	79.8		79.8	83.43	84.71	85.38		(217)
Fuel for water heating														
258.82	229.74	245.66	218.45	215.33	200.03	197.35	205.08		207.22	220.97	231.38	255.78	2685.82	(219)
Space Cooling														
0	0	0	0	0	0	0	0		0	0	0	0		(221)
Annual totals								kWh/year		kWh/year				
Space heating fuel used, main system 1													1554.65	(211)
Space heating fuel used, main system 2													0	(213)
Space heating fuel used, secondary													0	(215)
Water heating fuel used													2685.82	(219)
Electricity for instantaneous electric shower(s)													0	(64a)
Space cooling fuel used													0	(221)
Electricity for pumps, fans and electric keep-hot														
Mechanical vent fans - balanced, extract or positive input from outside								0		0			112.84	(230a)
warm air heating system fans													0	(230b)
Heating circulation pump or water pump within warm air heating unit													41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)													0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)													45	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)
Pump for solar water heating													0	(230g)
Pump for storage WWHRS													0	(230h)
Total electricity for the above													198.84	(231)
Electricity for lighting													130.46	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			4569.76	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.59	(240a)
Low-rate fraction	0		56.59	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.59	(241a)
Low-rate fraction	0		56.59	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		56.59	(242a)

Low-rate fraction	0		56.59	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		97.76	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		32.79	(249)
Energy For lighting	0		21.51	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		300.65	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		1.11	(257)
SAP rating		82.04	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			326.48	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			564.02	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		890.5	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		27.58	(267)
Electricity for lighting		18.83	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		936.91	(272)
Dwelling CO2 Emission Rate		17.78	(273)
EI rating		87	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			1756.75	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3034.97	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			4791.73	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			300.8	(281)
Electricity for lighting			200.1	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5292.63	(286)
Dwelling PE Rate			100.43	(287)

TER WORKSHEET

Dwelling Reference: B411
Dwelling Type: New Dwelling Design Stage

B411
Hornsey park road
London
N8 0JY

1. Overall dwelling dimensions

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground Floor	52.7	(1a) x	2.6	(2a) =	137.02	(3a)
Total floor area TFA					52.7	(4)
Dwelling volume					137.02	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80 =	0	(6a)
Open chimneys	0	x	20 =	0	(6b)
Chimneys / flues attached to closed fire	0	x	10 =	0	(6c)
Flues attached to solid fuel boiler	0	x	20 =	0	(6d)
Flues attached to other heater	0	x	35 =	0	(6e)
Number of blocked chimneys	0	x	20 =	0	(6f)
Number of intermittent extract fans	2	x	10 =	20	(7a)
Number of passive vents	0	x	10 =	0	(7b)
Number of flueless gas fires	0	x	40 =	0	(7c)

	Air changes per hour		
Number of storeys in the dwelling (ns)	0.15	0.15	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, ($m^3/h/m^2$)	5	5	(17)
Air permeability value, AP4, ($m^3/h/m^2$)	0	0	(17a)
Air permeability value)	0.4	0.4	(18)
Number of sides on which dwelling is sheltered	3	3	(19)
Shelter factor		0.78	(20)

Infiltration rate incorporating shelter factor												0.31	(21)
Infiltration rate modified for monthly wind speed													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.35	0.36	4.03	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(24d)
Effective air change rate														
	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(25)
Effective air change rate from PCDB:														
	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	2.16		(26)
Windows	12.62		(27)
Roof window	0		(27a)
Basement floor	0	0	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	0	0	(29)
External wall	17.21	1338.82	(29a)
Roof	5.8	474.3	(30)

Total area of external elements ∑A, m²		161.51	(31)
Party Wall	0	0	(32)
Party floor		2108	(32a)
Party ceiling		0	(32b)
Internal wall **		729	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		37.79	(33)
Heat capacity Cm = ∑(A x k)		4650.12	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		88.24	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		8.1	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		8.1	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		45.89	(37)

Ventilation heat loss calculated monthly

26.07	25.93	25.8	25.18	25.07	24.53	24.53	24.43	24.74	25.07	25.3	25.55	(38)

Heat transfer coefficient, W/K

71.96	71.82	71.69	71.07	70.96	70.42	70.42	70.32	70.63	70.96	71.19	71.44	(39)

Heat loss parameter (HLP), W/m²K

1.37	1.36	1.36	1.35	1.35	1.34	1.34	1.33	1.34	1.35	1.35	1.36	(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement

Assumed occupancy, N 1.77 (42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

53.89	53.08	51.9	49.64	47.98	46.12	45.06	46.23	47.52	49.51	51.82	53.69	(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

23.3	22.95	22.47	21.57	20.89	20.15	19.75	20.23	20.76	21.55	22.47	23.22	(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

32.75	31.56	30.37	29.18	27.99	26.8	26.8	27.99	29.18	30.37	31.56	32.75	(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J) 101.21 (43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

109.94	107.6	104.74	100.39	96.86	93.07	91.61	94.45	97.45	101.44	105.85	109.66	1213.06 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

174.12	153.22	160.98	137.43	130.39	114.44	110.79	116.95	120.17	137.65	150.81	171.7	1678.65 (45)

Distribution loss (46) = 0.15 x (45)

26.12	22.98	24.15	20.61	19.56	17.17	16.62	17.54	18.03	20.65	22.62	25.75	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/day (48) x (49) =	0.75	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.75	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

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

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

220.72	195.3	207.57	182.52	176.99	159.53	157.38	163.55	165.26	184.25	195.9	218.29	2227.27	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

24.64	21.79	22.82	18.89	17.61	15.07	14.12	15.02	15.59	18.38	20.82	24.18	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

196.08	173.51	184.76	163.63	159.38	144.46	143.26	148.53	149.67	165.87	175.08	194.11	1998.35	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

95.17	84.61	90.8	81.77	80.63	74.12	74.11	76.16	76.03	83.05	86.22	94.37	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

5. Internal gains (see Tables 5 and 5a)

Metabolic gains (Table 5), watts

88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	88.49	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

78.03	86.39	78.03	80.64	78.03	80.64	78.03	78.03	80.64	78.03	80.64	78.03	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

154.24	155.84	151.81	143.22	132.38	122.2	115.39	113.79	117.82	126.41	137.25	147.44	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	(69)

Pumps and fans gains (Table 5a)

3	3	3	3	3	0	0	0	0	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5

-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	-70.79	(71)

Water heating gains (Table 5)

127.92	125.91	122.05	113.57	108.38	102.95	99.62	102.37	105.6	111.62	119.75	126.84	(72)

Total internal gains

412.74	420.69	404.43	389.97	371.34	355.33	342.58	343.74	353.6	368.61	390.17	404.85	(73)

6. Solar gains

Solar gains in watts, calculated for each month

44.43	85.75	143.79	222.01	288.34	303.61	285.5	233.42	170.5	101.94	55.06	36.82	(83)

Total gains – internal and solar (watts)

457.17	506.45	548.22	611.98	659.68	658.94	628.08	577.16	524.1	470.55	445.23	441.68	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ⍰1,m (see Table 9a)

0.92	0.9	0.87	0.8	0.69	0.55	0.44	0.48	0.66	0.82	0.9	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

17.99	18.3	18.82	19.55	20.2	20.66	20.86	20.82	20.46	19.64	18.72	17.94	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.79	19.79	19.79	19.8	19.8	19.81	19.81	19.81	19.81	19.8	19.8	19.8	(88)

Roof

Utilisation factor for gains for rest of dwelling, ⍰2,m (see Table 9a)

0.91	0.89	0.85	0.77	0.64	0.48	0.34	0.38	0.6	0.79	0.88	0.92	(89)

Roof

Mean internal temperature in the rest of dwelling T2

16.34	16.73	17.38	18.28	19.05	19.55	19.74	19.71	19.36	18.41	17.26	16.28	(90)

Living area fraction 0.41 (91)

Mean internal temperature (for the whole dwelling)

17.02	17.37	17.97	18.8	19.52	20.01	20.19	20.16	19.81	18.91	17.85	16.96	(92)

Adjusted mean internal temperature:

17.02	17.37	17.97	18.8	19.52	20.01	20.19	20.16	19.81	18.91	17.85	16.96	(93)

8. Space heating requirement

Utilisation factor for gains,

0.88	0.85	0.81	0.74	0.63	0.49	0.37	0.41	0.6	0.76	0.85	0.88	(94)

Useful gains, mGm , W

401.28	431.53	445.22	449.89	413.89	323.39	231.88	237.03	311.91	358.77	377.02	390.61	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

915.1	895.63	822.2	703.59	554.74	380.61	253.04	264.51	402.93	589.91	765.64	911.57	(97)

Space heating requirement for each month

382.29	311.88	280.48	182.66	104.79	0	0	0	0	171.97	279.81	387.59	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

382.29	311.88	280.48	182.66	104.79	0	0	0	0	171.97	279.81	387.59	(98c)

Space heating requirement in kWh/m²/year 39.88 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

9a. Energy requirements – Individual heating systems including micro-CHP

Fraction of space heat from secondary/supplementary system,							0					0	(201)
Fraction of space heat from main system(s),												1	(202)
Fraction of main heating from main system 2,												0	(203)
Fraction of total space heat from main system 1,												1	(204)
Fraction of total space heat from main system 2,												0	(205)
Efficiency of main space heating system 1 (in %),												92.3	(206)
Efficiency of main space heating system 2 (in %),												0	(207)
Efficiency of secondary/supplementary heating system, %,												0	(208)
Cooling System Seasonal Energy Efficiency Ratio,							0					0	(209)
Space heating requirement (calculated above),													
0	0	0	0	0	0	0	0	0	0	0	0		(210)
Space heating fuel (main heating system 1), kWh/month							0					0	
414.18	337.89	303.87	197.9	113.54	0	0	0	0	186.31	303.15	419.93		(211)
Space heating fuel (main heating system 2), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(213)
Space heating fuel (secondary), kWh/month							0					0	
0	0	0	0	0	0	0	0	0	0	0	0		(215)
Output from water heater),							0					79.8	(216)
Efficiency of water heater													
85.53	85.36	84.99	84.31	83.14	79.8	79.8	79.8	79.8	84.14	85.11	85.58		(217)
Fuel for water heating													
229.26	203.28	217.38	194.09	191.7	181.03	179.53	186.13	187.56	197.13	205.72	226.82	2399.61	(219)
Space Cooling													
0	0	0	0	0	0	0	0	0	0	0	0		(221)
Annual totals								kWh/year		kWh/year			
Space heating fuel used, main system 1												2276.77	(211)
Space heating fuel used, main system 2												0	(213)
Space heating fuel used, secondary												0	(215)
Water heating fuel used												2399.61	(219)
Electricity for instantaneous electric shower(s)												0	(64a)
Space cooling fuel used												0	(221)
Electricity for pumps, fans and electric keep-hot													
Mechanical vent fans - balanced, extract or positive input from outside								0		0		0	(230a)
warm air heating system fans												0	(230b)
Heating circulation pump or water pump within warm air heating unit												41	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)												0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)												45	(230e)
Maintaining electric keep-hot facility for gas combi boiler												0	(230f)
Pump for solar water heating												0	(230g)
Pump for storage WWHRS												0	(230h)
Total electricity for the above												86	(231)
Electricity for lighting												130.86	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

14.25	21.19	32.1	38.12	42.92	40.74	40.27	37.12	31.88	25.13	16.06	12.2	351.98	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

5.04	10.84	22	33.71	45.21	45.65	45.09	37.87	27.36	15.7	6.79	3.97	299.23	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

Appendix Q, <item 1 description>	Fuel	kWh/year	
energy saved		0	(236a)
energy used		0	(237a)
Total delivered energy for all uses		4242.03	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.87	(240a)
Low-rate fraction	0		82.87	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.87	(241a)
Low-rate fraction	0		82.87	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		82.87	(242a)

Low-rate fraction	0		82.87	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		87.35	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		14.18	(249)
Energy For lighting	0		21.58	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		-74.76	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		223.22	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator		0.36	(256)
Energy cost factor (ECF)		0.82	(257)
SAP rating		86.67	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			478.12	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			503.92	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating		982.04	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		11.93	(267)
Electricity for lighting		18.89	(268)
energy saved or generated	0	-84.48	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		928.38	(272)
Dwelling CO2 Emission Rate		17.62	(273)
EI rating		87	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			2572.75	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			2711.56	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			5284.31	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			130.1	(281)
Electricity for lighting			200.71	(282)
energy saved or generated	0		-663.23	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4951.89	(286)
Dwelling PE Rate			93.96	(287)