Project Information

Building type Semi-detached house

Plot number	Plot 5		
Reference			
Date	08/02/2016		
Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

SAP 2012 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	44.77	2.40	107.45	(3a)
First floor	44.17	2.65	117.05	(3b)
Second floor	25.42	2.05	52.11	(3c)
Total floor area	114.36			(4)
Dwelling volume (m^3)			276.61	(5)

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.14	(8)
Pressure test, result q50	5.00		(17)
Air permeability		0.39	(18)
Number of sides on which sheltered		2.00	(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	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	
												52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	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	0.39	
												4.40 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.59	0.59	0.58	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

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**1.350**	**1.33 (1.40)**	1.79	(27)
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South)			**2.280**	**1.33 (1.40)**	3.02	(27)
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)			**7.470**	**1.33 (1.40)**	9.90	(27)
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**3.600**	**1.33 (1.40)**	4.77	(27)
Data						
Half glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)			**2.100**	**1.20**	2.52	(26)
Data						
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**8.400**	**1.40**	11.76	(26)
Data						
Pitched roofs insulated between joists			29.56	0.13	3.84	(30)
Walls			15.20	0.18	2.74	(29)
Timber partition to roofspace						
Walls			1.53	0.18	0.28	(29)
Dormer walls						
Walls			82.26	0.18	14.81	(29)
Ground floors			44.77	0.13	5.82	(28)
Pitched roofs insulated between rafters			14.25	0.13	1.85	(30)
Party wall			55.14	0.00	0.00	
Internal wall			141.52	0.00	0.00	
Internal timber partition						
Internal floor			70.80	0.00	0.00	
Internal ceiling			70.80	0.00	0.00	

3. Heat losses and heat loss parameter

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

Total area of external elements Sigma A, m²	212.77	(31)
Fabric heat loss, W/K	63.10	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	10.54	(36)
Total fabric heat loss	73.64	(37)

Ventilation heat loss calculated monthly

53.99	53.66	53.35	51.85	51.57	50.27	50.27	50.03	50.78	51.57	52.14	52.73	(38)

Heat transfer coefficient, W/K

127.63	127.30	126.99	125.49	125.22	123.92	123.92	123.67	124.42	125.22	125.78	126.37	
											125.49	(39)

Heat loss parameter (HLP), W/m²K

1.12	1.11	1.11	1.10	1.09	1.08	1.08	1.08	1.09	1.09	1.10	1.11	

HLP (average) 1.10 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy, N 2.84 (42)

Annual average hot water usage in litres per day Vd,average 101.62 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
111.78	107.71	103.65	99.58	95.52	91.46	91.46	95.52	99.58	103.65	107.71	111.78	(44)
Energy content of hot water used												
165.76	144.98	149.61	130.43	125.15	108.00	100.07	114.84	116.21	135.43	147.83	160.53	

Energy content (annual) 1598.83 (45)

Distribution loss												
24.86	21.75	22.44	19.56	18.77	16.20	15.01	17.23	17.43	20.31	22.17	24.08	(46)

Hot water storage volume (litres) 0.00 (50)

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

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

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

Total storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi loss calculated for each month												
50.96	46.03	50.96	49.11	48.68	45.10	46.60	48.68	49.11	50.96	49.32	50.96	(61)
Total heat required for water heating calculated for each month												
216.72	191.01	200.56	179.54	173.83	153.10	146.68	163.51	165.32	186.39	197.15	211.49	(62)
Output from water heater for each month, kWh/month												
216.72	191.01	200.56	179.54	173.83	153.10	146.68	163.51	165.32	186.39	197.15	211.49	(64)

2185.29 (64)

Heat gains from water heating, kWh/month												
67.86	59.71	62.48	55.65	53.78	47.18	44.93	50.35	50.92	57.77	61.48	66.12	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	(66)
Lighting gains												
27.06	24.04	19.55	14.80	11.06	9.34	10.09	13.12	17.61	22.35	26.09	27.81	(67)
Appliances gains												
277.68	280.56	273.30	257.84	238.33	219.99	207.74	204.85	212.12	227.57	247.09	265.43	(68)
Cooking gains												
37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	(71)
Water heating gains												
91.21	88.86	83.98	77.29	72.29	65.53	60.38	67.68	70.72	77.65	85.39	88.87	(72)
Total internal gains												
464.52	462.03	445.41	418.50	390.25	363.44	346.79	354.23	369.02	396.15	427.15	450.69	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)	0.9 x 1.350	19.64	0.63 x 0.70	0.77	8.1031	
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South)	0.9 x 2.280	46.75	0.63 x 0.70	0.77	32.5767	
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)	0.9 x 7.470	19.64	0.63 x 0.70	0.77	44.8373	
Data						
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)	0.9 x 3.600	19.64	0.63 x 0.70	0.77	21.6084	
Data						
Half glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)	0.9 x 2.100	0.00	0.63 x 0.70	0.77	0.0000	
Data						
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)	0.9 x 8.400	19.64	0.63 x 0.70	0.77	50.4195	
Data						
Total solar gains, January					157.55	(83-1)

Solar gains

157.55	297.82	470.56	663.98	799.64	813.66	776.57	675.50	539.23	347.62	194.44	130.92	(83)
Total gains												
622.07	759.85	915.97	1082.48	1189.89	1177.10	1123.36	1029.73	908.25	743.78	621.58	581.60	(84)

7. Mean internal temperature

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

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
62.22	62.38	62.54	63.28	63.42	64.09	64.09	64.21	63.83	63.42	63.14	62.84	
alpha												
5.15	5.16	5.17	5.22	5.23	5.27	5.27	5.28	5.26	5.23	5.21	5.19	
Utilisation factor for gains for living area												
1.00	1.00	0.99	0.94	0.83	0.64	0.48	0.54	0.82	0.98	1.00	1.00	(86)
Mean internal temperature in living area T1												
19.75	19.93	20.22	20.59	20.85	20.97	20.99	20.99	20.90	20.52	20.06	19.72	(87)
Temperature during heating periods in rest of dwelling Th2												
19.99	19.99	19.99	20.00	20.00	20.01	20.01	20.02	20.01	20.00	20.00	20.00	(88)
Utilisation factor for gains for rest of dwelling												
1.00	0.99	0.98	0.92	0.78	0.56	0.38	0.43	0.74	0.96	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
18.32	18.58	19.01	19.53	19.87	20.00	20.01	20.01	19.93	19.45	18.78	18.28	(90)

Living area fraction (20.91 / 114.36) 0.18 (91)

Mean internal temperature (for the whole dwelling)

18.58	18.83	19.23	19.72	20.05	20.17	20.19	20.19	20.11	19.64	19.02	18.54	(92)

Apply adjustment to the mean internal temperature, where appropriate

18.58	18.83	19.23	19.72	20.05	20.17	20.19	20.19	20.11	19.64	19.02	18.54	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	0.99	0.98	0.92	0.78	0.57	0.39	0.45	0.75	0.96	0.99	1.00	(94)
Useful gains												
620.45	754.33	894.24	993.49	928.71	672.90	443.06	464.83	680.25	713.19	617.86	580.52	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
1822.37	1772.91	1616.33	1357.91	1045.15	690.69	445.11	468.86	747.88	1132.28	1498.92	1812.68	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
894.23	684.48	537.23	262.38	86.64	-	-	-	-	311.80	634.36	916.73	

Total space heating requirement per year (kWh/year) (October to May) 4327.86 (98)

Space heating requirement per m² (kWh/m²/year) 37.84 (99)

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	93.40%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
894.23	684.48	537.23	262.38	86.64	-	-	-	-	311.80	634.36	916.73	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
957.42	732.85	575.20	280.92	92.76	-	-	-	-	333.84	679.19	981.50	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
216.72	191.01	200.56	179.54	173.83	153.10	146.68	163.51	165.32	186.39	197.15	211.49	(64)
Efficiency of water heater											80.30	(216)
88.24	87.99	87.41	86.01	83.40	80.30	80.30	80.30	80.30	86.34	87.78	88.32	(217)
Water heating fuel												
245.62	217.09	229.45	208.75	208.43	190.66	182.66	203.63	205.87	215.88	224.58	239.47	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4633.68	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2572.09	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	477.91	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7758.69	(238)

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4633.68	0.216	1000.88	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2572.09	0.216	555.57	(264)
Space and water heating			1556.45	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	477.91	0.519	248.04	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1843.41	(272)

	kg/m²/year	
Emissions per m² for space and water heating	**13.61**	(272a)
Emissions per m² for lighting	**2.17**	(272b)
Emissions per m² for pumps and fans	**0.34**	(272c)
Target Carbon Dioxide Emission Rate (TER)	**16.12**	(273)

= (13.6101 x 1.00) + 2.1689 + 0.3404

Project Information

Building type Semi-detached house

Plot number	Plot 5		
Reference			
Date	08/02/2016		
Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	44.77	2.40	107.45	(3a)
First floor	44.17	2.65	117.05	(3b)
Second floor	25.42	2.05	52.11	(3c)
Total floor area	114.36			(4)
Dwelling volume (m^3)			276.61	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	2	x 10	20.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.07	(8)
Pressure test, result q50	3.00		(17)
Air permeability		0.32	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.27	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	
												52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	
												13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.35	0.34	0.34	0.30	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32	
												3.60 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**3.600**	**1.33 (1.40)**	4.77			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East) Data			**7.470**	**1.33 (1.40)**	9.90			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South) Data			**2.280**	**1.33 (1.40)**	3.02			(27)
Half glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (East) Data			**2.100**	**1.10**	2.31			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**8.400**	**1.40**	11.76			(26)
Pitched roofs insulated between joists			29.56	0.14	4.14	9.00	266.04	(30)
Walls Timber partition to roofspace			15.20	0.22	3.34	9.00	136.80	(29)
Walls Dormer walls			1.53	0.22	0.34	9.00	13.77	(29)
Walls			82.26	0.20	16.45	60.00	4935.60	(29)
Ground floors			44.77	0.12	5.37	80.00	3581.60	(28)
Pitched roofs insulated between rafters			14.25	0.15	2.14	9.00	128.25	(30)
Party wall			55.14	0.00	0.00	70.00	3859.80	
Internal wall Internal timber partition			141.52	0.00	0.00	9.00	1273.68	
Internal floor			70.80	0.00	0.00	18.00	1274.40	
Internal ceiling			70.80	0.00	0.00	9.00	637.20	

3. Heat losses and heat loss parameter

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

Total area of external elements Sigma A, m²	212.77	(31)
Fabric heat loss, W/K	65.34	(33)
Heat capacity	19.35	(34)
Thermal mass parameter, kJ/m²K	140.85	(35)
Effect of thermal bridges	19.35	(36)
Total fabric heat loss	84.69	(37)

Ventilation heat loss calculated monthly

51.21	50.99	50.78	49.79	49.60	48.73	48.73	48.57	49.07	49.60	49.98	50.37	(38)

Heat transfer coefficient, W/K

135.90	135.68	135.47	134.48	134.29	133.42	133.42	133.26	133.76	134.29	134.67	135.06	
											134.48	(39)

Heat loss parameter (HLP), W/m²K

1.19	1.19	1.18	1.18	1.17	1.17	1.17	1.17	1.17	1.17	1.18	1.18	

HLP (average)	1.18	(40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy, N 2.84 (42)

Annual average hot water usage in litres per day Vd,average 101.62 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
111.78	107.71	103.65	99.58	95.52	91.46	91.46	95.52	99.58	103.65	107.71	111.78	(44)
Energy content of hot water used												
165.76	144.98	149.61	130.43	125.15	108.00	100.07	114.84	116.21	135.43	147.83	160.53	

Energy content (annual) 1598.83 (45)

Distribution loss												
24.86	21.75	22.44	19.56	18.77	16.20	15.01	17.23	17.43	20.31	22.17	24.08	(46)

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

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

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

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

Total storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi loss calculated for each month												
12.64	11.42	12.64	12.23	12.64	12.23	12.64	12.64	12.23	12.64	12.23	12.64	(61)
Total heat required for water heating calculated for each month												
178.41	156.40	162.25	142.66	137.79	120.23	112.71	127.48	128.44	148.07	160.06	173.17	(62)
Output from water heater for each month, kWh/month												
178.41	156.40	162.25	142.66	137.79	120.23	112.71	127.48	128.44	148.07	160.06	173.17	(64)

1747.67 (64)

Heat gains from water heating, kWh/month												
58.28	51.06	52.90	46.43	44.77	38.97	36.43	41.34	41.70	48.19	52.21	56.54	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	(66)
Lighting gains												
27.06	24.04	19.55	14.80	11.06	9.34	10.09	13.12	17.61	22.35	26.09	27.81	(67)
Appliances gains												
277.68	280.56	273.30	257.84	238.33	219.99	207.74	204.85	212.12	227.57	247.09	265.43	(68)
Cooking gains												
37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	(69)
Pumps and fans gains												
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values)												
-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	(71)
Water heating gains												
78.33	75.98	71.11	64.48	60.18	54.12	48.97	55.57	57.91	64.77	72.52	75.99	(72)
Total internal gains												
458.65	456.16	439.53	412.70	385.15	359.03	342.38	349.12	363.21	390.28	421.27	444.81	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 1.350	19.64	0.63 x 0.70	0.77	8.1031
Data					
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 3.600	19.64	0.63 x 0.70	0.77	21.6084
Data					
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 7.470	19.64	0.63 x 0.70	0.77	44.8373
Data					
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South)	0.9 x 2.280	46.75	0.63 x 0.70	0.77	32.5767
Data					
Half glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 2.100	0.00	0.63 x 0.70	0.77	0.0000
Data					
Full glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 8.400	19.64	0.63 x 0.70	0.77	50.4195
Data					

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 3.60	0.80	0.70 x 0.83	1.51
Data				

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 7.47	0.80	0.70 x 0.83	3.12
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South)	0.9 x 2.28	0.80	0.70 x 0.83	0.95
Data				

GL = 6.15 / 114.36 = 0.054
C1 = 0.500
C2 = 1.049
EI = 478

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
32.92	32.98	33.03	33.27	33.32	33.53	33.53	33.57	33.45	33.32	33.22	33.13	
alpha												
3.19	3.20	3.20	3.22	3.22	3.24	3.24	3.24	3.23	3.22	3.21	3.21	
Utilisation factor for gains for living area												
0.99	0.98	0.95	0.89	0.78	0.63	0.49	0.55	0.77	0.94	0.98	0.99	(86)
Mean internal temperature in living area T1												
18.94	19.20	19.64	20.17	20.60	20.86	20.95	20.93	20.72	20.12	19.42	18.89	(87)
Temperature during heating periods in rest of dwelling Th2												
19.93	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.94	19.94	19.94	19.94	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.97	0.94	0.87	0.74	0.55	0.39	0.44	0.71	0.92	0.98	0.99	(89)
Mean internal temperature in the rest of dwelling T2												
17.17	17.56	18.18	18.94	19.51	19.83	19.92	19.91	19.68	18.89	17.88	17.10	(90)

Living area fraction (20.91 / 114.36) 0.18 (91)
Mean internal temperature (for the whole dwelling)

17.50	17.86	18.45	19.16	19.71	20.02	20.11	20.10	19.87	19.11	18.16	17.43	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.50	17.86	18.45	19.16	19.71	20.02	20.11	20.10	19.87	19.11	18.16	17.43	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.96	0.92	0.85	0.73	0.56	0.40	0.46	0.70	0.90	0.96	0.98	(94)
Useful gains												
602.72	724.42	840.89	912.63	859.10	656.40	451.63	467.55	632.48	662.07	594.10	565.33	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
1793.41	1758.19	1618.64	1380.02	1075.94	722.94	468.30	492.53	771.80	1143.03	1489.94	1786.64	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
885.87	694.69	578.65	336.52	161.33	-	-	-	-	357.83	645.01	908.65	

Total space heating requirement per year (kWh/year) (October to May) 4568.56 (98)

Space heating requirement per m² (kWh/m²/year) 39.95 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									92.90%				(206)
Efficiency of secondary heating system									85.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
885.87	694.69	578.65	336.52	161.33	-	-	-	-	357.83	645.01	908.65		(98)
Appendix Q - monthly energy saved (main heating system 1)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(210)
Space heating fuel (main heating system 1)													
858.22	673.01	560.58	326.02	156.29	-	-	-	-	346.66	624.87	880.29		(211)
Appendix Q - monthly energy saved (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(212)
Space heating fuel (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(213)
Appendix Q - monthly energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
104.22	81.73	68.08	39.59	18.98	-	-	-	-	42.10	75.88	106.90		(215)
Water heating													
Water heating requirement													
178.41	156.40	162.25	142.66	137.79	120.23	112.71	127.48	128.44	148.07	160.06	173.17		(64)
Efficiency of water heater												87.30	(216)
89.41	89.37	89.27	89.05	88.61	87.30	87.30	87.30	87.30	89.06	89.33	89.43		(217)
Water heating fuel													
199.53	175.00	181.75	160.20	155.49	137.72	129.11	146.02	147.12	166.25	179.19	193.63		(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4425.94	(211)
Space heating fuel (secondary)	537.48	(215)
Water heating fuel	1971.03	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	130.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	175.00	(231)
Electricity for lighting (100.00% fixed LEL)	477.91	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7587.36	(238)

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4425.94	0.216	956.00	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	537.48	0.216	116.10	(263)
Water heating	1971.03	0.216	425.74	(264)
Space and water heating			1497.84	(265)
Electricity for pumps and fans	175.00	0.519	90.83	(267)
Electricity for lighting	477.91	0.519	248.04	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1836.70	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**16.06**	(273)

Project Information

Building type Semi-detached house

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Reference			
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Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England

assessed by program JPA Designer version 6.03a1, printed on 8/2/2016 at 3:53:39 PM

New dwelling as designed

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1 TER and DER

Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 16.12	
Dwelling Carbon Dioxide Emission Rate	DER = 16.06	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 49.7	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 47.4	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.20 (max. 0.30)	0.22 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.39 (max. 2.00)	1.40 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	3.00	OK
Maximum :	10.00	

4 Heating efficiency

Main heating system:

Boiler and radiators, mains gas
Ideal Logic Code Combi ES

Source of efficiency: from boiler database
Ideal Logic Code Combi ES 33
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

Room heater systems - Gas
Condensing gas fire
Efficiency: 85.00%
Minimum: 63.00% OK

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
Hot water controls	No cylinder	
Boiler Interlock	Yes	OK
Hot water controls	No cylinder	

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%
Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Midlands): OK
Slight OK

Based on:

Thermal mass parameter :	140.85
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : East

Ventilation rate :	4.00

Blinds/curtains :
Light-coloured curtain or roller blind with blinds/shutters closed 0.00% of daylight hours
None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.05, soft coat U-value 1.10 W/m²K
Ground floors U-value 0.12 W/m²K
Design air permeability 3.0 m³/h.m²

Project Information

Building type Semi-detached house

Plot number	Plot 5		
Reference			
Date	08/02/2016		
Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

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Plot 5 Victoria Court Development As-Designed

New Dwelling Plot 5 As-Designed
Victoria Court
May Bank
Brampron
ST5

Located in:	England
Region:	Midlands
Postcode:	ST5
UPRN:	
Date of assessment:	2016-02-08
Date of certificate:	2016-02-08
Assessment type:	New dwelling as designed
Tenure:	Unknown
Transaction type:	New dwelling
Related party disclosure:	No related party
PCDF revision number:	387

Property description

Dwelling type:	Semi-detached house		
Ground floor (1)	area = 44.77m²	storey height = 2.40m	
First floor	area = 44.17m²	storey height = 2.65m	
Second floor	area = 25.42m²	storey height = 2.05m	
Living area:	20.91 (fraction 0.183)		
Front of dwelling faces:	East		

Doors

Half glazed door	area = 2.10	U = 1.10	- Double-glazed, argon filled, low-E, En=0.05, soft coat (East)
Full glazed door	area = 8.40	U = 1.40	- Double-glazed, argon filled, low-E, En=0.05, soft coat (West)

Windows

Window	area = 1.35	U = 1.40	- Double-glazed, argon filled, low-E, En=0.05, soft coat (West)
Overshading:	Average or unknown (20-60 % sky blocked)		

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	Whitebridge Industrial Estate		May Bank
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Plot 5 Victoria Court Development As-Designed

Window	area = 3.60	U = 1.40	- Double-glazed, argon filled, low-E, En=0.05, soft coat (West)
Overshading:	Average or unknown (20-60 % sky blocked)		
Window	area = 7.47	U = 1.40	- Double-glazed, argon filled, low-E, En=0.05, soft coat (East)
Overshading:	Average or unknown (20-60 % sky blocked)		
Window	area = 2.28	U = 1.40	- Double-glazed, argon filled, low-E, En=0.05, soft coat (South)
Overshading:	Average or unknown (20-60 % sky blocked)		

Rooflights

Opaque Elements

Roofs	area = 29.56	U = 0.14, k = 9.0	
Walls	area = 15.20	U = 0.22, k = 9.0	Timber partition to roofspace
Walls	area = 1.53	U = 0.22, k = 9.0	Dormer walls
Walls	area = 82.26	U = 0.20, k = 60.0	
Ground floors	area = 44.77	U = 0.12, k = 80.0	
Roofs	area = 14.25	U = 0.15, k = 9.0	

Thermal bridges:	Htb = 19.35		
E10 Eaves (insulation at ceiling level) [A] E10	0.060	0.060	11.300
E12 Gable (insulation at ceiling level) [A] E12	0.240	0.240	6.900
E13 Gable (insulation at rafter level) [A] E13	0.040	0.040	7.000
E16 Corner (normal) [A] E16	0.090	0.090	10.800
E17 Corner (inverted – internal area greater than external area) [A] E17	-0.090	-0.090	10.800
E18 Party wall between dwellings (c) [A] E18	0.060	0.060	10.200

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Building type Semi-detached house

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Plot 5 Victoria Court Development As-Designed

E2 Other lintels (including other steel lintels) [A] E2	0.300	0.300	18.550
E25 Staggered party wall between dwellings (c) [D] E25	0.000	0.120	10.800
E3 Sill [A] E3	0.040	0.040	18.550
E4 Jamb [A] E4	0.050	0.050	31.200
E5 Ground floor (normal) [A] E5	0.160	0.160	13.700
E6 Intermediate floor within a dwelling [A] E6	0.070	0.070	23.900
P1 Ground floor (c) [D] P1	0.000	0.160	8.970
P2 Intermediate floor within a dwelling (c) [D] P2	0.000	0.000	8.970
P4 Roof (insulation at ceiling level) (c) [D] P4	0.000	0.240	3.000
P5 Roof (insulation at rafter level) (c) [D] P5	0.000	0.080	6.900
R8 Roof to wall (rafter) [D] R9	0.000	0.060	6.500

Thermal mass:	Calculated from k values
Pressure test:	Yes (q50 - 3.00) : measured in this dwelling : No
Ventilation:	Natural ventilation with intermittent extract fans
Number of chimneys:	0
Number of open flues:	0
Number of intermittent fans:	2
Number of passive stacks:	0
Number of sides sheltered:	2.00
Measured/design q50:	3.00
Main heating system:	Central heating systems with radiators or underfloor heating Gas boilers (including LPG) 1998 or later Condensing combi with automatic ignition Index : 17179

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Plot 5 Victoria Court Development As-Designed

	Eff 87.30% / 89.90% Ideal Logic Code Combi ES 33
	Radiators
	Pump in heated space: Yes
	Boiler has load or weather compensator: Yes
	Boiler Interlock: Yes
	Design flow temperature : > 45°C
	Central heating pump pre-2013
	Gas (mains)
Main heating controls:	Time and temperature zone control
Boiler has load compensator:	No
Boiler has weather compensator:	Yes
Boiler has emhanced load compensator:	No
Boiler interlock:	Yes
Secondary heating system:	Room heater systems
	Gas
	Condensing gas fire
	Gas (mains)
Water heating:	Combination boiler
	Combination boiler type : Instantaneous
	Solar panel: no
Water use <= 125 litres/person/day:	Yes
Low energy lights:	100.0% of fixed lighting outlets
Total fixed lighting outlets:	10
Electricity tariff:	Standard tariff
Photovoltaics 1:	Peak kW: 0.00
Photovoltaics 2:	Peak kW: 0.00

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Plot 5 Victoria Court Development As-Designed

Photovoltaics 3: Peak kW: 0.00
Conservatory: No
Fixed air conditioning: No
Smoke Control Area: Not specified
Additional allowable electricity generation :
0.00kg/m²/year

Predicted Energy Assessment

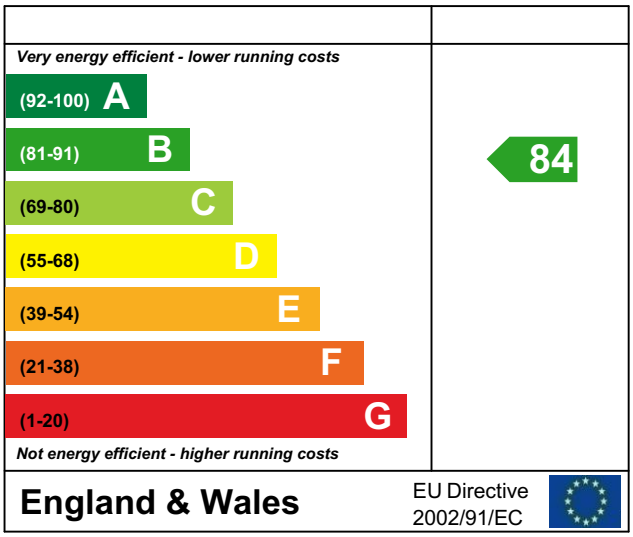
New Dwelling Plot 5 As-Designed
Victoria Court
May Bank
Brampron
ST5

Dwelling type:	Semi-detached house
Date of assessment:	8 February 2016
Produced by	Laurence Jay Limited
Total floor area:	114 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

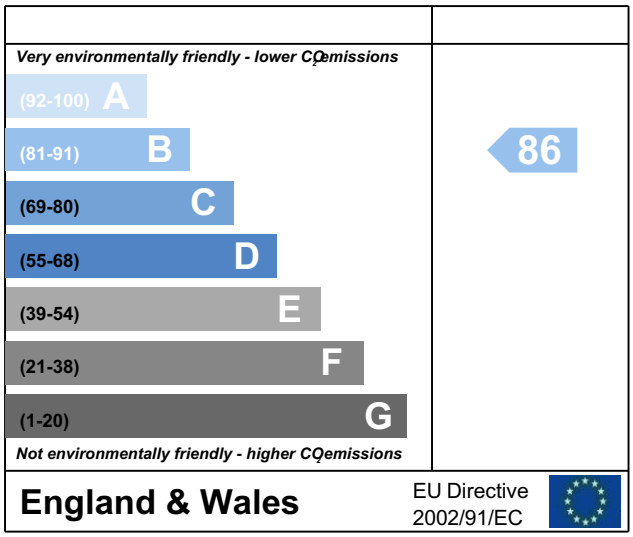
Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

Project Information

Building type Semi-detached house

Plot number	Plot 5		
Reference			
Date	08/02/2016		
Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

SAP 2012 worksheet for - calculation of fabric energy efficiency

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	44.77	2.40	107.45	(3a)
First floor	44.17	2.65	117.05	(3b)
Second floor	25.42	2.05	52.11	(3c)
Total floor area	114.36			(4)
Dwelling volume (m^3)			276.61	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.14	(8)
Pressure test, result q50	5.00		(17)
Air permeability		0.39	(18)
Number of sides on which sheltered		2.00	(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	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	
												52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	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	0.39	
												4.40 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.59	0.59	0.58	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

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**1.350**	**1.33 (1.40)**	1.79			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South) Data			**2.280**	**1.33 (1.40)**	3.02			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East) Data			**7.470**	**1.33 (1.40)**	9.90			(27)
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**3.600**	**1.33 (1.40)**	4.77			(27)
Half glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (East) Data			**2.100**	**1.10**	2.31			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (West) Data			**8.400**	**1.40**	11.76			(26)
Pitched roofs insulated between joists			29.56	0.14	4.14	9.00	266.04	(30)
Walls Timber partition to roofspace			15.20	0.22	3.34	9.00	136.80	(29)
Walls Dormer walls			1.53	0.22	0.34	9.00	13.77	(29)
Walls			82.26	0.20	16.45	60.00	4935.60	(29)
Ground floors			44.77	0.12	5.37	80.00	3581.60	(28)
Pitched roofs insulated between rafters			14.25	0.15	2.14	9.00	128.25	(30)
Party wall			55.14	0.00	0.00	70.00	3859.80	
Internal wall Internal timber partition			141.52	0.00	0.00	9.00	1273.68	
Internal floor			70.80	0.00	0.00	18.00	1274.40	
Internal ceiling			70.80	0.00	0.00	9.00	637.20	

3. Heat losses and heat loss parameter

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

Total area of external elements Sigma A, m²	212.77	(31)
Fabric heat loss, W/K	65.34	(33)
Heat capacity	16107.14	(34)
Thermal mass parameter, kJ/m²K	140.85	(35)
Effect of thermal bridges	19.35	(36)
Total fabric heat loss	84.69	(37)

Ventilation heat loss calculated monthly

53.99	53.66	53.35	51.85	51.57	50.27	50.27	50.03	50.78	51.57	52.14	52.73	(38)

Heat transfer coefficient, W/K

138.68	138.35	138.04	136.54	136.26	134.97	134.97	134.72	135.47	136.26	136.83	137.42	

136.54 (39)

Heat loss parameter (HLP), W/m²K

1.21	1.21	1.21	1.19	1.19	1.18	1.18	1.18	1.18	1.19	1.20	1.20	

HLP (average) 1.19 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy, N 2.84 (42)

Annual average hot water usage in litres per day Vd,average 101.62 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month											
111.78	107.71	103.65	99.58	95.52	91.46	91.46	95.52	99.58	103.65	107.71	111.78 (44)
Energy content of hot water used											
165.76	144.98	149.61	130.43	125.15	108.00	100.07	114.84	116.21	135.43	147.83	160.53

Energy content (annual) 1598.83 (45)

Distribution loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(46)

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

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

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

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

Total storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi loss calculated for each month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(62)
Output from water heater for each month, kWh/month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(64)

0.00 (64)

Heat gains from water heating, kWh/month												
35.23	30.81	31.79	27.72	26.59	22.95	21.27	24.40	24.69	28.78	31.41	34.11	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	(66)
Lighting gains												
27.06	24.04	19.55	14.80	11.06	9.34	10.09	13.12	17.61	22.35	26.09	27.81	(67)
Appliances gains												
277.68	280.56	273.30	257.84	238.33	219.99	207.74	204.85	212.12	227.57	247.09	265.43	(68)
Cooking gains												
37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	(71)
Water heating gains												
47.35	45.85	42.73	38.49	35.75	31.87	28.58	32.80	34.30	38.68	43.63	45.85	(72)
Total internal gains												
417.66	416.02	401.15	376.71	350.71	326.78	311.99	316.35	329.60	354.19	382.39	404.67	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 1.350 19.64	0.63 x 0.70	0.77	8.1031
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South)	0.9 x 2.280 46.75	0.63 x 0.70	0.77	32.5767
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 7.470 19.64	0.63 x 0.70	0.77	44.8373
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 3.600 19.64	0.63 x 0.70	0.77	21.6084
Data				
Half glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 2.100 0.00	0.63 x 0.70	0.77	0.0000
Data				
Full glazed door - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 8.400 19.64	0.63 x 0.70	0.77	50.4195
Data				

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 1.35	0.80	0.70 x 0.83	0.56
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (South)	0.9 x 2.28	0.80	0.70 x 0.83	0.95
Data				

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (East)	0.9 x 7.47	0.80	0.70 x 0.83	3.12
Data				
Window - Double-glazed, argon filled, low-E, En=0.05, soft coat (West)	0.9 x 3.60	0.80	0.70 x 0.83	1.51
Data				

7. Mean internal temperature

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

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
32.26	32.34	32.41	32.77	32.83	33.15	33.15	33.21	33.03	32.83	32.70	32.56	
alpha												
3.15	3.16	3.16	3.18	3.19	3.21	3.21	3.21	3.20	3.19	3.18	3.17	
Utilisation factor for gains for living area												
0.99	0.98	0.96	0.90	0.80	0.65	0.51	0.56	0.79	0.94	0.98	0.99	(86)
Mean internal temperature in living area T1												
18.85	19.12	19.56	20.11	20.57	20.85	20.95	20.93	20.69	20.06	19.35	18.80	(87)
Temperature during heating periods in rest of dwelling Th2												
19.91	19.91	19.91	19.92	19.93	19.94	19.94	19.94	19.93	19.93	19.92	19.92	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.98	0.95	0.88	0.75	0.57	0.40	0.46	0.72	0.93	0.98	0.99	(89)
Mean internal temperature in the rest of dwelling T2												
17.94	18.21	18.65	19.19	19.61	19.85	19.92	19.91	19.73	19.16	18.45	17.90	(90)

Living area fraction (20.91 / 114.36) 0.18 (91)

Mean internal temperature (for the whole dwelling)

18.11	18.38	18.82	19.36	19.78	20.03	20.10	20.09	19.91	19.32	18.61	18.07	(92)
Apply adjustment to the mean internal temperature, where appropriate												
18.11	18.38	18.82	19.36	19.78	20.03	20.10	20.09	19.91	19.32	18.61	18.07	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.94	0.87	0.74	0.58	0.42	0.47	0.72	0.91	0.97	0.99	(94)
Useful gains												
566.05	692.15	816.88	900.36	856.44	657.87	454.03	469.01	628.12	641.63	561.62	528.67	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
1914.88	1864.47	1700.06	1428.45	1101.49	732.87	473.02	497.58	786.80	1188.64	1575.56	1905.83	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
1003.53	787.80	657.08	380.22	182.32	-	-	-	-	406.97	730.03	1024.60	

Total space heating requirement per year (kWh/year) (October to May) 5172.57 (98)

Space heating requirement per m² (kWh/m²/year) 45.23 (99)

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperaturers												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	1268.67	998.74	1023.91	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.81	0.87	0.84	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	1027.36	867.95	858.09	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	495.20	475.51	482.99	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	951.03	907.67	789.55	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1446.24	1383.18	1272.53	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	17.67	-53.41	-50.87	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	301.59	383.33	308.34	-	-	-	-	(104)
Total											993.27	(104)
Cooled fraction											1.00	(105)
Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	75.40	95.83	77.09	-	-	-	-	
Space cooling (June to August)											248.32	(107)
Space cooling requirement per m² (kWh/m²/year)											2.17	(108)

8f. Fabric Energy Efficiency

	kWh/year	
Energy for space heating	45.23	(99)
Energy for space cooling	2.17	(108)
Total	47.40	(109)
Dwelling Fabric Energy Efficiency	**47.4**	(109)

Project Information

Building type Semi-detached house

Plot number	Plot 5		
Reference			
Date	08/02/2016		
Client	Byatt Oliver	Project	New Dwelling Plot 5 As-Designed
	Unit 1B Whitebridge Way		Victoria Court
	Whitebridge Industrial Estate		May Bank
	Stone		Brampron
	Staffordshire		ST5
	ST15 8LQ		
Tel:	01785 719268		
Email:	david@byattoliver.co.uk		

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	44.77	2.40	107.45	(3a)
First floor	44.17	2.65	117.05	(3b)
Second floor	25.42	2.05	52.11	(3c)
Total floor area	114.36			(4)
Dwelling volume (m^3)			276.61	(5)

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.14	(8)
Pressure test, result q50	5.00		(17)
Air permeability		0.39	(18)
Number of sides on which sheltered		2.00	(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
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	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	0.39

4.40 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.59	0.59	0.58	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

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**1.350**	**1.33 (1.40)**	1.79			(27)
Data								
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**3.600**	**1.33 (1.40)**	4.77			(27)
Data								
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)			**7.470**	**1.33 (1.40)**	9.90			(27)
Data								
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South)			**2.280**	**1.33 (1.40)**	3.02			(27)
Data								
Half glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)			**2.100**	**1.20**	2.52			(26)
Data								
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West)			**8.400**	**1.40**	11.76			(26)
Data								
Pitched roofs insulated between joists			29.56	0.13	3.84	9.00	266.04	(30)
Walls			15.20	0.18	2.74	9.00	136.80	(29)
Timber partition to roofspace								
Walls			1.53	0.18	0.28	9.00	13.77	(29)
Dormer walls								
Walls			82.26	0.18	14.81	60.00	4935.60	(29)
Ground floors			44.77	0.13	5.82	80.00	3581.60	(28)
Pitched roofs insulated between rafters			14.25	0.13	1.85	9.00	128.25	(30)
Party wall			55.14	0.00	0.00	70.00	3859.80	
Internal wall			141.52	0.00	0.00	9.00	1273.68	
Internal timber partition								
Internal floor			70.80	0.00	0.00	18.00	1274.40	
Internal ceiling			70.80	0.00	0.00	9.00	637.20	

3. Heat losses and heat loss parameter

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

Total area of external elements Sigma A, m²	212.77	(31)
Fabric heat loss, W/K	63.10	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	10.54	(36)
Total fabric heat loss	73.64	(37)

Ventilation heat loss calculated monthly

53.99	53.66	53.35	51.85	51.57	50.27	50.27	50.03	50.78	51.57	52.14	52.73	(38)

Heat transfer coefficient, W/K

127.63	127.30	126.99	125.49	125.22	123.92	123.92	123.67	124.42	125.22	125.78	126.37	
											125.49	(39)

Heat loss parameter (HLP), W/m²K

1.12	1.11	1.11	1.10	1.09	1.08	1.08	1.08	1.09	1.09	1.10	1.11	

HLP (average) 1.10 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy, N 2.84 (42)

Annual average hot water usage in litres per day Vd,average 101.62 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month											
111.78	107.71	103.65	99.58	95.52	91.46	91.46	95.52	99.58	103.65	107.71	111.78 (44)
Energy content of hot water used											
165.76	144.98	149.61	130.43	125.15	108.00	100.07	114.84	116.21	135.43	147.83	160.53

Energy content (annual) 1598.83 (45)

Distribution loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(46)

Hot water storage volume (litres) 0.00 (50)

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

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

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

Total storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
Net storage loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary loss												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi loss calculated for each month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(62)
Output from water heater for each month, kWh/month												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(64)

0.00 (64)

Heat gains from water heating, kWh/month												
35.23	30.81	31.79	27.72	26.59	22.95	21.27	24.40	24.69	28.78	31.41	34.11	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	141.93	(66)
Lighting gains												
27.06	24.04	19.55	14.80	11.06	9.34	10.09	13.12	17.61	22.35	26.09	27.81	(67)
Appliances gains												
277.68	280.56	273.30	257.84	238.33	219.99	207.74	204.85	212.12	227.57	247.09	265.43	(68)
Cooking gains												
37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	37.19	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	-113.54	(71)
Water heating gains												
47.35	45.85	42.73	38.49	35.75	31.87	28.58	32.80	34.30	38.68	43.63	45.85	(72)
Total internal gains												
417.66	416.02	401.15	376.71	350.71	326.78	311.99	316.35	329.60	354.19	382.39	404.67	(73)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East)	0.9 x 7.47	0.80	0.70 x 0.83	3.12
Data				
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South)	0.9 x 2.28	0.80	0.70 x 0.83	0.95
Data				

7. Mean internal temperature

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

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
62.22	62.38	62.54	63.28	63.42	64.09	64.09	64.21	63.83	63.42	63.14	62.84	
alpha												
5.15	5.16	5.17	5.22	5.23	5.27	5.27	5.28	5.26	5.23	5.21	5.19	
Utilisation factor for gains for living area												
1.00	1.00	0.99	0.95	0.84	0.66	0.49	0.56	0.84	0.98	1.00	1.00	(86)
Mean internal temperature in living area T1												
19.71	19.89	20.19	20.56	20.84	20.97	20.99	20.99	20.89	20.49	20.03	19.69	(87)
Temperature during heating periods in rest of dwelling Th2												
19.99	19.99	19.99	20.00	20.00	20.01	20.01	20.02	20.01	20.00	20.00	20.00	(88)
Utilisation factor for gains for rest of dwelling												
1.00	1.00	0.98	0.93	0.79	0.57	0.39	0.45	0.76	0.97	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
18.81	18.99	19.29	19.65	19.90	20.00	20.01	20.01	19.95	19.59	19.13	18.79	(90)

Living area fraction (20.91 / 114.36) 0.18 (91)

Mean internal temperature (for the whole dwelling)

18.97	19.16	19.45	19.82	20.07	20.18	20.19	20.19	20.12	19.76	19.30	18.95	(92)

Apply adjustment to the mean internal temperature, where appropriate

18.97	19.16	19.45	19.82	20.07	20.18	20.19	20.19	20.12	19.76	19.30	18.95	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	1.00	0.98	0.93	0.80	0.59	0.41	0.47	0.77	0.97	1.00	1.00	(94)
Useful gains												
574.29	710.31	856.01	968.02	918.06	670.75	442.77	464.13	670.84	679.88	574.61	535.00	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
1872.77	1814.73	1644.56	1370.37	1048.31	691.03	445.13	468.90	749.25	1146.71	1534.07	1864.12	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
966.07	742.17	586.68	289.69	96.91	-	-	-	-	347.33	690.81	988.87	

Total space heating requirement per year (kWh/year) (October to May) 4708.52 (98)

Space heating requirement per m² (kWh/m²/year) 41.17 (99)

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperaturers												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	1164.81	916.97	939.93	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.92	0.96	0.94	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	1067.30	878.69	881.63	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	495.20	475.51	482.99	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	951.03	907.67	789.55	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1446.24	1383.18	1272.53	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	1311.94	1532.11	1511.82	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	272.83	375.34	290.83	-	-	-	-	(104)

Total	939.01	(104)
Cooled fraction	1.00	(105)

Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	68.21	93.84	72.71	-	-	-	-	

Space cooling (June to August)	234.75	(107)
Space cooling requirement per m² (kWh/m²/year)	2.05	(108)

8f. Fabric Energy Efficiency

	kWh/year	
Energy for space heating	41.17	(99)
Energy for space cooling	2.05	(108)
Total	43.23	(109)
Target Fabric Energy Efficiency	**49.7**	(109)

= 43.2256 x 1.15, rounded to 1 d.p.