

Project Information

Building type End-terrace house

Plot number Plot 01

Reference

Date 9 August 2010

Client Mr R T Builder Project Brownfield Mews
The Old Yard Ochre
Tawnyville Suedeshire
Suedeshire EH1
BN123DR

SAP 2012 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	36.40	2.40	87.36	(3a)
First floor	36.40	2.66	96.82	(3b)
Total floor area	72.80			(4)
Dwelling volume (m ³)			184.18	(5)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	3	x 10	30.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.16	(8)									
Pressure test, result q50	7.00			(17)									
Air permeability			0.51	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.44	(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)													
0.56	0.54	0.53	0.48	0.47	0.41	0.41	0.40	0.44	0.47	0.49	0.51		
												5.72	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.58	0.60	0.61	0.62	0.63	(25)	

SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East/West)			16.350	1.33 (1.40)	21.68	(27)
Reference Glazing						
Solid door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East/West)			1.850	1.40	2.59	(26)
Reference Door						
Pitched roofs insulated between joists			36.40	0.11	4.00	(30)
Roof						
Walls			28.08	0.17	4.77	(29)
First floor, external wall						
Walls			41.76	0.17	7.10	(29)
Ground floor external wall						
Ground floors			36.40	0.15	5.46	(28)
Suspended concrete floor						
Party wall			18.62	0.00	0.00	
Party wall upstairs						
Party wall			16.80	0.00	0.00	
Ground floor party wall						
Internal wall			43.04	0.00	0.00	
ground floor						
Internal wall			37.90	0.00	0.00	
Internal wall upstairs						
Internal wall			34.43	0.00	0.00	
Upstairs, framed partition						
Internal floor			36.40	0.00	0.00	
First floor						
Internal ceiling			36.40	0.00	0.00	
Ground floor ceiling						

SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K								
Total area of external elements Sigma A, m ²						160.84 (31)							
Fabric heat loss, W/K						45.60 (33)							
Heat capacity						14176.73 (34)							
Thermal mass parameter, kJ/m ² K						198.44 (35)							
Effect of thermal bridges						12.87 (36)							
Total fabric heat loss						58.47 (37)							
Ventilation heat loss calculated monthly													
	39.78	39.41	39.06	37.38	37.06	35.60	35.60	35.33	36.17	37.06	37.70	38.36	(38)
Heat transfer coefficient, W/K													
	98.25	97.89	97.53	95.85	95.54	94.07	94.07	93.80	94.64	95.54	96.17	96.83	95.85 (39)
Heat loss parameter (HLP), W/m ² K													
	1.35	1.34	1.34	1.32	1.31	1.29	1.29	1.29	1.30	1.31	1.32	1.33	
HLP (average)													1.32 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for notional dwelling - calculation of target emissions

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.31 (42)
 Annual average hot water usage in litres per day Vd, average 93.80 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Hot water usage in litres per day for each month

103.18	99.43	95.68	91.93	88.18	84.42	84.42	88.18	91.93	95.68	99.43	103.18	(44)
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Energy content of hot water used

153.02	133.83	138.10	120.40	115.53	99.69	92.38	106.01	107.27	125.01	136.46	148.19
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Energy content (annual) 1475.89 (45)

Distribution loss

22.95	20.07	20.72	18.06	17.33	14.95	13.86	15.90	16.09	18.75	20.47	22.23	(46)
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Cylinder volume, l 150.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 1.89 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.02 (55)

Total storage loss

31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	(56)
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Net storage loss

31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	(57)
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Primary loss

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)
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Total heat required for water heating calculated for each month

207.92	183.42	193.00	173.53	170.43	152.82	147.28	160.91	160.40	179.92	189.59	203.09	(62)
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Waste water heat recovery

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(G10)
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Output from water heater for each month, kWh/month

207.92	183.42	193.00	173.53	170.43	152.82	147.28	160.91	160.40	179.92	189.59	203.09	(64)
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2122.31 (64)

Heat gains from water heating, kWh/month

94.80	84.17	89.84	82.54	82.33	75.65	74.64	79.17	78.17	85.49	87.88	93.19	(65)
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SAP 2012 worksheet for notional dwelling - calculation of target emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	(66)
Lighting gains												
18.16	16.13	13.12	9.93	7.42	6.27	6.77	8.80	11.82	15.00	17.51	18.67	(67)
Appliances gains												
203.74	205.86	200.53	189.19	174.87	161.41	152.42	150.31	155.64	166.98	181.30	194.75	(68)
Cooking gains												
34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	(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)												
-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	(71)
Water heating gains												
127.42	125.25	120.75	114.63	110.66	105.07	100.32	106.41	108.57	114.90	122.05	125.26	(72)
Total internal gains												
410.00	407.92	395.08	374.43	353.64	333.43	320.20	326.20	336.71	357.57	381.54	399.36	(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 (East/West) Reference Glazing	0.9 x 16.350	19.64 0.63 x 0.70	0.77	98.1379								
Solid door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East/West) Reference Door	0.9 x 1.850	0.00 0.63 x 0.70	0.77	0.0000								
Total solar gains, January				98.14	(83-1)							
Solar gains												
98.14	191.98	316.16	461.10	565.10	578.48	550.74	473.07	367.71	227.80	122.37	80.70	(83)
Total gains												
508.14	599.90	711.24	835.54	918.74	911.91	870.93	799.28	704.41	585.37	503.91	480.07	(84)

Lighting calculations

	Area	g	FF x Shading
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East/West) Reference Glazing	0.9 x 16.35	0.80	0.70 x 0.83 6.84

SAP 2012 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

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

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

40.84	41.00	41.15	41.87	42.01	42.66	42.66	42.78	42.40	42.01	41.73	41.44
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alpha

3.72	3.73	3.74	3.79	3.80	3.84	3.84	3.85	3.83	3.80	3.78	3.76
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Utilisation factor for gains for living area

0.99	0.98	0.96	0.90	0.78	0.61	0.46	0.52	0.76	0.94	0.98	0.99
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(86)

Mean internal temperature in living area T1

19.32	19.54	19.92	20.39	20.74	20.93	20.98	20.97	20.83	20.34	19.75	19.29
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(87)

Temperature during heating periods in rest of dwelling Th2

19.80	19.81	19.81	19.83	19.83	19.85	19.85	19.85	19.84	19.83	19.82	19.82
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(88)

Utilisation factor for gains for rest of dwelling

0.99	0.98	0.95	0.87	0.72	0.52	0.35	0.40	0.68	0.92	0.98	0.99
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(89)

Mean internal temperature in the rest of dwelling T2

17.59	17.92	18.46	19.13	19.58	19.80	19.84	19.84	19.70	19.08	18.23	17.57
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(90)

Living area fraction (21.00 / 72.80) 0.29 (91)

Mean internal temperature (for the whole dwelling)

18.09	18.39	18.88	19.49	19.92	20.12	20.17	20.16	20.02	19.44	18.67	18.06
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(92)

Apply adjustment to the mean internal temperature, where appropriate

17.94	18.24	18.73	19.34	19.77	19.97	20.02	20.01	19.87	19.29	18.52	17.91
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(93)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

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	0.86	0.72	0.53	0.36	0.42	0.68	0.90	0.97	0.99	(94)
Useful gains												
499.53	581.64	665.88	715.35	658.85	480.78	317.15	331.71	480.85	529.15	489.24	473.35	(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												
1340.32	1305.37	1192.81	1001.02	770.58	505.53	321.59	338.99	546.52	830.50	1098.47	1327.99	(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												
625.55	486.34	392.03	205.69	83.13	-	-	-	-	224.20	438.65	635.86	
Total space heating requirement per year (kWh/year) (October to May)										3091.44	(98)	
Space heating requirement per m ² (kWh/m ² /year)										42.46	(99)	

SAP 2012 worksheet for notional dwelling - calculation of target emissions

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										93.00%			(206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
625.55	486.34	392.03	205.69	83.13	-	-	-	-	224.20	438.65	635.86		(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)													
672.63	522.95	421.54	221.17	89.38	-	-	-	-	241.08	471.66	683.72		(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)
<u>Water heating</u>													
Water heating requirement													
207.92	183.42	193.00	173.53	170.43	152.82	147.28	160.91	160.40	179.92	189.59	203.09		(64)
Efficiency of water heater										79.80			(216)
87.22	86.96	86.36	85.03	82.88	79.80	79.80	79.80	79.80	85.15	86.66	87.30		(217)
Water heating fuel													
238.39	210.93	223.49	204.09	205.63	191.51	184.56	201.64	201.00	211.28	218.79	232.64		(219)
Annual totals												kWh/year	
Space heating fuel used, main system 1										3324.13			(211)
Space heating fuel (secondary)										0.00			(215)
Water heating fuel										2523.95			(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)										320.74			(232)
Energy saving/generation technologies													
kWp from floor area: 0.01 x total floor area = 0.73													
kWp from roof area limit: 0.3 x 1.15 x 0.12 x 36.40 = 1.51													
PVs 0.80 x 0.730 x 1029.187 x 1.000										601.045			
PVs 0.80 x 0.000 x 0.000 x 0.500										0.000			
PVs 0.80 x 0.000 x 0.000 x 0.500										0.000			
										601.045			(233)

Appendix Q -

JPA Designer Version 6.01x IES iSAP, SAP Version 9.92													
Energy saved or generated ():										0.000			(236a)
Licensed to: writelines										0.000			(237a)
Energy used ():										0.000			(237a)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	3324.13	0.216	718.01	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.000	0.00	(263)
Water heating	2523.95	0.216	545.17	(264)
Space and water heating			1263.18	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	320.74	0.519	166.46	(268)
Electricity generated - PVs	-601.05	0.519	-311.94	(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			1156.63	(272)
	TER	Heat fraction	kg/m²/year	
Target Carbon Dioxide Emission Rate (TER)			15.89	(273)

= sum of kg/m²/year, rounded to 2 d.p.

Project Information

Building type End-terrace house

Plot number Plot 01

Reference

Date 9 August 2010

Client Mr R T Builder Project Brownfield Mews
The Old Yard Ochre
Tawnyville Suedeshire
Suedeshire EH1
BN123DR

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

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	36.40	2.40	87.36	(3a)
First floor	36.40	2.66	96.82	(3b)
Total floor area	72.80			(4)
Dwelling volume (m ³)			184.18	(5)

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

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	2	x 10	20.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.11	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.36	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.30	(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)													
0.39	0.38	0.37	0.34	0.33	0.29	0.29	0.28	0.30	0.33	0.34	0.36		
												4.00	(22b)
Ventilation : natural ventilation, intermittent extract fans													
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	0.56	(25)	

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W4			1.440	1.33 (1.40)	1.91			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W5			1.100	1.33 (1.40)	1.46			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (West) W6			0.720	1.33 (1.40)	0.95			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W7			1.100	1.33 (1.40)	1.46			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W8			1.440	1.33 (1.40)	1.91			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W3			1.440	1.33 (1.40)	1.91			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W2			1.100	1.33 (1.40)	1.46			(27)
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W1			1.440	1.33 (1.40)	1.91			(27)
Solid door D1			1.960	1.60	3.14			(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.2, hard coat (West) D2			1.960	1.40	2.74			(26)
Pitched roofs insulated between joists Roof			36.40	0.11	4.00	9.00	327.60	(30)
Walls First floor, external wall			40.48	0.17	6.88	60.00	2428.80	(29)
Walls Ground floor external wall			33.86	0.17	5.76	60.00	2031.60	(29)

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Ground floors			36.40	0.15	5.46	75.00	2730.00	(28)					
Suspended concrete floor													
Party wall			18.62	0.20	3.72	70.00	1303.40						
Party wall upstairs													
Party wall			16.80	0.20	3.36	70.00	1176.00						
Ground floor party wall													
Internal wall			34.43	0.00	0.00	9.00	309.87						
Upstairs, framed partition													
Internal wall			43.04	0.00	0.00	39.00	1678.56						
ground floor													
Internal wall			37.90	0.00	0.00	39.00	1478.10						
Internal wall upstairs													
Internal floor			36.40	0.00	0.00	18.00	655.20						
First floor													
Internal ceiling			36.40	0.00	0.00	9.00	327.60						
Ground floor ceiling													
Total area of external elements Sigma A, m ²							160.84	(31)					
Fabric heat loss, W/K							48.03	(33)					
Heat capacity							14.03	(34)					
Thermal mass parameter, kJ/m ² K							198.44	(35)					
Effect of thermal bridges							14.03	(36)					
Total fabric heat loss							62.06	(37)					
Ventilation heat loss calculated monthly													
	34.98	34.80	34.63	33.81	33.65	32.94	32.94	32.81	33.21	33.65	33.96	34.29	(38)
Heat transfer coefficient, W/K													
	97.04	96.86	96.68	95.86	95.71	95.00	95.00	94.86	95.27	95.71	96.02	96.35	95.86 (39)
Heat loss parameter (HLP), W/m ² K													
	1.33	1.33	1.33	1.32	1.31	1.30	1.30	1.30	1.31	1.31	1.32	1.32	1.32 (40)
HLP (average)													
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	

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

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.31 (42)
 Annual average hot water usage in litres per day Vd,average 93.80 (43)

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

Hot water usage in litres per day for each month

103.18	99.43	95.68	91.93	88.18	84.42	84.42	88.18	91.93	95.68	99.43	103.18	(44)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	------

Energy content of hot water used

153.02	133.83	138.10	120.40	115.53	99.69	92.38	106.01	107.27	125.01	136.46	148.19
--------	--------	--------	--------	--------	-------	-------	--------	--------	--------	--------	--------

Energy content (annual) 1475.89 (45)

Distribution loss

22.95	20.07	20.72	18.06	17.33	14.95	13.86	15.90	16.09	18.75	20.47	22.23	(46)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Hot water storage volume (litres) 160.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0152 (51)

Volume factor 0.9086 (52)

Temperature factor 0.5400 (53)

Energy lost from hot water cylinder (kWh/day) 1.19 (55)

Total storage loss

36.95	33.38	36.95	35.76	36.95	35.76	36.95	36.95	35.76	36.95	35.76	36.95	(56)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Net storage loss

36.95	33.38	36.95	35.76	36.95	35.76	36.95	36.95	35.76	36.95	35.76	36.95	(57)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Primary loss

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)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Total heat required for water heating calculated for each month

213.23	188.22	198.32	178.67	175.74	157.96	152.59	166.22	165.54	185.23	194.74	208.41	(62)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Output from water heater for each month, kWh/month

213.23	188.22	198.32	178.67	175.74	157.96	152.59	166.22	165.54	185.23	194.74	208.41	(64)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

2184.88 (64)

Heat gains from water heating, kWh/month

99.05	88.01	94.09	86.65	86.59	79.77	78.89	83.42	82.29	89.74	91.99	97.45	(65)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic gains, Watts													
115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	115.61	(66)
Lighting gains													
23.60	20.96	17.04	12.90	9.65	8.14	8.80	11.44	15.35	19.49	22.75	24.25		(67)
Appliances gains													
203.74	205.86	200.53	189.19	174.87	161.41	152.42	150.31	155.64	166.98	181.30	194.75		(68)
Cooking gains													
34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	34.56	(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	3.00	(70)
Losses e.g. evaporation (negative values)													
-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	-92.49	(71)
Water heating gains													
133.13	130.97	126.47	120.35	116.38	110.79	106.03	112.12	114.29	120.62	127.77	130.98		(72)
Total internal gains													
421.15	418.46	404.72	383.12	361.57	341.02	327.94	334.55	345.96	367.77	392.49	410.66		(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W4	0.9 x 1.440 10.63	0.72 x 0.70	0.77	5.3481
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W5	0.9 x 1.100 10.63	0.72 x 0.70	0.77	4.0853
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (West) W6	0.9 x 0.720 19.64	0.72 x 0.70	0.77	4.9391
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W7	0.9 x 1.100 46.75	0.72 x 0.70	0.77	17.9621
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W8	0.9 x 1.440 46.75	0.72 x 0.70	0.77	23.5140
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W3	0.9 x 1.440 46.75	0.72 x 0.70	0.77	23.5140
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W2	0.9 x 1.100 46.75	0.72 x 0.70	0.77	17.9621

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

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W1	0.9 x 1.440 10.63	0.72 x 0.70	0.77	5.3481
Solid door D1	0.9 x 1.960 0.00	0.00 x 0.70	0.77	0.0000
Full glazed door - Double-glazed, air-filled, low-E, En=0.2, hard coat (West) D2	0.9 x 1.960 19.64	0.72 x 0.70	0.77	13.4452

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W4	0.9 x 1.44	0.80	0.70 x 0.83	0.60
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W5	0.9 x 1.10	0.80	0.70 x 0.83	0.46
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (West) W6	0.9 x 0.72	0.80	0.70 x 0.83	0.30
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W7	0.9 x 1.10	0.80	0.70 x 0.83	0.46
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W8	0.9 x 1.44	0.80	0.70 x 0.83	0.60
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W3	0.9 x 1.44	0.80	0.70 x 0.83	0.60
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (South) W2	0.9 x 1.10	0.80	0.70 x 0.83	0.46
Window - Double-glazed, air-filled, low-E, En=0.2, hard coat (North) W1	0.9 x 1.44	0.80	0.70 x 0.83	0.60

GL = 4.09 / 72.80 = 0.056

C1 = 0.600

C2 = 1.039

EI = 417

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

7. Mean internal temperature

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

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

tau

41.36	41.43	41.51	41.86	41.93	42.24	42.24	42.30	42.12	41.93	41.79	41.65
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

alpha

3.76	3.76	3.77	3.79	3.80	3.82	3.82	3.82	3.81	3.80	3.79	3.78
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

0.99	0.98	0.96	0.92	0.84	0.70	0.54	0.59	0.79	0.94	0.98	0.99
------	------	------	------	------	------	------	------	------	------	------	------

(86)

Mean internal temperature in living area T1

19.39	19.59	19.90	20.30	20.65	20.88	20.97	20.95	20.79	20.34	19.79	19.35
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(87)

Temperature during heating periods in rest of dwelling Th2

19.82	19.82	19.82	19.83	19.83	19.84	19.84	19.84	19.83	19.83	19.83	19.82
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(88)

Utilisation factor for gains for rest of dwelling

0.99	0.98	0.95	0.90	0.79	0.61	0.41	0.46	0.72	0.92	0.98	0.99
------	------	------	------	------	------	------	------	------	------	------	------

(89)

Mean internal temperature in the rest of dwelling T2

18.37	18.57	18.88	19.27	19.59	19.78	19.83	19.82	19.72	19.32	18.78	18.34
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(90)

Living area fraction (21.00 / 72.80) 0.29 (91)

Mean internal temperature (for the whole dwelling)

18.66	18.86	19.17	19.56	19.89	20.10	20.16	20.15	20.03	19.62	19.07	18.63
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(92)

Apply adjustment to the mean internal temperature, where appropriate

18.66	18.86	19.17	19.56	19.89	20.10	20.16	20.15	20.03	19.62	19.07	18.63
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(93)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.98	0.97	0.95	0.90	0.80	0.63	0.45	0.49	0.73	0.91	0.97	0.99	(94)
Useful gains												
527.98	600.40	648.96	665.15	616.98	474.94	327.78	341.49	477.46	537.83	516.13	502.41	(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												
1393.68	1352.45	1225.27	1022.17	784.07	522.11	337.74	355.69	564.74	862.85	1149.59	1389.99	(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												
644.08	505.38	428.77	257.06	124.32	-	-	-	-	241.82	456.09	660.36	
Total space heating requirement per year (kWh/year) (October to May)										3317.87	(98)	
Space heating requirement per m ² (kWh/m ² /year)										45.58	(99)	

8c. Space cooling requirement - not applicable

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

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										89.90%			(206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
644.08	505.38	428.77	257.06	124.32	-	-	-	-	241.82	456.09	660.36		(98)
Appendix Q - monthly energy saved (main heating system 1)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(210)
Space heating fuel (main heating system 1)													
716.44	562.15	476.94	285.94	138.29	-	-	-	-	268.98	507.33	734.55		(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)
<u>Water heating</u>													
Water heating requirement													
213.23	188.22	198.32	178.67	175.74	157.96	152.59	166.22	165.54	185.23	194.74	208.41		(64)
Efficiency of water heater										79.80			(216)
87.16	86.91	86.44	85.46	83.70	79.80	79.80	79.80	79.80	85.22	86.62	87.25		(217)
Water heating fuel													
244.66	216.56	229.43	209.06	209.98	197.95	191.22	208.30	207.45	217.35	224.82	238.86		(219)
Annual totals												kWh/year	
Space heating fuel used, main system 1										3690.63			(211)
Space heating fuel (secondary)										0.00			(215)
Water heating fuel										2595.62			(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 (80.00% fixed LEL)										416.71			(232)
Energy saving/generation technologies													
PVs 0.80 x 1.000 x 1068.070 x 0.800										683.565			
PVs 0.80 x 0.000 x 0.000 x 0.500										0.000			
PVs 0.80 x 0.000 x 0.000 x 0.500										0.000			
										683.565			(233)
Appendix Q -													
Energy saved or generated ():										0.000			(236a)
Energy used ():										0.000			(237a)
Total delivered energy for all uses										6094.40			(238)

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

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	3690.63	0.216	797.18	(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	2595.62	0.216	560.65	(264)
Space and water heating			1357.83	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	416.71	0.519	216.27	(268)
Electricity generated - PVs	-683.57	0.519	-354.77	(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			1258.26	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			17.28	(273)

Project Information

Building type End-terrace house

Plot number Plot 01

Reference

Date 9 August 2010

Client	Mr R T Builder	Project	Brownfield Mews
	The Old Yard		Ochre
	Tawnyville		Suedeshire
	Suedeshire		EH1
	BN123DR		

REGULATION COMPLIANCE REPORT - Domestic Handbook 2015, Section 6

assessed by program JPA Designer version 6.03a1, printed on 15/2/2016 at 17:00:00

New dwelling as designed

1 TER and DER

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

Target Carbon Dioxide Emission Rate	TER = 15.89	
Dwelling Carbon Dioxide Emission Rate	DER = 17.28	Fail
Excess emissions = 1.40kg/m ² (8.8%)		

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

4 Fabric U-values

<u>Element</u>	<u>Average</u>	<u>Highest</u>	
Wall	0.17 (max. 0.22)	0.17 (max. 0.70)	OK
Party Wall	0.20 (max. 0.20)	-	OK
Floor	0.15 (max. 0.18)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.15)	0.11 (max. 0.35)	OK
Openings	1.43 (max. 1.60)	1.60 (max. 3.30)	OK

5 Air permeability

Air permeability at 50 pascals:	5.00	OK
---------------------------------	------	----

6 Heating efficiency

Main heating system:

Boiler and radiators, mains gas

Source of efficiency: from manufacturer

Efficiency: 89.0% SEDBUK2009

Minimum: 88.0%

OK

Secondary heating system:

None -

7 Cylinder insulation

Hot water storage

Calculated cylinder loss factor (kWh/day)

2.21

Permitted by DBSCG

1.96

Fail

Primary pipework insulated

Yes

OK

8 Controls

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

Space heating controls

Programmer + TRVs + boiler energy manager

OK

Cylinderstat - Yes

OK

Independent timer for DHW - Yes

OK

Boiler Interlock

Yes

OK

9 Low energy lights

Percentage of fixed lights with low-energy fittings: 80.0%

Minimum: 75.0%

OK

10 Mechanical ventilation

Not applicable

Summertime temperature

Overheating risk (East Scotland):

Not significant

OK

OK

Based on:

Thermal mass parameter : 198.44

Overshading : Average or unknown (20-60 % sky blocked)

Orientation : North

Ventilation rate : 4.00

Blinds/curtains :

None with blinds/shutters closed 0.00% of daylight hours

1b Key features

Pitched roofs insulated between joists U-value 0.11 W/m²K

Photovoltaic array

