Energy Consultancy

Plot 1

John Rous Avenue

Canley

Coventry

Design Stage Report

Standard Assessment Procedure (SAP) &
Predicted Energy Assessment (EPC)

CNC CS
Project Ref:
EC778

RICS Professionals delivering value

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Clients Name:
Orbit Housing

CNC CS Project Number:
EC778

Project Address:
Plot 1, John Rous Avenue, Canley, Coventry

Project Description:
New Dwelling

Energy Consultant:
John Fleming
(STROMA Membership No. 005885)

Service:
Assessment, Calculation and Recommendations Report using STROMA accredited SAP 2009 software to produce the Standard Assessment Procedure (SAP) and Energy Performance Certificate (EPC)

Date: 16th May 2013

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Predicated Energy Assessment (PEA)

1.0 Introduction

We have been engaged by Beattie Passie to carry out a Standard Assessment Procedure (SAP) and Energy Performance Certificate (EPC) for the proposed new dwelling at Plot 1, John Rous Avenue, Canley, Coventry.

The purpose of this report is to advise the client on the energy performance of the new dwelling and to demonstrate compliance with Approved Document L1A of the Building Regulations.

Our terms of reference relate to our quotation dated 22.02.2013.

2.0 Information provided to carry out the assessments

Our assessment is based on the following information supplied by our client's agent Beattie Passive:

Drawings:	536.06J, 536.07F, 536.08A, 536.09, 536.10A, 536.11C, 536.12
Emails:	25.02.2013

3.0 Clients Brief

The client requires the standard service to show compliance with Approved Document L1A of the Building Regulations and to provide an Energy Performance Certificate (EPC) on completion.

4.0 Assessment Methodology

The Standard Assessment Procedure (SAP) 2009 has been adopted by government as part of the UK national methodology for the calculation of the energy performance of new buildings. It is used to demonstrate compliance with building regulations for dwellings - Part L (England and Wales) and to provide energy ratings for dwellings.

The program calculates the annual energy costs for space and water heating, and lighting. These depend on the insulation and air tightness of the house and the efficiency and control of the heating system. The calculation uses the Building Research Establishment's Domestic Energy Model (BREDEM). Also the program can calculate the total CO_2 emissions generated if this is part of the clients brief and T+C Contract.

5.0 Conclusion

The design information pertaining to the design stage SAP is contained in the enclosed SAP data sheets within this report.

We have been able to demonstrate that the proposed dwelling complies with the requirements of Approved Document L1A of the Building Regulations based on the modelling of the proposed building, the information supplied and the assumptions and summary of assessments as stated above.

The results of our assessment are as follows:

Dwelling Emission Rating (DER)	11.33KgCO$_2$/m^2.annum
Target Emission Rating (TER)	20.06KgCO$_2$/m^2.annum

Compliance is achieved because the Dwelling Emission Rating (DER) is lower than the Target Emission Rating (TER).

6.0 As-Built Stage

It is important that you agree with the design parameters and assumptions made, as changes to the design parameters during the construction of the dwelling may effect the overall as-built SAP assessment. The proposed changes could result in enhancements having to be made to bring the as-built SAP back into compliance and may delay the issuing of a completion certificate from the building control body. *Therefore, it is important that any changes are reported to us so we can model the overall effect on the assessment and relay our comments back to the design team and contractor.*

Upon completion of the works an as-built SAP will be required, taking into account the as-built construction and any changes or modifications on site. We will ask you to confirm in writing that the as-built status is as per our original assessment, assumptions and design parameters or confirm in writing what changes have been made so we can re-calculate these changes. Assuming any changes do not affect the overall compliance status an Energy Performance Certificate will be formally issued to you.

There is certain documentary evidence required prior to completion and before we can formally issue the final Energy Performance Certificate. These include;

- Completed air test certificate
- Full commissioning certificate for the heating system,
- Full postal address agreed with Royal Mail or the local authority and

- Declaration that the construction conforms to the design stage SAP assessment.

Without the above we will not be able to formally issue the as-built SAP assessment and Energy Performance Certificate. We recommend that you contact us at least 4 weeks before handover so we are able to produce the as-built SAP and Energy Performance Certificate.

Report Prepared by:

John Fleming
Sustainability Surveyor

Design Stage
L1A 2010 Regulation Analysis

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.37
Printed on 16 May 2013 at 14:23:45

Project Information:

Assessed By: John Fleming (STRO005885) **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : Plot 1 **Plot Reference:** Passive House

Address : Plot 1, John Rous Avenue, Canley, Coventry, CV4 8ES

Client Details:

Name: Orbit Housing

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1 TER and DER

Fuel for main heating system: Natural gas
Fuel factor: 1.00 (natural gas)

Target Carbon Dioxide Emission Rate (TER)	20.06 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.33 kg/m²	**OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.08 (max. 0.30)	0.08 (max. 0.70)	**OK**
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	**OK**
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	**OK**
Openings	0.76 (max. 2.00)	0.76 (max. 3.30)	**OK**

3 Air permeability

Air permeability at 50 pascals	0.50	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Database: (rev 338, product index 016646): Boiler system with radiators or underfloor - mains gas Brand name: Vokera Model: Linea Model qualifier: One (Combi boiler) Efficiency 89.2 % SEDBUK2009 Minimum 88.0 %	**OK**
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control	**OK**
Hot water controls:	No cylinder	
Boiler interlock:	Yes	**OK**

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.78	
Maximum	1.5	**OK**
MVHR efficiency:	91%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Midlands):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	0.95m²,
Windows facing: North	0.95m²,
Windows facing: North	0.95m²,
Windows facing: South	3.78m²,
Windows facing: South	3.78m²,
Windows facing: South	1.89m²,
Windows facing: South	0.95m²,
Windows facing: South	1.89m²,
Windows facing: East	1.89m²,
Ventilation rate:	4.00
Blinds/curtains:	None
	shutter closed 100% of daylight hours

10 Key features

Thermal bridging	0.01
Air permeablility	0.5 m³/m²h
Windows U-value	0.76 W/m²K
Doors U-value	0.76 W/m²K
Roofs U-value	0.08 W/m²K
External Walls U-value	0.08 W/m²K
Floors U-value	0.09 W/m²K

Design Stage
SAP Worksheet

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Fleming	**Stroma Number:**	STRO005885
Software Name:	Stroma FSAP 2009	**Software Version:**	Version: 1.5.0.37

Property Address: Plot 1

Address : Plot 1, John Rous Avenue, Canley, Coventry, CV4 8ES

1. Overall dwelling dimensions:

	Area(m²)		Ave Height(m)		Volume(m³)	
Ground floor	42.9 (1a)	x	2.4 (2a)	=	102.96	(3a)
First floor	42.9 (1b)	x	2.625 (2b)	=	112.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	85.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	215.57	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				0.5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.02 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides on which sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.02 (21)

Infiltration rate modified for monthly wind speed

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

Monthly average wind speed from Table 7

(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1

SAP WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.14	0.14	0.14	0.14	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.14	0.14	0.14	0.14	(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)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.91	x	0.76	=	1.4516			(26)
Windows Type 1			0.95	x1/[1/(0.76)+ 0.04] =			0.7			(27)
Windows Type 2			0.95	x1/[1/(0.76)+ 0.04] =			0.7			(27)
Windows Type 3			0.95	x1/[1/(0.76)+ 0.04] =			0.7			(27)
Windows Type 4			3.78	x1/[1/(0.76)+ 0.04] =			2.79			(27)
Windows Type 5			3.78	x1/[1/(0.76)+ 0.04] =			2.79			(27)
Windows Type 6			1.89	x1/[1/(0.76)+ 0.04] =			1.39			(27)
Windows Type 7			0.95	x1/[1/(0.76)+ 0.04] =			0.7			(27)
Windows Type 8			1.89	x1/[1/(0.76)+ 0.04] =			1.39			(27)
Windows Type 9			1.89	x1/[1/(0.76)+ 0.04] =			1.39			(27)
Floor			42.9	x	0.09	=	3.861			(28)
Walls	133.67	18.94	114.73	x	0.08	=	9.18			(29)
Roof	42.9	0	42.9	x	0.08	=	3.43			(30)
Total area of elements, m²			219.47							(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 30.48 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10487.4 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 2.19 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 32.68 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	10.1	9.98	9.98	9.76	9.61	9.53	9.45	9.45	9.64	9.76	9.87	9.98	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	42.78	42.66	42.66	42.44	42.28	42.21	42.13	42.13	42.32	42.44	42.55	42.66	

Average = Sum(39)$_{1...12}$ /12= 42.44 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.5	0.5	0.5	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.5	0.5	

Average = Sum(40)$_{1...12}$ /12= 0.49 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.56 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 95.09 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	104.6	100.79	96.99	93.19	89.38	85.58	85.58	89.38	93.19	96.99	100.79	104.6	

Total = Sum(44)$_{1...12}$ = 1141.07 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	155.49	135.99	140.33	122.34	117.39	101.3	93.87	107.72	109	127.03	138.66	150.58	

Total = Sum(45)$_{1...12}$ = 1499.7 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.32	20.4	21.05	18.35	17.61	15.19	14.08	16.16	16.35	19.05	20.8	22.59	(46)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (47)

Temperature factor from Table 2b 0 (48)

Energy lost from water storage, kWh/year (47) x (48) = 0 (49)

If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same 0 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

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

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year ((50) x (51) x (52) x (53) = 0 (54)

SAP WorkSheet: New dwelling design stage

Enter (49) or (54) in (55) | 0 | (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	49.43	45.96	45.55	42.2	43.61	45.55	45.96	49.43	49.32	50.96	(61)

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

(62)m=	206.45	182.02	189.76	168.3	162.94	143.5	137.48	153.26	154.96	176.46	187.98	201.54	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	206.45	182.02	189.76	168.3	162.94	143.5	137.48	153.26	154.96	176.46	187.98	201.54	

Output from water heater (annual)$_{1...12}$ | 2064.64 | (64)

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

(65)m=	64.44	56.72	59.02	52.17	50.42	44.23	42.11	47.2	47.73	54.59	58.43	62.81	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	153.83	153.83	153.83	153.83	153.83	153.83	153.83	153.83	153.83	153.83	153.83	153.83	(66)

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

(67)m=	52.4	46.54	37.85	28.66	21.42	18.08	19.54	25.4	34.09	43.29	50.52	53.86	(67)

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

(68)m=	344.98	348.56	339.54	320.33	296.09	273.31	258.08	254.5	263.53	282.73	306.97	329.76	(68)

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

(69)m=	52.95	52.95	52.95	52.95	52.95	52.95	52.95	52.95	52.95	52.95	52.95	52.95	(69)

Pumps and fans gains (Table 5a)

(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)

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

(71)m=	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	-102.55	(71)

Water heating gains (Table 5)

(72)m=	86.61	84.41	79.32	72.46	67.77	61.43	56.6	63.44	66.29	73.38	81.16	84.42	(72)

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

(73)m=	598.21	593.73	570.93	535.67	499.5	467.05	448.45	457.57	478.13	513.62	552.88	582.26	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.95	x	10.73	x	0.57	x	0.7	=	2.82	(74)
North	0.9x 0.77	x	0.95	x	10.73	x	0.57	x	0.7	=	2.82	(74)
North	0.9x 0.77	x	0.95	x	10.73	x	0.57	x	0.7	=	2.82	(74)
North	0.9x 0.77	x	0.95	x	20.36	x	0.57	x	0.7	=	5.35	(74)
North	0.9x 0.77	x	0.95	x	20.36	x	0.57	x	0.7	=	5.35	(74)
North	0.9x 0.77	x	0.95	x	20.36	x	0.57	x	0.7	=	5.35	(74)
North	0.9x 0.77	x	0.95	x	33.31	x	0.57	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	0.95	x	33.31	x	0.57	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	0.95	x	33.31	x	0.57	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	0.95	x	54.64	x	0.57	x	0.7	=	14.35	(74)
North	0.9x 0.77	x	0.95	x	54.64	x	0.57	x	0.7	=	14.35	(74)
North	0.9x 0.77	x	0.95	x	54.64	x	0.57	x	0.7	=	14.35	(74)
North	0.9x 0.77	x	0.95	x	75.22	x	0.57	x	0.7	=	19.76	(74)
North	0.9x 0.77	x	0.95	x	75.22	x	0.57	x	0.7	=	19.76	(74)
North	0.9x 0.77	x	0.95	x	75.22	x	0.57	x	0.7	=	19.76	(74)
North	0.9x 0.77	x	0.95	x	84.09	x	0.57	x	0.7	=	22.09	(74)
North	0.9x 0.77	x	0.95	x	84.09	x	0.57	x	0.7	=	22.09	(74)
North	0.9x 0.77	x	0.95	x	84.09	x	0.57	x	0.7	=	22.09	(74)
North	0.9x 0.77	x	0.95	x	79.12	x	0.57	x	0.7	=	20.78	(74)
North	0.9x 0.77	x	0.95	x	79.12	x	0.57	x	0.7	=	20.78	(74)
North	0.9x 0.77	x	0.95	x	79.12	x	0.57	x	0.7	=	20.78	(74)
North	0.9x 0.77	x	0.95	x	61.56	x	0.57	x	0.7	=	16.17	(74)
North	0.9x 0.77	x	0.95	x	61.56	x	0.57	x	0.7	=	16.17	(74)
North	0.9x 0.77	x	0.95	x	61.56	x	0.57	x	0.7	=	16.17	(74)
North	0.9x 0.77	x	0.95	x	41.09	x	0.57	x	0.7	=	10.79	(74)
North	0.9x 0.77	x	0.95	x	41.09	x	0.57	x	0.7	=	10.79	(74)
North	0.9x 0.77	x	0.95	x	41.09	x	0.57	x	0.7	=	10.79	(74)
North	0.9x 0.77	x	0.95	x	24.81	x	0.57	x	0.7	=	6.52	(74)
North	0.9x 0.77	x	0.95	x	24.81	x	0.57	x	0.7	=	6.52	(74)
North	0.9x 0.77	x	0.95	x	24.81	x	0.57	x	0.7	=	6.52	(74)
North	0.9x 0.77	x	0.95	x	13.22	x	0.57	x	0.7	=	3.47	(74)
North	0.9x 0.77	x	0.95	x	13.22	x	0.57	x	0.7	=	3.47	(74)
North	0.9x 0.77	x	0.95	x	13.22	x	0.57	x	0.7	=	3.47	(74)
North	0.9x 0.77	x	0.95	x	8.94	x	0.57	x	0.7	=	2.35	(74)
North	0.9x 0.77	x	0.95	x	8.94	x	0.57	x	0.7	=	2.35	(74)
North	0.9x 0.77	x	0.95	x	8.94	x	0.57	x	0.7	=	2.35	(74)
East	0.9x 1	x	1.89	x	19.87	x	0.57	x	0.7	=	10.39	(76)
East	0.9x 1	x	1.89	x	38.52	x	0.57	x	0.7	=	20.13	(76)
East	0.9x 1	x	1.89	x	61.57	x	0.57	x	0.7	=	32.17	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	1	x	1.89	x	91.41	x	0.57	x	0.7	=	47.77	(76)
East	0.9x	1	x	1.89	x	111.22	x	0.57	x	0.7	=	58.12	(76)
East	0.9x	1	x	1.89	x	116.05	x	0.57	x	0.7	=	60.65	(76)
East	0.9x	1	x	1.89	x	112.64	x	0.57	x	0.7	=	58.87	(76)
East	0.9x	1	x	1.89	x	98.03	x	0.57	x	0.7	=	51.23	(76)
East	0.9x	1	x	1.89	x	73.6	x	0.57	x	0.7	=	38.47	(76)
East	0.9x	1	x	1.89	x	46.91	x	0.57	x	0.7	=	24.51	(76)
East	0.9x	1	x	1.89	x	24.71	x	0.57	x	0.7	=	12.91	(76)
East	0.9x	1	x	1.89	x	16.39	x	0.57	x	0.7	=	8.57	(76)
South	0.9x	0.77	x	3.78	x	47.32	x	0.57	x	0.7	=	49.46	(78)
South	0.9x	0.77	x	3.78	x	47.32	x	0.57	x	0.7	=	49.46	(78)
South	0.9x	0.77	x	1.89	x	47.32	x	0.57	x	0.7	=	24.73	(78)
South	0.9x	0.77	x	0.95	x	47.32	x	0.57	x	0.7	=	12.43	(78)
South	0.9x	0.77	x	1.89	x	47.32	x	0.57	x	0.7	=	24.73	(78)
South	0.9x	0.77	x	3.78	x	77.18	x	0.57	x	0.7	=	80.67	(78)
South	0.9x	0.77	x	3.78	x	77.18	x	0.57	x	0.7	=	80.67	(78)
South	0.9x	0.77	x	1.89	x	77.18	x	0.57	x	0.7	=	40.34	(78)
South	0.9x	0.77	x	0.95	x	77.18	x	0.57	x	0.7	=	20.27	(78)
South	0.9x	0.77	x	1.89	x	77.18	x	0.57	x	0.7	=	40.34	(78)
South	0.9x	0.77	x	3.78	x	94.25	x	0.57	x	0.7	=	98.51	(78)
South	0.9x	0.77	x	3.78	x	94.25	x	0.57	x	0.7	=	98.51	(78)
South	0.9x	0.77	x	1.89	x	94.25	x	0.57	x	0.7	=	49.25	(78)
South	0.9x	0.77	x	0.95	x	94.25	x	0.57	x	0.7	=	24.76	(78)
South	0.9x	0.77	x	1.89	x	94.25	x	0.57	x	0.7	=	49.25	(78)
South	0.9x	0.77	x	3.78	x	105.11	x	0.57	x	0.7	=	109.87	(78)
South	0.9x	0.77	x	3.78	x	105.11	x	0.57	x	0.7	=	109.87	(78)
South	0.9x	0.77	x	1.89	x	105.11	x	0.57	x	0.7	=	54.93	(78)
South	0.9x	0.77	x	0.95	x	105.11	x	0.57	x	0.7	=	27.61	(78)
South	0.9x	0.77	x	1.89	x	105.11	x	0.57	x	0.7	=	54.93	(78)
South	0.9x	0.77	x	3.78	x	108.55	x	0.57	x	0.7	=	113.46	(78)
South	0.9x	0.77	x	3.78	x	108.55	x	0.57	x	0.7	=	113.46	(78)
South	0.9x	0.77	x	1.89	x	108.55	x	0.57	x	0.7	=	56.73	(78)
South	0.9x	0.77	x	0.95	x	108.55	x	0.57	x	0.7	=	28.51	(78)
South	0.9x	0.77	x	1.89	x	108.55	x	0.57	x	0.7	=	56.73	(78)
South	0.9x	0.77	x	3.78	x	108.9	x	0.57	x	0.7	=	113.82	(78)
South	0.9x	0.77	x	3.78	x	108.9	x	0.57	x	0.7	=	113.82	(78)
South	0.9x	0.77	x	1.89	x	108.9	x	0.57	x	0.7	=	56.91	(78)
South	0.9x	0.77	x	0.95	x	108.9	x	0.57	x	0.7	=	28.61	(78)
South	0.9x	0.77	x	1.89	x	108.9	x	0.57	x	0.7	=	56.91	(78)
South	0.9x	0.77	x	3.78	x	107.14	x	0.57	x	0.7	=	111.98	(78)
South	0.9x	0.77	x	3.78	x	107.14	x	0.57	x	0.7	=	111.98	(78)

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South	0.9x	0.77	x	1.89	x	107.14	x	0.57	x	0.7	=	55.99	(78)
South	0.9x	0.77	x	0.95	x	107.14	x	0.57	x	0.7	=	28.14	(78)
South	0.9x	0.77	x	1.89	x	107.14	x	0.57	x	0.7	=	55.99	(78)
South	0.9x	0.77	x	3.78	x	103.88	x	0.57	x	0.7	=	108.58	(78)
South	0.9x	0.77	x	3.78	x	103.88	x	0.57	x	0.7	=	108.58	(78)
South	0.9x	0.77	x	1.89	x	103.88	x	0.57	x	0.7	=	54.29	(78)
South	0.9x	0.77	x	0.95	x	103.88	x	0.57	x	0.7	=	27.29	(78)
South	0.9x	0.77	x	1.89	x	103.88	x	0.57	x	0.7	=	54.29	(78)
South	0.9x	0.77	x	3.78	x	99.99	x	0.57	x	0.7	=	104.51	(78)
South	0.9x	0.77	x	3.78	x	99.99	x	0.57	x	0.7	=	104.51	(78)
South	0.9x	0.77	x	1.89	x	99.99	x	0.57	x	0.7	=	52.26	(78)
South	0.9x	0.77	x	0.95	x	99.99	x	0.57	x	0.7	=	26.27	(78)
South	0.9x	0.77	x	1.89	x	99.99	x	0.57	x	0.7	=	52.26	(78)
South	0.9x	0.77	x	3.78	x	85.29	x	0.57	x	0.7	=	89.15	(78)
South	0.9x	0.77	x	3.78	x	85.29	x	0.57	x	0.7	=	89.15	(78)
South	0.9x	0.77	x	1.89	x	85.29	x	0.57	x	0.7	=	44.57	(78)
South	0.9x	0.77	x	0.95	x	85.29	x	0.57	x	0.7	=	22.4	(78)
South	0.9x	0.77	x	1.89	x	85.29	x	0.57	x	0.7	=	44.57	(78)
South	0.9x	0.77	x	3.78	x	56.07	x	0.57	x	0.7	=	58.6	(78)
South	0.9x	0.77	x	3.78	x	56.07	x	0.57	x	0.7	=	58.6	(78)
South	0.9x	0.77	x	1.89	x	56.07	x	0.57	x	0.7	=	29.3	(78)
South	0.9x	0.77	x	0.95	x	56.07	x	0.57	x	0.7	=	14.73	(78)
South	0.9x	0.77	x	1.89	x	56.07	x	0.57	x	0.7	=	29.3	(78)
South	0.9x	0.77	x	3.78	x	40.89	x	0.57	x	0.7	=	42.74	(78)
South	0.9x	0.77	x	3.78	x	40.89	x	0.57	x	0.7	=	42.74	(78)
South	0.9x	0.77	x	1.89	x	40.89	x	0.57	x	0.7	=	21.37	(78)
South	0.9x	0.77	x	0.95	x	40.89	x	0.57	x	0.7	=	10.74	(78)
South	0.9x	0.77	x	1.89	x	40.89	x	0.57	x	0.7	=	21.37	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	179.66	298.46	378.7	448.04	486.28	496.98	485.3	452.77	410.64	333.91	213.87	154.57	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	777.87	892.2	949.63	983.7	985.78	964.03	933.75	910.34	888.77	847.53	766.74	736.83	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.86	0.75	0.64	0.53	0.4	0.28	0.19	0.19	0.32	0.51	0.76	0.88	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.96	20.99	21	21	21	21	21	21	21	21	20.99	20.95	(87)

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

(88)m=	20.52	20.52	20.52	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.52	20.52	(88)

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.84	0.73	0.61	0.51	0.38	0.26	0.16	0.17	0.3	0.49	0.74	0.86	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.47	20.51	20.52	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.51	20.46	(90)

fLA = Living area ÷ (4) = 0.18 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.56	20.59	20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.6	20.55	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.56	20.59	20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.6	20.55	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.84	0.74	0.62	0.51	0.38	0.26	0.17	0.17	0.3	0.49	0.74	0.86	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	657.23	656.79	587.39	505.2	376.85	253.81	156.48	156.48	267.15	416.2	570.46	633.92	(95)
Monthly average external temperature from Table 8													
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	686.84	665.31	589.02	505.45	376.86	253.81	156.48	156.48	267.15	416.34	578.52	667.68	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	22.03	5.72	1.21	0.18	0.01	0	0	0	0	0.1	5.8	25.12	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 60.17 (98)

Space heating requirement in kWh/m²/year 0.7 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.1 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	22.03	5.72	1.21	0.18	0.01	0	0	0	0	0.1	5.8	25.12	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)													(211)
	23.66	6.15	1.3	0.19	0.01	0	0	0	0	0.11	6.23	26.98	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 64.63 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] + (214) m } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

SAP WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

	206.45	182.02	189.76	168.3	162.94	143.5	137.48	153.26	154.96	176.46	187.98	201.54

Efficiency of water heater: 80 (216)

(217)m= 80.87 | 80.27 | 80.06 | 80.01 | 80 | 80 | 80 | 80 | 80 | 80.01 | 80.27 | 81.01 (217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m= 255.27 | 226.74 | 237.03 | 210.35 | 203.67 | 179.38 | 171.85 | 191.58 | 193.7 | 220.56 | 234.19 | 248.8

Total = Sum(219a)$_{1...12}$ = 2573.11 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		64.63	
Water heating fuel used		2573.11	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	256.42		(230a)
central heating pump:	130		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	431.42	(231)
Electricity for lighting		370.17	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.1	x 0.01 =	2	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	0	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1	x 0.01 =	79.77	(247)
Pumps, fans and electric keep-hot	(231)	11.46	x 0.01 =	49.44	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	11.46	x 0.01 =	42.42	(250)
Additional standing charges (Table 12)				106	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 279.63 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12): 0.47 (256)

Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] = 1 (257)

SAP rating (Section 12): 85.98 (258)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

SAP WorkSheet: New dwelling design stage

Space heating (main system 1)	(211) x	0.198	=	12.8	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Water heating	(219) x	0.198	=	509.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =			522.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517	=	223.05	(267)
Electricity for lighting	(232) x	0.517	=	191.38	(268)
Total CO2, kg/year	sum of (265)…(271) =			936.7	(272)
CO2 emissions per m²	(272) ÷ (4) =			10.92	(273)
EI rating (section 14)				90	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	1.02	=	65.93	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Energy for water heating	(219) x	1.02	=	2624.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2690.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92	=	1259.76	(267)
Electricity for lighting	(232) x	0	=	1080.91	(268)
‘Total Primary Energy	sum of (265)…(271) =			5031.16	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			58.64	(273)

Predicted Energy Assessment

Predicted Energy Assessment

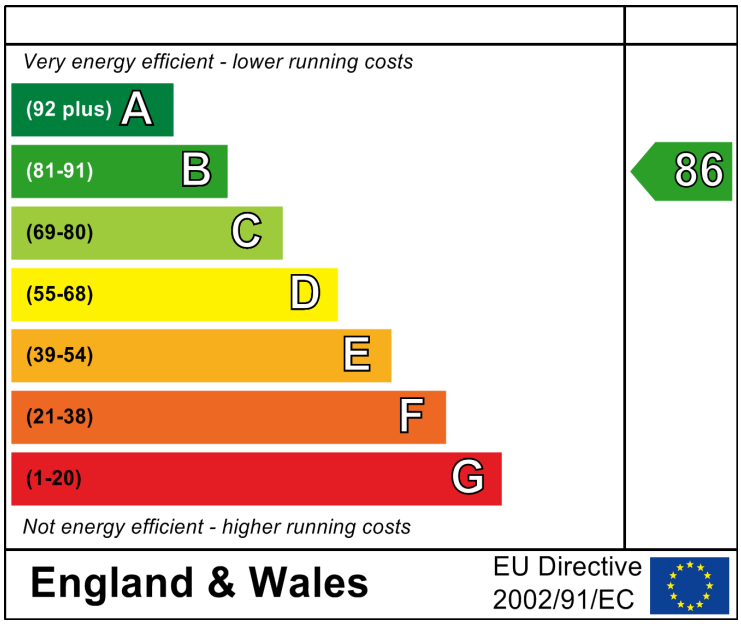
Plot 1
John Rous Avenue
Canley
Coventry
CV4 8ES

Dwelling type: Detached House
Date of assessment: 28 February 2013
Produced by: John Fleming
Total floor area: 85.8 m²

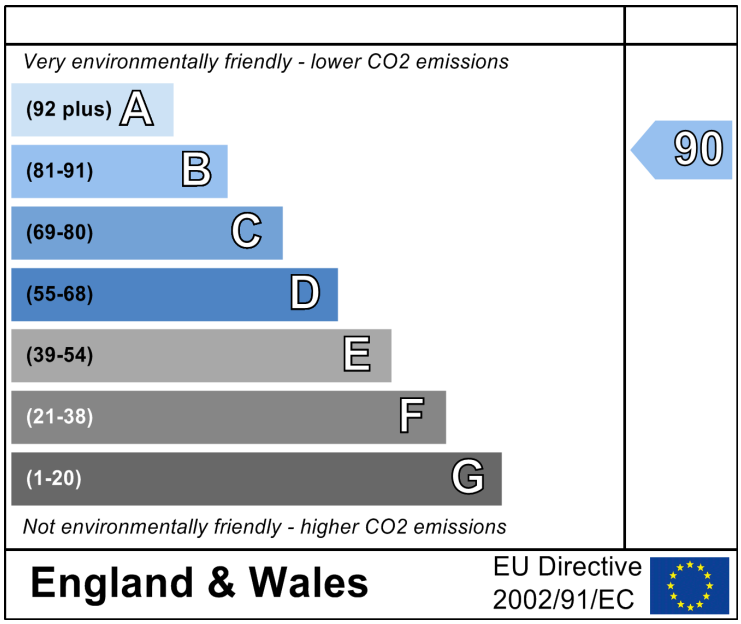
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2009 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 (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) 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.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

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