SAP Worksheet: Design

This Design submission has been carried out by an Authorised SAP Assessor. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor Name	Mrs Azita Ghandizadeh Dezfouli	**Assessor Number**	2342
Client			
Date Last Modified	21/07/2008		
Address	Unit 8, 1-7 Mill Lane,London,NW6		

1. Overall dwelling dimensions

	Area (m²)		Average storey height (m)		Volume (m³)	
Ground Floor	67.74	(1a)	× 2.45	=	165.96	(1)
First Floor	73.83	(2a)	× 2.52	=	186.05	(2)
Total floor area (1a)+(2a)+(3a)+(4a)+(4b)+(4d)+(4f)+(4h) =	141.57	(5)				
Dwelling volume			(1)+(2)+(3)+(4)+(4c)+(4e)+(4g)+(4i) =		352.01	(6)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	× 40 =	0	(7)
Number of open flues	0	× 20 =	0	(8)
Number of intermittent fans or passive vents	0	× 10 =	0	(9)
Number of flueless gas fires	0	× 40 =	0	(9a)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (7)+(8)+(9)+(9a) =	0	÷ box (6) =	0.00	(10)
If a pressurisation test has been carried out, proceed to box (19)				
Number of storeys in the dwelling	2	(11)		
Additional infiltration		[(11) - 1] × 0.1 =	N/A	(12)
Structural infiltration: *0.25 for steel or timber frame or 0.35 for masonry construction*			N/A	(13)
If suspended wooden floor, *enter 0.2 (unsealed) or 0.1 (sealed)*, else enter 0			N/A	(14)
If no draught lobby, enter 0.05, else enter 0			N/A	(15)
Percentage of windows and doors draught stripped	N/A	(16)		
Enter 100 in box (16) for new dwellings which are to comply with Building Regulations				
Window infiltration		0.25 - [0.2 × (16) ÷ 100] =	N/A	(17)
Infiltration rate		(10)+(12)+(13)+(14)+(15)+(17) =	N/A	(18)

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If based on air permeability value, then [÷20] + (10) in box (19), otherwise (19) = (18)		0.25	(19)
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 *(Enter 2 in box (20) for new dwellings where location is not shown)*		3	(20)
Shelter factor	1 - [0.075 × (20)] =	0.78	(21)
Adjusted infiltration rate	(19) × (21) =	0.19	(22)
Calculate effective air change rate for the applicable case			
a) If balanced whole house mechanical ventilation with heat recovery	(22) + 0.17 =	N/A	(23)
b) If balanced whole house mechanical ventilation without heat recovery	(22) + 0.5 =	N/A	(23a)
c) If whole house extract ventilation or positive input ventilation from outside ***if (22) < 0.25, then (23b) = 0.5; otherwise (23b) = 0.25 + (22)***		N/A	(23b)
d) If natural ventilation or whole house positive input ventilation from loft ***if (22) ≥ 1, then (24) = (22); otherwise (24) = 0.5 + [(22)² × 0.5]***		0.52	(24)
Effective air change rate - enter (23) or (23a) or (23b) or (24) in box (25)		0.52	(25)

3. Heat losses and heat loss parameter

ELEMENT	Area (m²)		U - value		AXU (W/K)	
Doors	1.89	×	3.00	=	5.67	(26)
Windows *	18.90	×	1.42	=	26.75	(27)
Above Unheated Basement Floor	72.27	×	0.15	=	10.84	(31)
Walls	109.73	×	0.20	=	21.95	(29)
Roof	73.83	×	0.15	=	11.07	(30)
Total area of elements ΣA, m²	276.63	(32)				

** for windows and rooflights, use effective window U-value calculated as given in paragraph 3.2*

Fabric heat loss, W/K	(26)+(27)+(27a)+(27b)+(28)+(29)+(29a)+(30)+(30a)+(31) =	76.28	(33)
Thermal bridges - Σ (lxΨ) calculated using Appendix K *if details of thermal bridging are not known calculate y× (32) [see Appendix K] and enter in box (34)*		22.13	(34)
Total fabric heat loss	(33)+(34) =	98.41	(35)
Ventilation heat loss	(25) × 0.33 × (6) =	60.26	(36)
Heat loss coefficient, W/K	(35)+(36) =	158.67	(37)
Heat loss parameter (HLP), W/m²K	(37) ÷ (5) =	1.12	(38)

4. Water heating energy requirement

	kWh/year	
Energy content of hot water used from Table 1 column (b)	2589.68	(39)

Distribution loss from Table 1 column (c) *If instantaneous water heating at point of use, enter "0" in boxes (40) to (45)* *For community heating use Table 1 (c) whether or not hot water tank is present*		457.00	(40)
Water storage loss:			
a) If manufacturer's declared loss factor is known (kWh/day):		N/A	(41)
Temperature factor from Table 2b		N/A	(41a)
Energy lost from water storage, kWh/year	(41)x(41a)x365 =	N/A	(42)
b) If manufacturer's declared cylinder loss factor is not known:			
Cylinder volume (litres) including any solar storage within same cylinder *If community heating and no tank in dwelling, enter 110 litres in box (43)* *Otherwise, if no stored hot water (this includes instantaneous combi boilers), enter '0' in box (43)*		150.00	(43)
Hot water storage loss factor from Table 2 (kWh/litre/day) *If community heating and no tank in dwelling, use cylinder loss from Table 2 for 50 mm factory insulation in box (44)*		0.01	(44)
Volume factor from Table 2a		0.93	(44a)
Temperature factor from Table 2b		0.54	(44b)
Energy lost from water storage, kWh/year	(43)x(44)x(44a)x(44b)x365 =	316.93	(45)
Enter (42) or (45) in box (46)		316.93	(46)
If cylinder contains dedicated solar storage, box (47) = (46) x [(43) - (H11)] / (43), else (47) = (46)		316.93	(47)
Primary circuit loss from Table 3		360.00	(48)
Combi loss from Table 3a (enter "0" if no combi boiler)		0.00	(49)
Solar DHW input calculated using Appendix H (enter "0" if no solar collector)		0.00	(50)
Output from water heater, kWh/year	(39)+(40)+(47)+(48)+(49)-(50) =	3723.61	(51)
Heat gains from water heating *include (47) in calculation of (52) only if cylinder is in the dwelling or hot water is from community heating*	0.25 x [(39)+(49)]+0.8x[(40)+(47)+(48)] =	1554.57	(52)

5. Internal gains

		Watts	
Lights, appliances, cooking and metabolic (Table 5)		767.17	(53)
Reduction of internal gains due to low energy lighting (calculated in Appendix L)		56.05	(53a)
Additional gains from Table 5a		21.12	(53b)
Water heating	(52) ÷ 8.76 =	177.46	(54)
Total internal gains	(53) + (53b) + (54) - (53a) =	909.70	(55)

6. Solar gains

	Access factor Table 6d		Area m²		Flux Table 6a		g Table 6b		FF Table 6c		Gains (W)	
West	0.77	×	8.82	×	48.00	x 0.9 x	0.63	×	0.70	=	129.38	(57)
East	0.77	×	10.08	×	48.00	x 0.9 x	0.63	×	0.70	=	147.87	(59)

Total solar gains: [(56) + ... + (64)] = 277.25 (65)

Note: for new dwellings where overshading is not known, the solar access factor is '0.77'

Total gains, W	(55) + (65) =	1186.96	(66)
Gain/loss ratio (GLR)	(66) ÷ (37) =	7.48	(67)
Utilisation factor (Table 7, using GLR in box (67))		0.91	(68)
Useful gains, W	(66) x (68) =	1079.94	(69)

7. Mean internal temperature

		°C	
Mean internal temperature of the living area (Table 8)		18.88	(70)
Temperature adjustment from Table 4e, where appropriate		0.00	(71)
Adjustment for gains *R is obtained from the 'responsiveness' column of Table 4a or Table 4d*	{[(69) ÷ (37)] - 4.0} x 0.2 xR =	0.56	(72)
Adjusted living room temperature	(70) + (71) + (72) =	19.44	(73)
Temperature difference between zones (Table 9)		0.45	(74)
Living area fraction (0 to 1.0)	living room area ÷ (5) =	0.15	(75)
Rest-of-house fraction	1 - (75) =	0.85	(76)
Mean internal temperature	(73) - [(74) x (76)] =	19.06	(77)

8. Degree days

Temperature rise from gains	(69) ÷ (37) =	6.81	(78)
Base temperature	(77) - (78) =	12.25	(79)
Degree-days, *use box (79) and Table 10*		1398.27	(80)

9. Space heating requirements

Space heating requirement (useful), kWh/year	0.024 x (80) x (37) =	5324.71	(81)

For range cooker boilers where efficiency is obtained from the Boiler Efficiency Database or manufacturer's declared value, multiply the result in box (81) by (1 - Φ case/Φwater) where Φ case is the heat emission from the case of the range cooker at fullload (in kW); and Φ water is the heat transferred to water at full load (in kW). Φ case and Φ water are obtained from the database record for the range cooker boiler or manufacturer's declared value.

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

Note: when space and water heating is provided by community heating use the alternative worksheet 9b

Space heating:

Fraction of heat from secondary/supplementary system (*use value from Table 11, Table 12a or Appendix F)*		0.00	(82)
Efficiency of main heating system, %		110.00	(83)
(SEDBUK or from Table 4a or 4b, adjusted where appropriate by the amount shown in the 'efficiency adjustment' column of Table 4c)			
Efficiency of secondary/supplementary heating system, % (use value from Table 4a or Appendix E)		0.00	(84)
Space heating fuel (main) requirement, kWh/year	[1- (82)] x (81) x100 ÷ (83) =	4840.64	(85)
Space heating fuel (secondary), kWh/year	(82) x (81) x100 ÷ (84) =	N/A	(85a)

Water heating:

Efficiency of water heater, %		104.76	(86)
(SEDBUK or from Table 4a or 4b, adjusted where appropriate by the amount shown in the 'efficiency adjustment' column of Table 4c)			
Energy required for water heating, kWh/year	(51) x 100 ÷ (86) =	3554.36	(86a)

Electricity for pumps and fans:

	kWh/year	
each central heating pump, (Table 4f)	0.00	(87a)
each boiler with a fan-assisted flue (Table 4f)	0.00	(87b)
warm air heating system fans (Table 4f)	211.21	(87c)
mechanical ventilation -balanced, extract or positive input from outside (Table 4f)	0.00	(87d)
maintaining keep-hot facility for gas combi boiler (Table 4f)	0.00	(87e)
pump for solar water heating (Table 4f)	0.00	(87f)
Total electricity for the above equipment, kWh/year (87a)+(87b)+(87c)+(87d)+(87e)+(87f) =	211.21	(87)

10a. Fuel costs - individual heating systems

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system	(85)	x	1.63	x0.01 =	78.90	(88)
Space heating - secondary	(85a)	x	N/A	x 0.01 =	0.00	(89)

Water heating

Water heating cost (electric, off-peak tariff)

On-peak fraction (Table 13, or Appendix F for electric CPSUs)			0.00	(90)	
Off-peak fraction	1.0 - (90) =		1.00	(90a)	
		Fuel price			
On-peak cost	(86a) x (90) x	N/A	x 0.01 =	0.00	(91)

Off-peak cost	(86a) × (90a) ×	N/A	× 0.01 =	0.00	(91a)
Water heating cost (other fuel)	(86a)	×	1.63	× 0.01 =	57.94	(91b)
Pump and fan energy cost	(87)	×	7.12	× 0.01 =	15.04	(92)
Energy for lighting (calculated in Appendix L)	996.49	×	7.12	× 0.01 =	70.95	(93)
Additional standing charges (Table 12)					34.00	(94)
Renewable and energy-saving technologies (Appendices M and N)						
Energy produced or saved, kWh/year	N/A	(95)				
Cost of energy produced or saved, £/year	(95)	×	N/A	× 0.01 =	N/A	(95a)
Energy consumed by the technology, kWh/year	N/A	(96)				
Cost of energy consumed, £/year	(96)	×	N/A	×0.01 =	N/A	(96a)
Special features (Appendix Q)						
Energy produced or saved, kWh/year	608.00	(s1)				
Cost of energy produced or saved, £/year	(s1)	×	7.12	× 0.01 =	43.29	(s1a)
Energy consumed by the technology, kWh/year	0.00	(s2)				
Cost of energy consumed, £/year	(s2)	×	N/A	×0.01 =	N/A	(s2a)
Total energy cost	(88)+(89)+(91)+(91a)+(91b)+(92)+(93)+(94)-(95a)+(96a)-(s1a)+(s2a) =				213.54	(97)

11a. SAP rating - individual heating systems

Energy cost deflator (SAP 2005)		0.91	(98)
Energy cost factor (ECF)	{[(97) × (98)] - 30.0} ÷ {(5) + 45.0} =	0.88	(99)
SAP rating (Table 14)		87.70	(100)
SAP band		B	

12a. Carbon dioxide emissions rate for individual heating systems (including micro-CHP) and community heating without CHP

Individual heating system:	**Energy** kWh/year		**Emission factor** kg CO_2/kWh		**Emissions** kgCO_2/year	
Space heating main from box (85)	4840.64	×	0.194	=	939.08	(101)
Space heating secondary from box (85a)	N/A	×	N/A	=	0.00	(102)
Energy for water heating from box (86a)	3554.36	×	0.194	=	689.55	(103)
Community scheme:						
Efficiency of community boilers % *use actual efficiency if known, or value in Table 4a*					N/A	(104)

Energy for space heating	(87*) x 100 ÷ (104) =	N/A	×	N/A	=	N/A	(105)
Energy for water heating	(87b*) x 100 ÷ (104) =	N/A	×	N/A	=	N/A	(106)
Space and water heating		[(101) + (102) + (103)] or [(105) + (106)] =				1628.63	(107)
Electricity for pumps and fans from box (87) or (88*)		211.21	×	0.422	=	89.13	(108)
Energy for lighting from Appendix L		996.49	×	0.422	=	420.52	(109)
Energy produced or saved in dwelling (Appendices M and N)		(95) or (95*)	×	N/A	=	0.00	(110)
Energy consumed by the above technology (Appendices M and N)		(96) or (96*)	×	N/A	=	0.00	(111)
Energy produced or saved in dwelling (Appendix Q)		(s1) or (s1*)	×	0.422	=	256.58	(s1a)
Energy consumed by the above technology (Appendix Q)		(s2) or (s2*)	×	N/A	=	0.00	(s2a)
Total CO_2 kg/year		(107) + (108) + (109) - (110) + (111) - (s1a) + (s2a)			=	1881.70	(112)
Carbon dioxide emissions rate				(112) ÷ (5)	=	13.29	(113)
EI rating						86.49	
EI band						B	

13a. Primary energy, for individual heating systems (including micro-CHP) and community heating without CHP

Individual heating system:	**Energy kWh/year**		**Primary energy factor**		**Primary energy (kWh/year)**
Space heating main from box (85)	4840.64	×	1.150	=	5566.74
Space heating secondary from box (85a)	N/A	×	N/A	=	0.00
Energy for water heating from box (86a)	3554.36	×	1.150	=	4087.51
Community scheme:					
Efficiency of community boilers % N/A (104) *use actual efficiency if known, or value in Table 4a*					
Energy for space heating (87*) x 100 ÷ (104) =	N/A	×	N/A	=	N/A
Energy for water heating (87b*) x 100 ÷ (104) =	N/A	×	N/A	=	N/A
Space and water heating					9654.25
Electricity for pumps and fans from box (87) or (88*)	211.21	×	2.800	=	591.38
Energy for lighting from Appendix L	996.49	×	2.800	=	2790.16
Energy produced or saved in dwelling (Appendices M and N)	(95) or (95*)	×	N/A	=	0.00
Energy consumed by the above technology (Appendices M and N)	(96) or (96*)	×	N/A	=	0.00

Energy produced or saved in dwelling (Appendix Q)	(s1) or (s1*)	×	2.800	=	1702.40
Energy consumed by the above technology (Appendix Q)	(s2) or (s2*)	×	N/A	=	0.00
Primary energy kWh/year					11333.40
Primary energy kWh/m²/year					80.06

Code for Sustainable Homes: Design

This Design Assessment has been carried out by an Authorised SAP Assessor. It has been prepared from plans and specifications and may not reflect the property as constructed. Code calculations are from the Technical Guide (version dated March 2007).

Assessor Name	Mrs Azita Ghandizadeh Dezfouli	**Assessor Number**	2342
Client			
Date Last Modified	21/07/2008		
Address	Unit 8, 1-7 Mill Lane,London,NW6		

Category 1 - Energy and Carbon Dioxide Emissions

Ene 1 - Dwelling Emission Rate (mandatory element)

These calculations have been applied to data entered into NHER Plan Assessor software, therefore a separate assessment must be carried out for any air-conditioning or renewables not currently dealt with in SAP 2005 v 9.80.

Levels 1-5 Assessment		kg/m ^{2}/yr	
Target Carbon Dioxide Emission Rate for notional dwelling	TER =	19.85	(1)
Dwelling Carbon Dioxide Emission Rate for proposed dwelling	DER =	14.62	(2)
% improvement achieved of DER over TER		26.35	(3)
Reduction in DER needed to reach next Code Level		3.50	(4)
Code level achieved		Level 3	
Number of credits for Ene 1		6	

Ene 2 - Building Fabric

Heat Loss Parameter (HLP) from SAP worksheet box 36	1.12	(5)
Number of credits for Ene 2	1	

Percentage of SAP carbon dioxide emissions displaced by renewables

This calculation is not a CSH requirement (i.e. it is not part of the zero carbon home or Level 6 assessment) but is useful for planning purposes. It uses SAP emissions data only and does not include any additional emissions due to appliances and cooking used for the Code . Therefore a % from renewables greater than 100% does not necessarily mean that the home is "zero carbon".

$$\text{\% of SAP carbon dioxide emissions displaced by renewables} = \frac{\text{carbon dioxide emissions saved by renewables in SAP}}{\text{total carbon dioxide emissions}} \times 100$$

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Emissions saved by renewables

N.B. Only renewables entered into SAP are included here

	Energy kWh/year		Emission factor		Emissions kgCO2/year
Emissions saved by solar water heating	N/A	x	N/A	=	N/A
Emissions saved by PV	N/A	x	N/A	=	N/A
Emissions saved by SAP renewables					0.00

Total carbon dioxide emissions

N.B. Values for kWh and emission factors from SAP

	Energy kWh/year		Emission factor		Emissions kgCO2/year
Emissions from main heating	4840.64	x	0.194	=	939.08
Emissions from secondary heating	N/A	x	N/A	=	N/A
Emissions from water heating	3723.61	x	0.194	=	722.38
Emissions from pumps and fans	211.21	x	0.422	=	89.13
Emissions from lighting	996.49	x	0.422	=	420.52
Emissions from renewables and energy saving technologies	N/A	x	N/A	=	N/A
Total carbon dioxide emissions					2171.11

$$\frac{\text{Emissions saved by SAP renewables}}{\text{Total carbon dioxide emissions}} \times 100 = \frac{0.00}{2171.11} \times 100 = 0.00\ \%$$

SAP Data Input: Design

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Assessor Name	Mrs Azita Ghandizadeh Dezfouli	**Assessor Number**	2342
Client			
Date Last Modified	21/07/2008		
Address	Unit 8, 1-7 Mill Lane,London,NW6		

Property type:	House
Built form:	Semi detached
Flat type:	N/A
Number of sides sheltered:	3

Storeys:

Ground floor:	area =	67.74 m^2	storey height =	2.45 m
First floor:	area =	73.83 m^2	storey height =	2.52 m
Living room area:		21.14 m^2	Living area fraction:	0.15

Openings:

D 1	area =	1.89 m^2	U-value =	3.00 W/m^2K
W 2	area =	3.36 m^2	U-value =	1.50 W/m^2K
W 3	area =	3.36 m^2	U-value =	1.50 W/m^2K
W 4	area =	1.68 m^2	U-value =	1.50 W/m^2K
W 5	area =	2.10 m^2	U-value =	1.50 W/m^2K
W 6	area =	3.36 m^2	U-value =	1.50 W/m^2K
W 7	area =	1.68 m^2	U-value =	1.50 W/m^2K
W 8	area =	3.36 m^2	U-value =	1.50 W/m^2K

Floors:

Ground Floor	area =	67.74 m^2	U-value =	0.15 W/m^2K
Exposed First Floor	area =	4.53 m^2	U-value =	0.15 W/m^2K

Walls:

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External-GF	area =	49.79 m^2	U-value =	0.20	$W/m^2 K$
External_FF	area =	66.78 m^2	U-value =	0.20	$W/m^2 K$
Semi Exposed	area =	13.96 m^2	U-value =	0.20	$W/m^2 K$

Roofs:

Roof	area =	73.83 m^2	U-value =	0.15	$W/m^2 K$

Thermal bridging:

Detailed thermal bridges calculation:	No
'y' value type:	0.08 Accredited Construction Details 'y' value used
User defined 'y' value:	N/A

Air permeability:

Air permeability entered:	Yes
Seek exemption for <3 properties:	No
Air permeability rate:	5.00 m^3/hm^2 (@50Pa)
Pressure test reference:	N/A
Ventilation:	Not present (natural ventilation)
Number of chimneys:	0
Number of flues:	0
Number of flueless gas fires:	0
Number of fans and vents:	0

Main heating:

Electricity Tariff:	Standard
Main heating type:	Heat pump - warm air
Efficiency from:	N/A
Boiler type:	N/A
Fuel:	Mains gas
Fan flue:	N/A
Main heating system:	Air source
Controls:	Programmer and room thermostat
Emitter:	N/A

Boiler Interlock:	N/A
Compensator:	N/A
Pump in heated space:	N/A
Main heating efficiency:	110.00 %

Community heating CHP:

Is there CHP:	No

Secondary heating system:

Secondary heating present:	No
Open flue or chimney present:	No

A secondary heating system is defaulted by the software for calculating the DER, in accordance with the building regulations.

Water heating:

Water heating type:	From main
Cylinder within dwelling:	N/A
Water heating fuel:	Mains gas
Water heating separately timed:	Yes

Cylinder Details:

Manufacturer's loss factor :	No
Declared factor :	N/A
Cylinder volume:	150.00
Cylinder insulation:	Spray Foam
Cylinder thickness:	80.00
Primary pipework insulation:	Yes
Cylinderstat:	Yes
Boiler interlock:	N/A

Heat Pumps:

Heat pump uses immersion:	Yes

Solar water heating:

Solar water heating:	No

Photovoltaics (PV):

Photovoltaics:	No

Low energy lighting:

Low energy lights:	54.55 % of fixed lighting outlets (30% assumed for DER calculation)

External Lighting:

Assess external lighting:	No
Fiitings only accept > 40 lumens per circuit watt:	N/A
Lamps not > 150W, off in day and at night when not needed:	N/A

Summer overheating:

Summer overheating included:	Yes
Is cross ventilation possible:	Yes
Window ventilation:	Fully open
Internal partition construction:	Plasterboard, timber/steel frame
Separating (party) wall construction:	Plasterboard, timber/steel frame
Curtains closed in daylight hours:	Yes
Fraction curtains closed:	1.00
Summer overheating included:	Light-coloured curtain or roller blind

Special features:

Special features included:	Yes
Description:	Woodgreen MVHR
Energy saved/produced:	608.00 kWh/year
Applicable fuel:	Electricity
Energy used:	0.00 kWh/year
Applicable fuel:	N/A