

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 JOANNE CHURCHILL	Assessor number	1591
Client		Last modified	21/04/2010
Address	Unit 15 Makepeace Mansions Unit 15, Holly Lodge Estate, Camden, Greater London, NW1		

### 1. Overall dwelling dimensions

	Area (m <sup>2</sup> )		Average storey height		Volume (m <sup>3</sup> )
Lowest occupied	<input type="text" value="42.99"/> (1a)	x	<input type="text" value="2.60"/>	=	<input type="text" value="111.77"/> (1)
Total floor area	(1a) + (2a) + (3a) + (4a) =		<input type="text" value="42.99"/> (5)		
Dwelling volume				(1) + (2) + (3) + (4) =	<input type="text" value="111.77"/> (6)

### 2. Ventilation rate

			m <sup>3</sup> per hour		Air changes per hour
Number of chimneys	<input type="text" value="0"/>	x 40 =	<input type="text" value="0"/> (7)		
Number of open flues	<input type="text" value="0"/>	x 20 =	<input type="text" value="0"/> (8)		
Number of intermittent fans or passive vents	<input type="text" value="0"/>	x 10 =	<input type="text" value="0"/> (9)		
Number of flueless gas fires	<input type="text" value="0"/>	x 40 =	<input type="text" value="0"/> (9a)		
Infiltration due to chimneys, flues and fans		(7) + (8) + (9) + (9a) =	<input type="text" value="0"/>	÷ (6) =	<input type="text" value="0.00"/> (10)
If a pressurisation test has been carried out, proceed to box (19)					
Number of storeys in the dwelling			<input type="text" value="N/A"/> (11)		
Additional infiltration				[(11) - 1] x 0.1 =	<input type="text" value="N/A"/> (12)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction					<input type="text" value="N/A"/> (13)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0					<input type="text" value="N/A"/> (14)
If no draught lobby, enter 0.05, else enter 0					<input type="text" value="N/A"/> (15)
Percentage of windows and doors draught stripped			<input type="text" value="N/A"/> (16)		
Window infiltration		0.25 - [0.2 x (16) ÷ 100] =			<input type="text" value="N/A"/> (17)
Infiltration rate		(10) + (12) + (13) + (14) + (15) + (17) =			<input type="text" value="N/A"/> (18)
If based on air permeability value, then [q50 ÷ 20] + (10) in (19), otherwise (19) = (18)					<input type="text" value="0.50"/> (19)
Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used					
Number of sides on which sheltered					<input type="text" value="2"/> (20)
Shelter factor		1 - [0.075 x (20)] =			<input type="text" value="0.85"/> (21)
Adjusted infiltration rate		(19) x (21) =			<input type="text" value="0.42"/> (22)
Calculate effective air change rate for the applicable case:					
If balanced whole house mechanical ventilation		air throughput (in ach, see 2.6.6) =	<input type="text" value="0.30"/> (22a)		
If balanced with heat recovery		efficiency in % allowing for in-use factor =	<input type="text" value="79.05"/> (22b)		
a) If balanced mechanical ventilation with heat recovery		(22) + (22a) x [1 - (22b) ÷ 100] =	<input type="text" value="0.49"/> (23)		
b) If balanced mechanical ventilation without heat recovery		(22) + (22a) =	<input type="text" value="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)					<input type="text" value="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)<sup>2</sup> x 0.5]

(24)

Effective air change rate - enter (23) or (23a) or (23b) or (24) in (25)

(25)

### 3. Heat losses and heat loss perimeter

	Net area (m <sup>2</sup> )		U-value		AxU (W/K)
Windows*	<input type="text" value="9.30"/>	x	<input type="text" value="1.77"/>	=	<input type="text" value="16.42"/> (27)
Walls	<input type="text" value="31.55"/>	x	<input type="text" value="0.31"/>	=	<input type="text" value="9.87"/> (29)
Walls	<input type="text" value="20.77"/>	x	<input type="text" value="0.25"/>	=	<input type="text" value="5.19"/> (29)
Roof	<input type="text" value="42.99"/>	x	<input type="text" value="0.30"/>	=	<input type="text" value="12.90"/> (30)
Total area of elements	<input type="text" value="104.61"/> (32)				

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

Fabric heat loss (26) + (27) + (28) + (29) + (30) =  (33)

Thermal bridges - calculated using Appendix K  (34)

if details of thermal bridging are not known calculate y x (32) [see Appendix K] and enter in (34)

Total fabric heat loss (33) + (34) =  (35)

Ventilation heat loss (25) x 0.33 x (6) =  (36)

Heat loss coefficient (35) + (36) =  (37)

Heat loss parameter (HLP), W/m<sup>2</sup>K (37) ÷ (5) =  (38)

### 4. Water heating energy requirements

Energy content of hot water used from Table 1 column (b)  (39)

Distribution loss from Table 1 column (c)  (40)

if instantaneous water heating at point of use, enter '0' in (40) to (45)

for community heating use Table 1 (c) whether or not hot water tank is present

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day)  (41)

Temperature factor from Table 2b  (41a)

Energy lost from water storage, kWh/year (41) x (41a) =  (42)

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

Cylinder volume (litres) including any solar storage within same  (43)

if community heating and no tank in dwelling, enter 110 litres in (43)

otherwise if no stored hot water (this includes instantaneous combi boilers) enter 0 in (43)

Hot water storage loss factor from Table 2, kWh/litre/day  (44)

if community heating and no tank in dwelling, use cylinder loss from Table 2 for 50mm factory insulation

Volume factor from Table 2a  (44a)

Temperature factor from Table 2b  (44b)

Energy lost from water storage, kWh/year  (45)

Enter (42) or (45) in (46)  (46)

If dedicated solar storage is within cylinder, (47) = (46) x [(43) - (H11)] ÷ (43), else  (47)

Primary circuit loss from Table 3  (48)

Combi loss from Table 3a (enter 0 if not a combi)  (49)

Solar DHW input calculated using Appendix H (enter 0 if no solar collector)  (50)

Output from water heater (39) + (40) + (47) + (48) + (49) - (50) =  (51)

Heat gains from water heating 0.25 x [(39) + (49)] + 0.8 x [(40) + (47) + (48)] =  (52)

include (47) in the calculation of (52) only if a cylinder is in the dwelling or hot water is from community heating

### 5. Internal gains

Lights, appliances, cooking and metabolic from Table 5  (53)

Reduction of internal gains due to low energy lighting using Appendix L		28.81	(53a)
Additional gains from Table 5a		0.00	(53b)
Water heating		116.43	(54)
Total internal gains		384.27	(55)

## 6. Solar gains

	Access factor Table 6d	Area (m <sup>2</sup> )	Flux Table 6a	gL Table 6b	FF Table 6c	Gains (W)
East	0.77	1.56	48.00	0.72	0.70	26.15 (58)
South	0.77	7.74	72.00	0.72	0.70	194.67 (60)
Total solar gains			(56) + (57) + (58) + (59) + (60) + (61) + (62) + (63) + (64) =			220.83 (65)
Total gains					(55) + (65) =	605.09 (66)
Gain/loss ratio (GLR)					(66) ÷ (37) =	7.75 (67)
Utilisation factor from Table 7, using GLR in (67)						0.90 (68)
Useful gains					(66) × (68) =	545.78 (69)

## 7. Mean internal temperature

	°C
Mean internal temperature of the living area from Table 8	18.86 (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	$\{[(69) \div (37)] - 4\} \times 0.2 \times R =$ 0.60 (72)
Adjusted living room temperature	(70) + (71) + (72) = 19.46 (73)
Temperature difference between zones from Table 9	2.02 (74)
Living area fraction (0 to 1.0)	living room area ÷ (5) = 0.55 (75)
Rest-of-house fraction	1 - (75) = 0.45 (76)
Mean internal temperature	(73) - [(74) × (76)] = 18.55 (77)

## 8. Degree days

Temperature rise from gains	(69) ÷ (37) = 6.99 (78)
Base temperature	(77) - (78) = 11.56 (79)
Degree days, use (79) and Table 10	1252.37 (80)

## 9. Space heating requirement

	kWh/year
Space heating requirement (useful)	0.024 × (80) × (37) = 2346.67 (81)

## 9b. Energy requirements - community heating scheme

Overall efficiency allowing for space heating control 100% minus the amount shown in the 'efficiency adjustment' column of Table 4c(3) where appropriate	100 (82*)
Fraction of heat from CHP unit from operational records or the plant design specification	0.00 (83*)
Fraction of heat from boilers or heat pump	1 - (83*) = 1.00 (84*)
Distribution loss factor from Table 12c	1.05 (85*)
Space heating from CHP	$[(81) \times (83*) \times 100] \div (82*) \times (85*) =$ 0.00 (86*)
Space heating from boilers or heat pump	$[(81) \times (84*) \times 100] \div (82*) \times (85*) =$ 2464.00 (87*)
Domestic hot water only community scheme	
Overall efficiency of the DHW only heating plant	100.00 (82*)
Fraction of heat from CHP unit	0.00 (83*)

Fraction of heat from boilers or heat pump			$1 - (83^*) =$	<input type="text" value="1.00"/>	(84*)
Distribution loss factor from Table 12c				<input type="text" value="1.05"/>	(85*)
Water heated by CHP			$[(51) \times (83^*) \times 100] \div (82^*) \times (85^*) =$	<input type="text" value="0.00"/>	(87a*)
Water heated by boilers or heat pump			$[(51) \times (84^*) \times 100] \div (82^*) \times (85^*) =$	<input type="text" value="2303.50"/>	(87b*)
Electricity for pumps and fans from Table 4f for dwellings with mechanical ventilation, otherwise enter '0'				<input type="text" value="54.98"/>	(88*)

### 10b. Fuel costs - community heating scheme

	Fuel required kWh/year		Fuel price Table 12		Fuel cost £/year	
Space heating from CHP	(86*)	x	<input type="text" value="N/A"/>	x 0.01 =	<input type="text" value="0.00"/>	(89*)
Space heating from boilers or heat pump	(87*)	x	<input type="text" value="1.99"/>	x 0.01 =	<input type="text" value="49.03"/>	(90*)
Domestic hot water only community scheme						
Water heated by CHP	(87a*)	x	<input type="text" value="N/A"/>	x 0.01 =	<input type="text" value="0.00"/>	(91*)
Water heated by boilers or heat pump	(87b*)	x	<input type="text" value="1.99"/>	x 0.01 =	<input type="text" value="45.84"/>	(92*)
Pump and fan energy	(88*)	x	<input type="text" value="7.12"/>	x 0.01 =	<input type="text" value="3.91"/>	(94*)
Energy for lighting, calculated in Appendix L	<input type="text" value="192.10"/>	x	<input type="text" value="7.12"/>	x 0.01 =	<input type="text" value="13.68"/>	(94a*)
Additional standing charges from Table 12					<input type="text" value="34.00"/>	(94b*)
Renewable and energy-saving technologies (Appendices M, N and Q)						
Energy produced or saved	<input type="text" value="0.00"/>	x	<input type="text" value="N/A"/>	x 0.01 =	<input type="text" value="0.00"/>	(95*)
Energy consumed	<input type="text" value="0.00"/>	x	<input type="text" value="N/A"/>	x 0.01 =	<input type="text" value="0.00"/>	(96*)
Total energy cost				$(89^*) + (90^*) + (91^*) + (92^*) + (94^*) + (94a^*) + (94b^*) - (95^*) + (96^*) =$	<input type="text" value="146.47"/>	(97*)

### 11b. SAP rating - community heating scheme

Energy cost deflator	<input type="text" value="0.91"/>	(98*)
Energy cost factor (ECF)	<input type="text" value="1.17"/>	(99*)
SAP rating from Table 14	<input type="text" value="84"/>	(100*)
SAP band	<input type="text" value="B"/>	

### 12a. CO emissions - individual heating systems and community heating without CHP

	Energy kWh/year		Emission factor kg CO /kWh		Emissions kg CO /year	
Community heating scheme						
Efficiency of community boilers, % use actual efficiency if known, or value in Table 4a				<input type="text" value="75.00"/>	<input type="text" value="75.00"/>	(104)
Space heating	$(87^*) \times 100 \div (104)$	x	<input type="text" value="0.194"/>	=	<input type="text" value="637.36"/>	(105)
Domestic hot water only community scheme						
Efficiency of community boilers, %				<input type="text" value="90.00"/>	<input type="text" value="90.00"/>	(104)
Water heating	$(87b^*) \times 100 \div (104)$	x	<input type="text" value="0.194"/>	=	<input type="text" value="496.53"/>	(106)
Space and water heating if negative, enter '0' in (107)				$(105) + (106) + (108^*) =$	<input type="text" value="1133.89"/>	(107)
Electricity from pumps and fans from (87) or (88*)	<input type="text" value="54.98"/>	x	<input type="text" value="0.422"/>	=	<input type="text" value="23.20"/>	(108)
Energy for lighting from Appendix L	<input type="text" value="192.10"/>	x	<input type="text" value="0.422"/>	=	<input type="text" value="81.07"/>	(109)
Renewable and energy-saving technologies (Appendices M, N and Q)						
Energy produced or saved	<input type="text" value="0.00"/>	x	<input type="text" value="N/A"/>	=	<input type="text" value="0.00"/>	(110)
Energy consumed	<input type="text" value="0.00"/>	x	<input type="text" value="N/A"/>	=	<input type="text" value="0.00"/>	(111)
Total CO				$(107) + (108) + (109) - (110) + (111) =$	<input type="text" value="1238.16"/>	(112)
Dwelling CO emission rate				$(112) \div (5) =$	<input type="text" value="28.80"/>	(113)
El rating					<input type="text" value="81"/>	
El band					<input type="text" value="B"/>	

	Energy kWh/year		Primary energy factor		Primary energy kWh/year
<b>Community heating scheme</b>					
Efficiency of community boilers, % use actual efficiency if known, or value in Table 4a				75.00	{104}
Space heating	$(87^*) \times 100 \div \{104\}$	x	1.150	=	3778.14 {105}
<b>Domestic hot water only community scheme</b>					
Efficiency of community boilers, %				90.00	{104}
Water heating	$(87b^*) \times 100 \div \{104\}$	x	1.150	=	2943.35 {106}
Space and water heating if negative, enter '0' in {107}				$\{105\} + \{106\} + \{108^*\} =$	6721.50 {107}
Electricity from pumps and fans from (87) or (88*)	54.98	x	2.800	=	153.95 {108}
Energy for lighting from Appendix L	192.10	x	2.800	=	537.88 {109}
<b>Renewable and energy-saving technologies (Appendices M, N and Q)</b>					
Energy produced or saved	0.00	x	N/A	=	0.00 {110}
Energy consumed	0.00	x	N/A	=	0.00 {111}
Primary energy				$\{107\} + \{108\} + \{109\} - \{110\} + \{111\} =$	7413.32 {112}
Primary energy, kWh/m <sup>2</sup> /year				$\{112\} \div (5) =$	172.44 {113}