SAP 2005 Worksheet
Design - Draft

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.

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Client		Last modified	27/04/2010
Address	Unit 9 Ex Makepeace Mansions Unit 9, Holly Lodge Estate, Camden, Greater London, NW1		

1. Overall dwelling dimensions

		Area (m²)		Average storey height		Volume (m³)	
Lowest occupied		42.24	(1a) x	2.60	=	109.82	(1)
Total floor area	(1a) + (2a) + (3a) + (4a) =	42.24	(5)				
Dwelling volume					(1) + (2) + (3) + (4) =	109.82	(6)

2. Ventilation rate

		m³ per hour	
Number of chimneys	0	x 40 = 0	(7)
Number of open flues	0	x 20 = 0	(8)
Number of intermittent fans or passive vents	2	x 10 = 20	(9)
Number of flueless gas fires	0	x 40 = 0	(9a)

			Air changes per hour	
Infiltration due to chimneys, flues and fans	(7) + (8) + (9) + (9a) =	20	÷ (6) = 0.18	(10)
If a pressurisation test has been carried out, proceed to box (19)				
Number of storeys in the dwelling		N/A		(11)
Additional infiltration			[(11) - 1] x 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)
Window infiltration			0.25 - [0.2 x (16) ÷ 100] = N/A	(17)
Infiltration rate			(10) + (12) + (13) + (14) + (15) + (17) = N/A	(18)
If based on air permeability value, then [q50 ÷ 20] + (10) in (19), otherwise (19) = (18)			0.68	(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			2	(20)
Shelter factor			1 - [0.075 x (20)] = 0.85	(21)
Adjusted infiltration rate			(19) x (21) = 0.58	(22)
Calculate effective air change rate for the applicable case:				
If balanced whole house mechanical ventilation			air throughput (in ach, see 2.6.6) = N/A	(22a)
If balanced with heat recovery			efficiency in % allowing for in-use factor = N/A	(22b)
a) If balanced mechanical ventilation with heat recovery			(22) + (22a) x [1 - (22b) ÷ 100] = N/A	(23)
b) If balanced mechanical ventilation without heat recovery			(22) + (22a) = 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 x 0.5]	0.67	(24)
Effective air change rate - enter (23) or (23a) or (23b) or (24) in (25)	0.67	(25)

3. Heat losses and heat loss perimeter

	Net area (m²)		U-value		AxU (W/K)	
Windows*	10.93	x	4.03	=	44.02	(27)
Walls	29.92	x	1.58	=	47.27	(29)
Walls	20.77	x	1.30	=	27.00	(29)
Total area of elements	61.62	(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) = 118.29	(33)
Thermal bridges - calculated using Appendix K if details of thermal bridging are not known calculate y x (32) [see Appendix K] and enter in (34)	9.24	(34)
Total fabric heat loss	(33) + (34) = 127.53	(35)
Ventilation heat loss	(25) x 0.33 x (6) = 24.21	(36)
Heat loss coefficient	(35) + (36) = 151.75	(37)
Heat loss parameter (HLP), W/m²K	(37) ÷ (5) = 3.59	(38)

4. Water heating energy requirements

		kWh/year	
Energy content of hot water used from Table 1 column (b)		1325.73	(39)
Distribution loss from Table 1 column (c) 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		233.95	(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) =	N/A		(42)
b) If manufacturer's declared cylinder loss factor is not known:			
Cylinder volume (litres) including any solar storage within same 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)	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 50mm factory insulation	0.01		(44)
Volume factor from Table 2a	0.93		(44a)
Temperature factor from Table 2b	0.60		(44b)
Energy lost from water storage, kWh/year	261.39		(45)
Enter (42) or (45) in (46)		261.39	(46)
If dedicated solar storage is within cylinder, (47) = (46) x [(43) - (H11)] ÷ (43), else		261.39	(47)
Primary circuit loss from Table 3		360.00	(48)
Combi loss from Table 3a (enter 0 if not a combi)		0.00	(49)
Solar DHW input calculated using Appendix H (enter 0 if no solar collector)		0.00	(50)
Output from water heater (39) + (40) + (47) + (48) + (49) - (50) =		2181.08	(51)
Heat gains from water heating 0.25 x [(39) + (49)] + 0.8 x [(40) + (47) + (48)] =		1015.71	(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

	Watts	
Lights, appliances, cooking and metabolic from Table 5	292.86	(53)
Reduction of internal gains due to low energy lighting using Appendix L	28.28	(53a)

Additional gains from Table 5a	0.00	(53b)
Water heating	115.95	(54)
Total internal gains	380.52	(55)

6. Solar gains

	Access factor Table 6d		Area (m²)		Flux Table 6a		gL Table 6b		FF Table 6c		Gains (W)	
East	0.77	x	1.56	x	48.00	x 0.9 x	0.85	x	0.70	=	30.88	(58)
South	0.77	x	9.37	x	72.00	x 0.9 x	0.85	x	0.70	=	278.21	(60)

Total solar gains	(56) + (57) + (58) + (59) + (60) + (61) + (62) + (63) + (64) = 309.09	(65)
Total gains	(55) + (65) = 689.61	(66)
Gain/loss ratio (GLR)	(66) ÷ (37) = 4.54	(67)
Utilisation factor from Table 7, using GLR in (67)	0.98	(68)
Useful gains	(66) x (68) = 676.47	(69)

7. Mean internal temperature

	°C	
Mean internal temperature of the living area from Table 8	18.59	(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} x 0.2 x R = 0.09	(72)
Adjusted living room temperature	(70) + (71) + (72) = 18.69	(73)
Temperature difference between zones from Table 9	2.50	(74)
Living area fraction (0 to 1.0)	living room area ÷ (5) = 0.54	(75)
Rest-of-house fraction	1 - (75) = 0.46	(76)
Mean internal temperature	(73) - [(74) x (76)] = 17.54	(77)

8. Degree days

Temperature rise from gains	(69) ÷ (37) = 4.46	(78)
Base temperature	(77) - (78) = 13.08	(79)
Degree days, use (79) and Table 10	1577.75	(80)

9. Space heating requirement

	kWh/year	
Space heating requirement (useful)	0.024 x (80) x (37) = 5746.01	(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*)
	kWh/year	
Space heating from CHP	[(81) x (83*) x 100] ÷ (82*) x (85*) = 0.00	(86*)
Space heating from boilers or heat pump	[(81) x (84*) x 100] ÷ (82*) x (85*) = 6033.31	(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*) = 1.00	(84*)

Distribution loss fcator from Table 12c		1.05	(85*)
Water heated by CHP	[(51) x (83*) x 100] ÷ (82*) x (85*) =	0.00	(87a*)
Water heated by boilers or heat pump	[(51) x (84*) x 100] ÷ (82*) x (85*) =	2290.13	(87b*)
Electricity for pumps and fans from Table 4f for dwellings with mechanical ventilation, otherwise enter '0'		0.00	(88*)

10b. Fuel costs - community heating scheme

	Fuel required kWh/year		Fuel price Table 12		Fuel cost £/year	
Space heating from CHP	(86*)	x	N/A	x 0.01 =	0.00	(89*)
Space heating from boilers or heat pump	(87*)	x	1.99	x 0.01 =	120.06	(90*)
Domestic hot water only community scheme						
Water heated by CHP	(87a*)	x	N/A	x 0.01 =	0.00	(91*)
Water heated by boilers or heat pump	(87b*)	x	1.99	x 0.01 =	45.57	(92*)
Pump and fan energy	(88*)	x	7.12	x 0.01 =	0.00	(94*)
Energy for lighting, calculated in Appendix L	188.56	x	7.12	x 0.01 =	13.43	(94a*)
Additional standing charges from Table 12					34.00	(94b*)
Renewable and energy-saving technologies (Appendices M, N and Q)						
Energy produced or saved	0.00	x	N/A	x 0.01 =	0.00	(95*)
Energy consumed	0.00	x	N/A	x 0.01 =	0.00	(96*)
Total energy cost	(89*) + (90*) + (91*) + (92*) + (94*) + (94a*) + (94b*) - (95*) + (96*) =				213.06	(97*)

11b. SAP rating - community heating scheme

Energy cost deflator	0.91	(98*)
Energy cost factor (ECF)	1.88	(99*)
SAP rating from Table 14	74	(100*)
SAP band	C	

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				75.00		(104)
Space heating	(87*) x 100 ÷ (104)	x	0.194	=	1560.62	(105)
Domestic hot water only community scheme						
Efficiency of community boilers, %				90.00		(104)
Water heating	(87b*) x 100 ÷ (104)	x	0.194	=	493.65	(106)
Space and water heating if negative, enter '0' in (107)			(105) + (106) + (108*) =		2054.27	(107)
Electricity from pumps and fans from (87) or (88*)	0.00	x	0.422	=	0.00	(108)
Energy for lighting from Appendix L	188.56	x	0.422	=	79.57	(109)
Renewable and energy-saving technologies (Appendices M, N and Q)						
Energy produced or saved	0.00	x	N/A	=	0.00	(110)
Energy consumed	0.00	x	N/A	=	0.00	(111)
Total CO	(107) + (108) + (109) - (110) + (111) =				2133.84	(112)
Dwelling CO emission rate	(112) ÷ (5) =				50.52	(113)
EI rating					67	
EI band					D	

13a. Primary energy - individual heating systems and community heating without CHP

	Energy kWh/year		Primary energy factor		Primary energy kWh/year	
Community heating scheme						
Efficiency of community boilers, % use actual efficiency if known, or value in Table 4a				75.00	{104}	
Space heating	(87*) x 100 ÷ {104}	x	1.150	=	9251.08	{105}
Domestic hot water only community scheme						
Efficiency of community boilers, %				90.00	{104}	
Water heating	(87b*) x 100 ÷ {104}	x	1.150	=	2926.28	{106}
Space and water heating if negative, enter '0' in {107}			{105} + {106} + {108*} =		12177.36	{107}
Electricity from pumps and fans from (87) or (88*)	0.00	x	2.800	=	0.00	{108}
Energy for lighting from Appendix L	188.56	x	2.800	=	527.97	{109}
Renewable and energy-saving technologies (Appendices M, N and Q)						
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} =		12705.32	{112}
Primary energy, kWh/m²/year				{112} ÷ (5) =	300.79	{113}

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