

SAP WorkSheet: New dwelling design stage

User Details

Assessor Name: Nicholas Jones **Stroma Number:** STRO000971
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.18

Property Address: Plot 37

Address : Plot 37, Cinders Road, Yapton, BN18 0JJ

1. General dwelling dimensions

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	46.86 (1a)	x	2.37 (2a)	=	111.06 (3a)
First floor	46.86 (1b)	x	2.55 (2b)	=	119.49 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.72 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	230.55 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				4	40 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.17 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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			5.09999990463257 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.43 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - {0.075 x (19)} =		0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.36 (21)
Infiltration rate modified for monthly wind speed			

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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(36)m=	46.24	45.93	45.61	44.15	43.87	42.6	42.6	42.36	43.09	43.87	44.43	45.01	(38)
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Heat transfer coefficient, W/K

$$(39)m = (37) + (38)m$$

(39)m=	120.95	120.64	120.32	118.86	118.58	117.3	117.3	117.07	117.8	118.58	119.14	119.72	
Average = Sum(39) _{1...12} / 12 =												118.86	(39)

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m + (4)$$

(40)m=	1.29	1.29	1.28	1.27	1.27	1.25	1.25	1.25	1.26	1.27	1.27	1.28	
Average = Sum(40) _{1...12} / 12 =												1.27	(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

if TFA > 13.9, $N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)^2)] + 0.0013 \times (TFA - 13.9)$

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day $V_{d,average} = (25 \times N) + 36$

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	107.46	103.55	99.64	95.74	91.83	87.92	87.92	91.83	95.74	99.64	103.55	107.46	
Total = Sum(44) _{1...12} =												1172.29	(44)

Energy content of hot water used - calculated monthly = $4.190 \times V_{d,m} \times n_m \times DT_m / 3600$ kWh/month (see Tables 1b, 1c, 1d)

(45)m=	159.36	139.38	143.82	125.39	120.31	103.82	96.21	110.4	111.72	130.2	142.12	154.33	
Total = Sum(45) _{1...12} =												1537.06	(45)

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

(46)m=	23.9	20.91	21.57	18.81	18.05	15.57	14.43	16.56	16.76	19.53	21.32	23.15	(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

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

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

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

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

If community heating see section 4.3

Volume factor from Table 2a

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

Enter (50) or (54) in (55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1	(56)
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If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H

(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1	(57)
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Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	20.07	20.07	20.07	20.08	20.08	20.09	20.09	20.09	20.09	20.08	20.08	20.07	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.07	20.07	20.07	20.08	20.08	20.09	20.09	20.09	20.09	20.08	20.08	20.07	(93)
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9 Space heating requirement

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation factor for gains, h_m :

(94)m=	0.91	0.88	0.83	0.75	0.64	0.48	0.34	0.37	0.56	0.76	0.88	0.92	(94)
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Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	795.06	890.09	923.33	888.75	774.15	569.71	387.99	404.94	590.08	736.14	758.81	759.07	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	1907	1829.86	1632.86	1328.89	994.02	644.15	409.54	432.32	705.35	1124.46	1546.25	1900.49	(97)
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Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	827.29	631.53	527.89	316.9	163.58	0	0	0	0	288.91	566.96	849.21	
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Total per year ($kWh/year$) = $Sum(98)_{1..12} =$ 4172.27 (98)

Space heating requirement in $kWh/m^2/year$

44.52 (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) = $(202) \times [1 - (203)] =$

1 (204)

Efficiency of main space heating system 1

348.95 (206)

Efficiency of secondary/supplementary heating system, %

0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
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Space heating requirement (calculated above)

827.29	631.53	527.89	316.9	163.58	0	0	0	0	288.91	566.96	849.21
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

237.08	180.98	151.28	90.82	46.88	0	0	0	0	82.79	162.48	243.36
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Total ($kWh/year$) = $Sum(211)_{1..12} =$ 1195.67 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

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

Water heating

Output from water heater (calculated above)

204.72	180.35	189.18	169.29	165.67	147.72	141.57	155.76	155.61	175.55	186.01	199.69
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Efficiency of water heater

176.98 (216)

(217)m=	176.98	176.98	176.98	176.98	176.98	176.98	176.98	176.98	176.98	176.98	176.98	(217)
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Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	115.67	101.9	106.89	95.65	93.61	83.46	79.99	88.01	87.92	99.19	105.1	112.83
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Total = $Sum(219a)_{1..12} =$ 1170.23 (219)

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Annual totals

Space heating fuel used, main system 1

kWh/year

kWh/year

1195.67

Water heating fuel used

1170.23

Electricity for pumps, fans and electric keep-hot

Total electricity for the above, kWh/year

sum of (230a)...(230g) =

0

(231)

Electricity for lighting

398.99

(232)

12a Fuel costs - individual heating systems

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	{211} x	13.19	x 0.01 = 157.71 (240)
Space heating - main system 2	{213} x	0	x 0.01 = 0 (241)
Space heating - secondary	{215} x	13.19	x 0.01 = 0 (242)
Water heating cost (other fuel)	{219}	13.19	x 0.01 = 154.35 (247)
Pumps, fans and electric keep-hot	{231}	13.19	x 0.01 = 0 (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}	13.19	x 0.01 = 52.63 (250)
Additional standing charges (Table 12)			120 (251)

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

Total energy cost

(245)...(247) + (250)...(254) =

484.69

(255)

12a SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.47 (257)
SAP rating (Section 12)		79.53 (258)

12a CO2 emissions - individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	{211} x	0.519	= 620.55 (261)
Space heating (secondary)	{215} x	0.519	= 0 (263)
Water heating	{219} x	0.216	= 252.77 (264)
Space and water heating	{261} + (262) + (263) + (264) =		873.32 (265)
Electricity for pumps, fans and electric keep-hot	{231} x	0.519	= 0 (267)
Electricity for lighting	{232} x	0.519	= 207.07 (268)
Total CO2, kg/year		sum of (265) ... (271) =	1080.39 (272)
CO2 emissions per m²		(272) ÷ (4) =	11.53 (273)
EI rating (section 14)			90 (274)

13a Primary Energy

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	Energy kWh/year	Primary factor		P. Energy kWh/year
Space heating (main system 1)	{211} x	3.07	=	3670.69 {261}
Space heating (secondary)	{215} x	3.07	=	0 {263}
Energy for water heating	{219} x	1.22	=	1427.67 {264}
Space and water heating	{261} + {262} + {263} + {264} =			5098.37 {265}
Electricity for pumps, fans and electric keep-hot	{231} x	3.07	=	0 {267}
Electricity for lighting	{232} x	0	=	1224.88 {268}
'Total Primary Energy		sum of {265}...{271} =		6323.25 {272}
Primary energy kWh/m²/year		{272} ÷ {4} =		67.47 {273}