

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	00229 Station Rd F.03			Issued on Date	08/11/2019
Assessment Reference	Option 3 Electric Boilers	Prop Type Ref			
Property					
SAP Rating	72 C	DER	27.19	TER	31.56
Environmental	83 B	% DER<TER	13.85		
CO ₂ Emissions (t/year)	1.02	DFEE	53.73	TFEE	54.68
General Requirements Compliance	Pass	% DFEE<TFEE	1.74		
Assessor Details	Miss Charlotte Curry, Charlotte Curry, Tel: 020 7993 8507, charlotte@jawsustainability.com			Assessor ID	R564-0001
Client					

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 48 m²

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

1a TER and DER

Fuel for main heating: Electricity
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 31.56 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 27.19 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 53.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.33 (max. 2.00)	1.42 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using default ψ -value of 0.15

3 Air permeability

Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Electric underfloor heating with radiators or underfloor - Electric
Data from manufacturer
tbc tbc

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.00 kWh/day
Permitted by DBSCG 2.30 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.50
Maximum 1.5 OK
MVHR efficiency: 91%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing East: 7.73 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1170.00 kWh/Year

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.2000 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1550 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												77.3500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3109	0.3070	0.3031	0.2838	0.2799	0.2605	0.2605	0.2566	0.2683	0.2799	0.2876	0.2954 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
DOOR			2.0000	1.0000	2.0000		(26)
WINDOWS (Uw = 1.42)			7.7300	1.3437	10.3866		(27)
COM			48.0000	0.0850	4.0800		(28b)
External Wall 1	24.9000	7.7300	17.1700	0.2200	3.7774		(29a)
Wall to stairs	16.2500		16.2500	0.1256	2.0407		(29a)
Wall to corridor	17.9500	2.0000	15.9500	0.1321	2.1062		(29a)
Unheated	7.2500		7.2500	0.1347	0.9767		(29a)
Total net area of external elements Aum(A, m ²)			114.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.3677		(33)
Party Wall 1			11.8500	0.0000	0.0000		(32)
Party Ceilings 1			48.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							17.1525 (36)
Total fabric heat loss							(33) + (36) = 42.5202 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.3107	12.1572	12.0038	11.2365	11.0831	10.3158	10.3158	10.1624	10.6227	11.0831	11.3900	11.6969 (38)
Heat transfer coeff	54.8308	54.6774	54.5239	53.7567	53.6032	52.8360	52.8360	52.6825	53.1429	53.6032	53.9101	54.2170 (39)
Average = Sum(39)m / 12 =												53.7183 (39)
HLP	1.1423	1.1391	1.1359	1.1199	1.1167	1.1007	1.1007	1.0976	1.1071	1.1167	1.1231	1.1295 (40)
HLP (average)												1.1191 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6314 (42)
Average daily hot water use (litres/day)												72.9461 (43)
Daily hot water use	80.2407	77.3228	74.4050	71.4872	68.5693	65.6515	65.6515	68.5693	71.4872	74.4050	77.3228	80.2407 (44)
Energy conte	118.9946	104.0735	107.3945	93.6291	89.8394	77.5245	71.8379	82.4350	83.4196	97.2174	106.1204	115.2399 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m =	1147.7258 (45)
Distribution loss (46)m = 0.15 x (45)m													
	17.8492	15.6110	16.1092	14.0444	13.4759	11.6287	10.7757	12.3653	12.5129	14.5826	15.9181	17.2860	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.2000	(55)
Total storage loss													
	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000	(56)
If cylinder contains dedicated solar storage													
	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	156.1946	137.6735	144.5945	129.6291	127.0394	113.5245	109.0379	119.6350	119.4196	134.4174	142.1204	152.4399	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
												Solar input (sum of months) = Sum (63)m =	0.0000 (63)
Output from w/h													
	156.1946	137.6735	144.5945	129.6291	127.0394	113.5245	109.0379	119.6350	119.4196	134.4174	142.1204	152.4399	(64)
Heat gains from water heating, kWh/month												Total per year (kWh/year) = Sum (64)m =	1585.7258 (64)
	69.3257	61.4844	65.4687	59.9317	59.6316	54.5769	53.6461	57.1696	56.5370	62.0848	64.0850	68.0773	(65)

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	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.1943	11.7191	9.5306	7.2153	5.3935	4.5534	4.9201	6.3954	8.5839	10.8992	12.7210	13.5610	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	142.0415	143.5155	139.8012	131.8939	121.9123	112.5311	106.2638	104.7899	108.5042	116.4115	126.3930	135.7743	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	(71)
Water heating gains (Table 5)													
	93.1797	91.4947	87.9955	83.2384	80.1500	75.8013	72.1050	76.8409	78.5236	83.4473	89.0070	91.5017	(72)
Total internal gains													
	295.8868	294.2004	284.7985	269.8188	254.9270	240.3570	230.7601	235.4974	243.0829	258.2292	275.5922	288.3082	(73)

6. Solar gains

[Jan]													
	Area	Solar flux		g		FF		Access		Gains			
	m2	Table 6a		or Table 6b		or Table 6c		factor		W			
		W/m2						Table 6d					
East	7.7300	19.6403		0.6300		0.7000		0.7700		46.3979		(76)	
Solar gains	46.3979	90.7642	149.4757	218.0014	267.1689	273.4949	260.3783	223.6611	173.8464	107.6994	57.8528	38.1554	(83)
Total gains	342.2847	384.9646	434.2742	487.8202	522.0959	513.8519	491.1385	459.1585	416.9293	365.9286	333.4450	326.4636	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.3172	24.3855	24.4541	24.8031	24.8741	25.2353	25.2353	25.3088	25.0896	24.8741	24.7325	24.5925	
alpha	2.6211	2.6257	2.6303	2.6535	2.6583	2.6824	2.6824	2.6873	2.6726	2.6583	2.6488	2.6395	
util living area	0.9511	0.9325	0.8948	0.8209	0.7096	0.5649	0.4375	0.4784	0.6795	0.8572	0.9314	0.9562	(86)
MIT	19.2460	19.4371	19.7704	20.1936	20.5376	20.7639	20.8500	20.9356	20.6633	20.2105	19.6624	19.2152	(87)
Th 2	19.9644	19.9690	19.9716	19.9846	19.9872	20.0002	20.0002	20.0028	19.9950	19.9872	19.9820	19.9768	(88)
util rest of house	0.9441	0.9229	0.8795	0.7944	0.6657	0.4977	0.3498	0.3899	0.6175	0.8300	0.9200	0.9498	(89)
MIT 2	17.6198	17.8960	18.3737	18.9756	19.4396	19.7307	19.8210	19.8117	19.6163	19.0144	18.2337	17.5826	(90)
Living area fraction	18.4268	18.6607	19.0668	19.5801	19.9845	20.2434	20.3316	20.3198	fLA = Living area / (4) =	20.1359	19.6080	18.9427	0.4963 (91)
MIT	18.4268	18.6607	19.0668	19.5801	19.9845	20.2434	20.3316	20.3198	20.1359	19.6080	18.9427	18.3928	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4268	18.6607	19.0668	19.5801	19.9845	20.2434	20.3316	20.3198	20.1359	19.6080	18.9427	18.3928	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.9078	0.8636	0.7825	0.6656	0.5149	0.3799	0.4192	0.6269	0.8182	0.9057	0.9373	(94)
Useful gains	318.5925	349.4802	375.0342	381.7067	347.4920	264.5799	186.5951	192.4974	261.3870	299.4026	301.9972	306.0087	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	774.5833	752.4014	685.1901	574.1247	444.0735	298.1765	197.1646	206.5050	320.7649	482.8564	638.4405	769.4901	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	339.2571	270.7631	230.7560	138.5409	71.8566	0.0000	0.0000	0.0000	0.0000	136.4896	242.2392	344.8301	(98)
Space heating												1774.7326	(98)
Space heating per m2												(98) / (4) =	36.9736 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1774.7326	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	339.2571	270.7631	230.7560	138.5409	71.8566	0.0000	0.0000	0.0000	0.0000	136.4896	242.2392	344.8301	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	339.2571	270.7631	230.7560	138.5409	71.8566	0.0000	0.0000	0.0000	0.0000	136.4896	242.2392	344.8301	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	156.1946	137.6735	144.5945	129.6291	127.0394	113.5245	109.0379	119.6350	119.4196	134.4174	142.1204	152.4399	(64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)	
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)	
Fuel for water heating, kWh/month	156.1946	137.6735	144.5945	129.6291	127.0394	113.5245	109.0379	119.6350	119.4196	134.4174	142.1204	152.4399	(219)	
Water heating fuel used												1585.7258	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1774.7326	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.2500, SFP = 0.6250)													91.5000	(230a)
mechanical ventilation fans (SFP = 0.6250)													91.5000	(231)
Total electricity for the above, kWh/year													233.0159	(232)
Electricity for lighting (calculated in Appendix L)														
Energy saving/generation technologies (Appendices M ,N and Q)														
Total delivered energy for all uses													3684.9744	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1774.7326	0.5190	921.0862	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1585.7258	0.5190	822.9917	(264)
Space and water heating			1744.0780	(265)
Pumps and fans	91.5000	0.5190	47.4885	(267)
Energy for lighting	233.0159	0.5190	120.9352	(268)
Energy saving/generation technologies				
PV Unit	-1170.0000	0.5190	-607.2300	(269)
Total CO2, kg/year			1305.2717	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.1900	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			27.1900	ZC1
Total Floor Area		TFA	48.0000	
Assumed number of occupants		N	1.6314	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.5356	ZC2
CO2 emissions from cooking, equation (L16)			3.2949	ZC3
Total CO2 emissions			48.0205	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			48.0205	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4167 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3229 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794 (22b)
	0.5848	0.5815	0.5782	0.5631	0.5603	0.5471	0.5471	0.5446	0.5521	0.5603	0.5660	0.5720 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0000	1.0000	2.0000		(26)
TER Opening Type (Uw = 1.40)			7.7300	1.3258	10.2481		(27)
COM			48.0000	0.1300	6.2400		(28b)
External Wall 1	24.9000	7.7300	17.1700	0.1800	3.0906		(29a)
Wall to stairs	16.2500		16.2500	0.1800	2.9250		(29a)
Wall to corridor	17.9500	2.0000	15.9500	0.1800	2.8710		(29a)
Unheated	7.2500		7.2500	0.1800	1.3050		(29a)
Total net area of external elements Aum(A, m ²)			114.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6797		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.7175 (36)
Total fabric heat loss						(33) + (36) =	34.3972 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.1563	23.0260	22.8983	22.2982	22.1860	21.6633	21.6633	21.5666	21.8646	22.1860	22.4131	22.6505 (38)
Heat transfer coeff	57.5536	57.4232	57.2955	56.6954	56.5832	56.0606	56.0606	55.9638	56.2619	56.5832	56.8103	57.0477 (39)
Average = Sum(39)m / 12 =												56.6949 (39)
HLP	1.1990	1.1963	1.1937	1.1812	1.1788	1.1679	1.1679	1.1659	1.1721	1.1788	1.1835	1.1885 (40)
HLP (average)												1.1811 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6314 (42)
Average daily hot water use (litres/day)												72.9461 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	80.2407	77.3228	74.4050	71.4872	68.5693	65.6515	65.6515	68.5693	71.4872	74.4050	77.3228	80.2407 (44)
Energy content (annual)	118.9946	104.0735	107.3945	93.6291	89.8394	77.5245	71.8379	82.4350	83.4196	97.2174	106.1204	115.2399 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1147.7258 (45)
Water storage loss:	17.8492	15.6110	16.1092	14.0444	13.4759	11.6287	10.7757	12.3653	12.5129	14.5826	15.9181	17.2860 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss												
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage												
28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
170.7412	150.8123	159.1411	143.7065	141.5860	127.6019	123.5845	134.1816	133.4969	148.9640	156.1978	166.9865	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
170.7412	150.8123	159.1411	143.7065	141.5860	127.6019	123.5845	134.1816	133.4969	148.9640	156.1978	166.9865	(64)
Heat gains from water heating, kWh/month												
80.9630	71.9955	77.1059	71.1936	71.2689	65.8388	65.2834	68.8069	67.7989	73.7221	75.3469	79.7146	(65)

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	
81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.1943	11.7191	9.5306	7.2153	5.3935	4.5534	4.9201	6.3954	8.5839	10.8992	12.7210	13.5610	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
142.0415	143.5155	139.8012	131.8939	121.9123	112.5311	106.2638	104.7899	108.5042	116.4115	126.3930	135.7743	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	(71)
Water heating gains (Table 5)												
108.8212	107.1362	103.6370	98.8799	95.7915	91.4428	87.7465	92.4824	94.1651	99.0888	104.6485	107.1432	(72)
Total internal gains												
314.5283	312.8419	303.4400	288.4603	273.5685	258.9985	249.4016	254.1389	261.7244	276.8707	294.2337	306.9497	(73)

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
Specific data												
or Table 6c												
FF												
Access												
factor												
Table 6d												
Gains												
W												
East	7.7300	19.6403	0.6300	0.7000	0.7700	46.3979	(76)					
Solar gains	46.3979	90.7642	149.4757	218.0014	267.1689	273.4949	260.3783	223.6611	173.8464	107.6994	57.8528	38.1554 (83)
Total gains	360.9262	403.6061	452.9157	506.4617	540.7374	532.4934	509.7800	477.8000	435.5708	384.5701	352.0865	345.1051 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.9171	58.0485	58.1780	58.7937	58.9103	59.4595	59.4595	59.5623	59.2468	58.9103	58.6748	58.4306
alpha	4.8611	4.8699	4.8785	4.9196	4.9274	4.9640	4.9640	4.9708	4.9498	4.9274	4.9117	4.8954
util living area	0.9946	0.9900	0.9757	0.9295	0.8198	0.6396	0.4770	0.5270	0.7807	0.9537	0.9894	0.9957 (86)
MIT	19.8323	19.9815	20.2452	20.5812	20.8386	20.9645	20.9931	20.9890	20.9062	20.5685	20.1418	19.8055 (87)
Th 2	19.9208	19.9229	19.9251	19.9351	19.9370	19.9457	19.9457	19.9474	19.9424	19.9370	19.9332	19.9292 (88)
util rest of house	0.9929	0.9867	0.9675	0.9056	0.7642	0.5481	0.3663	0.4124	0.6981	0.9329	0.9853	0.9943 (89)
MIT 2	18.3851	18.6031	18.9840	19.4593	19.7863	19.9234	19.9434	19.9431	19.8721	19.4536	18.8447	18.3521 (90)
Living area fraction												
MIT	19.1032	19.2871	19.6099	20.0160	20.3085	20.4401	20.4643	20.4622	20.3852	20.0069	19.4884	19.0734 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1032	19.2871	19.6099	20.0160	20.3085	20.4401	20.4643	20.4622	20.3852	20.0069	19.4884	19.0734 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9911	0.9841	0.9645	0.9077	0.7851	0.5924	0.4214	0.4695	0.7352	0.9345	0.9831	0.9927 (94)
Useful gains	357.7074	397.2050	436.8537	459.7247	424.5425	315.4655	214.8446	224.3284	320.2530	359.3898	346.1259	342.5888 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	851.9793	826.1559	751.1364	630.2290	487.0962	327.3968	216.6361	227.3334	353.6189	532.2702	703.7887	848.4909 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	367.7383	288.2550	233.8263	122.7631	46.5400	0.0000	0.0000	0.0000	0.0000	128.6230	257.5173	376.3912 (98)
Space heating												1821.6542 (98)
Space heating per m2												37.9511 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1948.2932 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	367.7383	288.2550	233.8263	122.7631	46.5400	0.0000	0.0000	0.0000	0.0000	128.6230	257.5173	376.3912	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	393.3030	308.2941	250.0816	131.2974	49.7754	0.0000	0.0000	0.0000	0.0000	137.5647	275.4195	402.5574	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	170.7412	150.8123	159.1411	143.7065	141.5860	127.6019	123.5845	134.1816	133.4969	148.9640	156.1978	166.9865	(64)
Efficiency of water heater (217)m	86.8092	86.5154	85.8389	84.3971	82.2044	79.8000	79.8000	79.8000	79.8000	84.4252	86.1393	86.9184	(216)
Fuel for water heating, kWh/month	196.6855	174.3184	185.3951	170.2742	172.2365	159.9021	154.8678	168.1474	167.2893	176.4451	181.3316	192.1186	(219)
Water heating fuel used												2099.0116	(219)
Annual totals kWh/year													
Space heating fuel - main system												1948.2932	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												233.0159	(232)
Total delivered energy for all uses												4355.3207	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1948.2932	0.2160	420.8313 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2099.0116	0.2160	453.3865 (264)
Space and water heating			874.2178 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.0159	0.5190	120.9352 (268)
Total CO2, kg/m2/year			1034.0781 (272)
Emissions per m2 for space and water heating			18.2129 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5195 (272b)
Emissions per m2 for pumps and fans			0.8109 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2129 * 1.55) + 2.5195 + 0.8109, rounded to 2 d.p.			31.5600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1667 (8)
Measured/design AP50					Yes
Infiltration rate					4.0000
Number of sides sheltered					0.3667 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2842 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3623	0.3552	0.3481	0.3126	0.3055	0.2700	0.2700	0.2629	0.2842	0.3055	0.3197	0.3339 (22b)
	0.5656	0.5631	0.5606	0.5489	0.5467	0.5364	0.5364	0.5345	0.5404	0.5467	0.5511	0.5557 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
DOOR			2.0000	1.0000	2.0000		(26)
WINDOWS (Uw = 1.42)			7.7300	1.3437	10.3866		(27)
COM			48.0000	0.0850	4.0800		(28b)
External Wall 1	24.9000	7.7300	17.1700	0.2200	3.7774		(29a)
Wall to stairs	16.2500		16.2500	0.1256	2.0407		(29a)
Wall to corridor	17.9500	2.0000	15.9500	0.1321	2.1062		(29a)
Unheated	7.2500		7.2500	0.1347	0.9767		(29a)
Total net area of external elements Aum(A, m ²)			114.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.3677		(33)
Party Wall 1			11.8500	0.0000	0.0000		(32)
Party Ceilings 1			48.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							17.1525 (36)
Total fabric heat loss						(33) + (36) =	42.5202 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.3992	22.2982	22.1993	21.7346	21.6477	21.2430	21.2430	21.1680	21.3989	21.6477	21.8236	22.0074 (38)
Heat transfer coeff	64.9193	64.8184	64.7195	64.2548	64.1679	63.7632	63.7632	63.6882	63.9190	64.1679	64.3437	64.5276 (39)
Average = Sum(39)m / 12 =												64.2544 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3525	1.3504	1.3483	1.3386	1.3368	1.3284	1.3284	1.3268	1.3316	1.3368	1.3405	1.3443 (40)
HLP (average)												1.3386 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6314 (42)
Average daily hot water use (litres/day)	72.9461 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.2407	77.3228	74.4050	71.4872	68.5693	65.6515	65.6515	68.5693	71.4872	74.4050	77.3228	80.2407 (44)
Energy conte	118.9946	104.0735	107.3945	93.6291	89.8394	77.5245	71.8379	82.4350	83.4196	97.2174	106.1204	115.2399 (45)
Energy content (annual)										Total = Sum(45)m =		1147.7258 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.2864	22.1156	22.8213	19.8962	19.0909	16.4740	15.2655	17.5174	17.7267	20.6587	22.5506	24.4885 (65)

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	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1943	11.7191	9.5306	7.2153	5.3935	4.5534	4.9201	6.3954	8.5839	10.8992	12.7210	13.5610	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	142.0415	143.5155	139.8012	131.8939	121.9123	112.5311	106.2638	104.7899	108.5042	116.4115	126.3930	135.7743	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	(71)
Water heating gains (Table 5)	33.9870	32.9101	30.6738	27.6336	25.6598	22.8805	20.5182	23.5449	24.6204	27.7671	31.3203	32.9146	(72)
Total internal gains	236.6941	235.6159	227.4768	214.2139	200.4368	187.4362	179.1734	182.2014	189.1796	202.5490	217.9055	229.7211	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					7.7300	19.6403	0.6300	0.7000			0.7700	46.3979 (76)	
Solar gains	46.3979	90.7642	149.4757	218.0014	267.1689	273.4949	260.3783	223.6611	173.8464	107.6994	57.8528	38.1554 (83)	
Total gains	283.0920	326.3801	376.9525	432.2154	467.6057	460.9311	439.5517	405.8625	363.0260	310.2483	275.7582	267.8766 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.5383	20.5703	20.6017	20.7507	20.7788	20.9107	20.9107	20.9353	20.8597	20.7788	20.7220	20.6630	
alpha	2.3692	2.3714	2.3734	2.3834	2.3853	2.3940	2.3940	2.3957	2.3906	2.3853	2.3815	2.3775	
util living area	0.9690	0.9555	0.9280	0.8730	0.7848	0.6613	0.5375	0.5845	0.7701	0.9069	0.9572	0.9726	(86)
MIT	18.1834	18.4533	18.9500	19.6020	20.1967	20.6381	20.8447	20.8045	20.4346	19.6508	18.7989	18.1282	(87)
Th 2	19.7999	19.8016	19.8032	19.8107	19.8121	19.8187	19.8187	19.8199	19.8161	19.8121	19.8092	19.8063	(88)
util rest of house	0.9639	0.9481	0.9156	0.8496	0.7414	0.5844	0.4234	0.4730	0.7073	0.8849	0.9489	0.9681	(89)
MIT 2	17.2492	17.5169	18.0067	18.6444	19.2043	19.5964	19.7517	19.7292	19.4359	18.7054	17.8676	17.1989	(90)
Living area fraction													0.4963 (91)
MIT	17.7128	17.9816	18.4748	19.1196	19.6968	20.1133	20.2941	20.2628	19.9315	19.1745	18.3298	17.6601	(92)
Temperature adjustment													0.0000
adjusted MIT	17.7128	17.9816	18.4748	19.1196	19.6968	20.1133	20.2941	20.2628	19.9315	19.1745	18.3298	17.6601	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9518	0.9334	0.8982	0.8334	0.7366	0.6053	0.4724	0.5181	0.7143	0.8701	0.9351	0.9570	(94)
Useful gains	269.4452	304.6459	338.5858	360.2034	344.4285	279.0093	207.6370	210.2851	259.3189	269.9546	257.8713	256.3567	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	870.7499	847.9273	775.0048	656.6574	513.1357	351.5483	235.5482	246.0158	372.7440	550.2103	722.5643	868.5458	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	447.3707	365.0851	324.6957	213.4468	125.5181	0.0000	0.0000	0.0000	0.0000	208.5103	334.5790	455.4686	(98)
Space heating												2474.6743	(98)
Space heating per m2												51.5557	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	599.3737	471.8474	484.0304	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7063	0.7713	0.7408	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	423.3290	363.9310	358.5760	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	600.9385	574.8077	536.4065	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.8788	156.8923	132.3059	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												417.0770 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	31.9697	39.2231	33.0765	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												104.2692 (107)
Space cooling per m2												2.1723 (108)
Energy for space heating												51.5557 (99)
Energy for space cooling												2.1723 (108)
Total												53.7280 (109)
Dwelling Fabric Energy Efficiency (DFEE)												53.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1667 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4167 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3229 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4117	0.4036	0.3956	0.3552	0.3471	0.3068	0.3068	0.2987	0.3229	0.3471	0.3633	0.3794 (22b)
	0.5848	0.5815	0.5782	0.5631	0.5603	0.5471	0.5471	0.5446	0.5521	0.5603	0.5660	0.5720 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0000	1.0000	2.0000		(26)
TER Opening Type (Uw = 1.40)			7.7300	1.3258	10.2481		(27)
COM			48.0000	0.1300	6.2400		(28b)
External Wall 1	24.9000	7.7300	17.1700	0.1800	3.0906		(29a)
Wall to stairs	16.2500		16.2500	0.1800	2.9250		(29a)
Wall to corridor	17.9500	2.0000	15.9500	0.1800	2.8710		(29a)
Unheated	7.2500		7.2500	0.1800	1.3050		(29a)
Total net area of external elements Aum(A, m ²)			114.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6797		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.7175 (36)
Total fabric heat loss						(33) + (36) =	34.3972 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.1563	23.0260	22.8983	22.2982	22.1860	21.6633	21.6633	21.5666	21.8646	22.1860	22.4131	22.6505 (38)
Heat transfer coeff	57.5536	57.4232	57.2955	56.6954	56.5832	56.0606	56.0606	55.9638	56.2619	56.5832	56.8103	57.0477 (39)
Average = Sum(39)m / 12 =												56.6949 (39)
HLP	1.1990	1.1963	1.1937	1.1812	1.1788	1.1679	1.1679	1.1659	1.1721	1.1788	1.1835	1.1885 (40)
HLP (average)												1.1811 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6314 (42)
Average daily hot water use (litres/day)												72.9461 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	80.2407	77.3228	74.4050	71.4872	68.5693	65.6515	65.6515	68.5693	71.4872	74.4050	77.3228	80.2407 (44)
Energy content (annual)	118.9946	104.0735	107.3945	93.6291	89.8394	77.5245	71.8379	82.4350	83.4196	97.2174	106.1204	115.2399 (45)
Distribution loss (46)m = 0.15 x (45)m												1147.7258 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.2864	22.1156	22.8213	19.8962	19.0909	16.4740	15.2655	17.5174	17.7267	20.6587	22.5506	24.4885 (65)

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	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	81.5707	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1943	11.7191	9.5306	7.2153	5.3935	4.5534	4.9201	6.3954	8.5839	10.8992	12.7210	13.5610	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	142.0415	143.5155	139.8012	131.8939	121.9123	112.5311	106.2638	104.7899	108.5042	116.4115	126.3930	135.7743	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	31.1571	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	-65.2566	(71)
Water heating gains (Table 5)	33.9870	32.9101	30.6738	27.6336	25.6598	22.8805	20.5182	23.5449	24.6204	27.7671	31.3203	32.9146	(72)
Total internal gains	236.6941	235.6159	227.4768	214.2139	200.4368	187.4362	179.1734	182.2014	189.1796	202.5490	217.9055	229.7211	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Table 6b	Specific data or Table 6b	FF Table 6c	Specific data or Table 6c	Access factor Table 6d	Gains W	
East				7.7300	19.6403	0.6300		0.7000		0.7700	46.3979 (76)	
Solar gains	46.3979	90.7642	149.4757	218.0014	267.1689	273.4949	260.3783	223.6611	173.8464	107.6994	57.8528	38.1554 (83)
Total gains	283.0920	326.3801	376.9525	432.2154	467.6057	460.9311	439.5517	405.8625	363.0260	310.2483	275.7582	267.8766 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.9171	58.0485	58.1780	58.7937	58.9103	59.4595	59.4595	59.5623	59.2468	58.9103	58.6748	58.4306	
alpha	4.8611	4.8699	4.8785	4.9196	4.9274	4.9640	4.9640	4.9708	4.9498	4.9274	4.9117	4.8954	
util living area	0.9981	0.9959	0.9883	0.9592	0.8763	0.7143	0.5467	0.6084	0.8585	0.9794	0.9963	0.9986	(86)
MIT	19.6841	19.8369	20.1105	20.4719	20.7734	20.9423	20.9876	20.9795	20.8509	20.4460	19.9986	19.6576	(87)
Th 2	19.9208	19.9229	19.9251	19.9351	19.9370	19.9457	19.9457	19.9474	19.9424	19.9370	19.9332	19.9292	(88)
util rest of house	0.9975	0.9945	0.9840	0.9436	0.8299	0.6211	0.4231	0.4819	0.7881	0.9687	0.9947	0.9981	(89)
MIT 2	18.7249	18.8790	19.1520	19.5113	19.7852	19.9196	19.9427	19.9416	19.8593	19.4936	19.0488	18.7053	(90)
Living area fraction									fLA = Living area / (4) =			0.4963	(91)
MIT	19.2009	19.3543	19.6277	19.9880	20.2756	20.4271	20.4612	20.4567	20.3514	19.9663	19.5202	19.1779	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2009	19.3543	19.6277	19.9880	20.2756	20.4271	20.4612	20.4567	20.3514	19.9663	19.5202	19.1779	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9969	0.9935	0.9825	0.9445	0.8463	0.6659	0.4849	0.5452	0.8185	0.9691	0.9939	0.9977	(94)
Ext temp.	282.2238	324.2691	370.3739	408.2203	395.7301	306.9111	213.1492	221.2766	297.1335	300.6528	274.0876	267.2471	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	857.5998	830.0151	752.1552	628.6410	485.2327	326.6730	216.4620	227.0278	351.7145	529.9729	705.5929	854.4526	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	428.0798	339.8613	284.0453	158.7029	66.5899	0.0000	0.0000	0.0000	0.0000	170.6142	310.6838	436.8809	(98)
Space heating per m2												2195.4580	(98)
												45.7387	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	526.9692	414.8481	425.3247	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8819	0.9357	0.9128	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	464.7493	388.1595	388.2565	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	600.9385	574.8077	536.4065	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	98.0562	138.8663	110.2236	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												347.1461	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

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Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	24.5141	34.7166	27.5559	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											86.7865 (107)
Space cooling per m2											1.8081 (108)
Energy for space heating											45.7387 (99)
Energy for space cooling											1.8081 (108)
Total											47.5468 (109)
Target Fabric Energy Efficiency (TFEE)											54.7 (109)