

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-1			Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref			
Property	Flat 1, School & Downing Road, Tilehurst, RG31				
SAP Rating	84 B	DER	17.35	TER	20.89
Environmental	88 B	% DER<TER	16.96		
CO ₂ Emissions (t/year)	0.96	DFEE	51.06	TFEE	60.42
General Requirements Compliance	Pass	% DFEE<TFEE	15.50		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk			Assessor ID	R434-0001
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 67 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 51.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC CODE COMBI ESP1 26
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes 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: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 2.40 m², No overhang
Windows facing South West: 8.98 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Exposed floor U-value 0.10 W/m²K

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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	66.7800 (1b)	x 2.4500 (2b)	= 163.6110 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6110 (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												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3151	0.3113	0.3074	0.2880	0.2841	0.2648	0.2648	0.2609	0.2725	0.2841	0.2919	0.2996 (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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			11.3800	1.3258	15.0871		(27)
exposed floor			59.5800	0.1500	8.9370		(28b)
commercial floor			4.6100	0.1000	0.4610		(28b)
semi exposed floor			2.5900	0.1500	0.3885		(28b)
External Wall	63.2800	11.3800	51.9000	0.2400	12.4560		(29a)
Corridor Wall	9.9200	1.8900	8.0300	0.2005	1.6103		(29a)
joists	10.3900		10.3900	0.1100	1.1429		(30)
Total net area of external elements Aum(A, m ²)			150.3700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7288		(33)
Party Wall 1			7.5900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.6844 (36)
Total fabric heat loss						(33) + (36) =	59.4132 (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	17.0141	16.8049	16.5957	15.5496	15.3404	14.2943	14.2943	14.0851	14.7127	15.3404	15.7588	16.1772 (38)
Heat transfer coeff	76.4273	76.2181	76.0089	74.9628	74.7536	73.7075	73.7075	73.4983	74.1259	74.7536	75.1720	75.5904 (39)
Average = Sum(39)m / 12 =												74.9105 (40)
HLP	1.1445	1.1413	1.1382	1.1225	1.1194	1.1037	1.1037	1.1006	1.1100	1.1194	1.1257	1.1319 (40)
HLP (average)												1.1218 (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												2.1655 (42)
Average daily hot water use (litres/day)												85.6303 (43)
Daily hot water use	94.1934	90.7681	87.3429	83.9177	80.4925	77.0673	77.0673	80.4925	83.9177	87.3429	90.7681	94.1934 (44)
Energy conte	139.6860	122.1703	126.0688	109.9098	105.4611	91.0049	84.3294	96.7692	97.9250	114.1221	124.5732	135.2785 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1347.2984 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.9529	18.3255	18.9103	16.4865	15.8192	13.6507	12.6494	14.5154	14.6887	17.1183	18.6860	20.2918 (46)
Water storage loss:												
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)
Combi loss	3.0461	2.7513	3.0461	2.9478	3.0461	2.9478	3.0461	3.0461	2.9478	3.0461	2.9478	3.0461 (61)
Total heat required for water heating calculated for each month	142.7321	124.9216	129.1148	112.8576	108.5072	93.9527	87.3755	99.8153	100.8728	117.1682	127.5210	138.3245 (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)
FGHRS	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)
Output from w/h	142.7321	124.9216	129.1148	112.8576	108.5072	93.9527	87.3755	99.8153	100.8728	117.1682	127.5210	138.3245 (64)
Heat gains from water heating, kWh/month	47.2071	41.3094	42.6794	37.2820	35.8273	30.9961	28.8010	32.9373	33.2970	38.7071	42.1575	45.7416 (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	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4319	15.4828	12.5915	9.5326	7.1257	6.0158	6.5003	8.4493	11.3407	14.3996	16.8065	17.9163	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.6683	191.6364	186.6767	176.1181	162.7897	150.2629	141.8943	139.9261	144.8858	155.4444	168.7728	181.2996	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	(71)
Water heating gains (Table 5)	63.4504	61.4724	57.3648	51.7805	48.1550	43.0501	38.7111	44.2706	46.2458	52.0257	58.5521	61.4806	(72)
Total internal gains	329.0329	327.0740	315.1153	295.9135	276.5527	257.8112	245.5880	251.1283	260.9546	280.3521	302.6137	319.1789	(73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast											2.4000	11.2829	0.7600	0.7000	0.7700	9.9834 (75)	
Southwest											8.9800	36.7938	0.7600	0.7000	0.7700	121.8137 (79)	
Solar gains	131.7971	227.8153	320.5150	411.8974	474.8350	477.3288	457.7291	409.8686	352.0193	254.1594	158.4665	112.4001	(83)				
Total gains	460.8300	554.8893	635.6303	707.8108	751.3878	735.1399	703.3171	660.9969	612.9740	534.5114	461.0802	431.5790	(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	60.6786	60.8451	61.0126	61.8640	62.0372	62.9176	62.9176	63.0967	62.5625	62.0372	61.6919	61.3504
alpha	5.0452	5.0563	5.0675	5.1243	5.1358	5.1945	5.1945	5.2064	5.1708	5.1358	5.1128	5.0900
util living area	0.9962	0.9900	0.9730	0.9211	0.8029	0.6172	0.4566	0.5038	0.7539	0.9493	0.9914	0.9973 (86)
MIT	19.8495	20.0453	20.3184	20.6395	20.8700	20.9744	20.9955	20.9927	20.9301	20.6181	20.1697	19.8155 (87)
Th 2	19.9647	19.9672	19.9698	19.9825	19.9850	19.9978	19.9978	20.0003	19.9927	19.9850	19.9799	19.9748 (88)
util rest of house	0.9950	0.9868	0.9641	0.8958	0.7470	0.5307	0.3550	0.3983	0.6721	0.9274	0.9881	0.9964 (89)
MIT 2	18.4416	18.7276	19.1214	19.5752	19.8647	19.9818	19.9962	19.9975	19.9411	19.5586	18.9193	18.3992 (90)
Living area fraction	18.4416	18.7276	19.1214	19.5752	19.8647	19.9818	19.9962	19.9975	19.9411	19.5586	18.9193	18.3992 (90)
MIT	18.9872	19.2383	19.5853	19.9877	20.2543	20.3665	20.3835	20.3832	20.3244	19.9692	19.4039	18.9481 (91)
Temperature adjustment	18.9872	19.2383	19.5853	19.9877	20.2543	20.3665	20.3835	20.3832	20.3244	19.9692	19.4039	18.9481 (91)
adjusted MIT	18.9872	19.2383	19.5853	19.9877	20.2543	20.3665	20.3835	20.3832	20.3244	19.9692	19.4039	18.9481 (92)
												0.0000

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	457.7732	545.8677	610.2221	634.1567	573.2486	414.2594	277.4888	290.3946	429.6229	495.4887	454.4040	429.4609	(94)
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	1122.5058	1092.8376	994.5965	831.1618	639.4635	425.0335	278.8711	292.7592	461.3883	700.3826	924.9083	1114.8136	(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	494.5611	367.5638	285.9746	141.8437	49.2639	0.0000	0.0000	0.0000	0.0000	152.4410	338.7631	509.9025	(98)
Space heating												2340.3137	(98)
Space heating per m2												35.0451	(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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2585.9819	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	494.5611	367.5638	285.9746	141.8437	49.2639	0.0000	0.0000	0.0000	0.0000	152.4410	338.7631	509.9025	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	546.4763	406.1478	315.9940	156.7334	54.4353	0.0000	0.0000	0.0000	0.0000	168.4431	374.3239	563.4281	(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	142.7321	124.9216	129.1148	112.8576	108.5072	93.9527	87.3755	99.8153	100.8728	117.1682	127.5210	138.3245	(64)	
Efficiency of water heater (217)m	89.7631	89.6663	89.4798	89.0536	88.2746	87.3000	87.3000	87.3000	87.3000	89.0810	89.6018	89.7976	(216)	
Fuel for water heating, kWh/month	159.0098	139.3183	144.2950	126.7300	122.9200	107.6205	100.0865	114.3360	115.5473	131.5300	142.3197	154.0403	(219)	
Water heating fuel used												1557.7533	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2585.9819	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6250)														
mechanical ventilation fans (SFP = 0.6250)													124.7534	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													199.7534	(231)
Electricity for lighting (calculated in Appendix L)													307.8522	(232)
Total delivered energy for all uses													4651.3408	(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	2585.9819	0.2160	558.5721 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1557.7533	0.2160	336.4747 (264)
Space and water heating			895.0468 (265)
Pumps and fans	199.7534	0.5190	103.6720 (267)
Energy for lighting	307.8522	0.5190	159.7753 (268)
Total CO2, kg/year			1158.4941 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3500 (273)

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

DER		17.3500	ZC1
Total Floor Area		66.7800	
Assumed number of occupants		2.1655	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.8304	ZC2
CO2 emissions from cooking, equation (L16)		2.5602	ZC3
Total CO2 emissions		36.7406	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		36.7406	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	66.7800 (1b)	x 2.4500 (2b)	= 163.6110 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6110 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1222 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3722 (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) =	0.2885 (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	0.3678	0.3606	0.3534	0.3173	0.3101	0.2741	0.2741	0.2669	0.2885	0.3101	0.3245	0.3390 (22b)
Effective ac	0.5676	0.5650	0.5624	0.5504	0.5481	0.5376	0.5376	0.5356	0.5416	0.5481	0.5527	0.5575 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			11.3800	1.3258	15.0871			(27)					
exposed floor			59.5800	0.1300	7.7454			(28b)					
commercial floor			4.6100	0.1300	0.5993			(28b)					
semi exposed floor			2.5900	0.1300	0.3367			(28b)					
External Wall	63.2800	11.3800	51.9000	0.1800	9.3420			(29a)					
Corridor Wall	9.9200	1.8900	8.0300	0.1800	1.4454			(29a)					
joists	10.3900		10.3900	0.1300	1.3507			(30)					
Total net area of external elements Aum(A, m2)			150.3700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.7966			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								20.0255 (36)					
Total fabric heat loss						(33) + (36) =		57.8221 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 30.6481	Feb 30.5063	Mar 30.3673	Apr 29.7143	May 29.5922	Jun 29.0235	Jul 29.0235	Aug 28.9182	Sep 29.2425	Oct 29.5922	Nov 29.8393	Dec 30.0977	(38)
Heat transfer coeff	88.4703	88.3284	88.1894	87.5365	87.4143	86.8456	86.8456	86.7403	87.0647	87.4143	87.6614	87.9198	(39)
Average = Sum(39)m / 12 =													87.5359 (39)
HLP	Jan 1.3248	Feb 1.3227	Mar 1.3206	Apr 1.3108	May 1.3090	Jun 1.3005	Jul 1.3005	Aug 1.2989	Sep 1.3038	Oct 1.3090	Nov 1.3127	Dec 1.3166	(40)
HLP (average)												1.3108	(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												2.1655 (42)
Average daily hot water use (litres/day)												85.6303 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	94.1934	90.7681	87.3429	83.9177	80.4925	77.0673	77.0673	80.4925	83.9177	87.3429	90.7681	94.1934 (44)
Energy conte	139.6860	122.1703	126.0688	109.9098	105.4611	91.0049	84.3294	96.7692	97.9250	114.1221	124.5732	135.2785 (45)
Energy content (annual)												Total = Sum(45)m = 1347.2984 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.9529	18.3255	18.9103	16.4865	15.8192	13.6507	12.6494	14.5154	14.6887	17.1183	18.6860	20.2918 (46)	
Water storage loss:												
Total storage loss												

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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 (56)
Combi loss	47.9999	41.7782	44.5090	41.3841	41.0181	38.0058	39.2726	41.0181	41.3841	44.5090	44.7624	47.9999 (57)
Total heat required for water heating calculated for each month	187.6859	163.9485	170.5778	151.2939	146.4792	129.0107	123.6021	137.7873	139.3091	158.6311	169.3356	183.2784 (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)
Output from w/h	187.6859	163.9485	170.5778	151.2939	146.4792	129.0107	123.6021	137.7873	139.3091	158.6311	169.3356	183.2784 (64)
Heat gains from water heating, kWh/month	58.4456	51.0662	53.0451	46.8910	45.3203	39.7606	37.8577	42.4303	42.9061	49.0729	52.6112	56.9801 (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)
(66)m	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4319	15.4828	12.5915	9.5326	7.1257	6.0158	6.5003	8.4493	11.3407	14.3996	16.8065	17.9163	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.6683	191.6364	186.6767	176.1181	162.7897	150.2629	141.8943	139.9261	144.8858	155.4444	168.7728	181.2996	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	(71)
Water heating gains (Table 5)	78.5559	75.9913	71.2972	65.1264	60.9144	55.2230	50.8840	57.0300	59.5918	65.9581	73.0711	76.5861	(72)
Total internal gains	344.1383	341.5929	329.0477	309.2594	289.3122	269.9841	257.7609	263.8877	274.3006	294.2845	317.1327	334.2844	(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
Northeast					2.4000	11.2829	0.6300	0.7000			0.7700	8.2757 (75)
Southwest					8.9800	36.7938	0.6300	0.7000			0.7700	100.9772 (79)

Solar gains	109.2529	188.8469	265.6901	341.4412	393.6132	395.6804	379.4333	339.7595	291.8055	210.6848	131.3604	93.1738 (83)
Total gains	453.3912	530.4398	594.7378	650.7006	682.9254	665.6645	637.1942	603.6472	566.1061	504.9692	448.4930	427.4581 (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	52.4187	52.5029	52.5857	52.9779	53.0520	53.3994	53.3994	53.4642	53.2650	53.0520	52.9024	52.7469	
alpha	4.4946	4.5002	4.5057	4.5319	4.5368	4.5600	4.5600	4.5643	4.5510	4.5368	4.5268	4.5165	
util living area	0.9966	0.9926	0.9828	0.9545	0.8828	0.7394	0.5749	0.6234	0.8433	0.9679	0.9931	0.9974	(86)
MIT	19.6021	19.7789	20.0530	20.4014	20.7129	20.9129	20.9784	20.9689	20.8313	20.4255	19.9441	19.5658	(87)
Th 2	19.8215	19.8231	19.8247	19.8324	19.8338	19.8405	19.8405	19.8417	19.8379	19.8338	19.8309	19.8279	(88)
util rest of house	0.9954	0.9900	0.9765	0.9368	0.8355	0.6403	0.4357	0.4843	0.7651	0.9518	0.9903	0.9965	(89)
MIT 2	17.9811	18.2395	18.6374	19.1371	19.5527	19.7825	19.8328	19.8293	19.7048	19.1802	18.4868	17.9326	(90)
Living area fraction	18.6093	18.8361	19.1860	19.6271	20.0023	20.2206	20.2768	20.2709	20.1414	19.6628	19.0516	18.5655	(92)
Temperature adjustment	18.6093	18.8361	19.1860	19.6271	20.0023	20.2206	20.2768	20.2709	20.1414	19.6628	19.0516	18.5655	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	450.4997	523.5410	578.0611	607.0585	575.9640	449.6213	312.3386	325.1149	446.3625	479.0972	442.9331	425.3324	(94)
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	1265.9511	1230.9510	1118.7718	939.0135	725.7414	488.1212	319.3110	335.7660	525.9893	792.2155	1047.6904	1263.0147	(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	606.6958	475.3795	402.2887	239.0075	111.4344	0.0000	0.0000	0.0000	0.0000	232.9600	435.4252	623.2356	(98)
Space heating												3126.4268	(98)
Space heating per m2												46.8168	(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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3347.3520 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.6958	475.3795	402.2887	239.0075	111.4344	0.0000	0.0000	0.0000	0.0000	232.9600	435.4252	623.2356	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	649.5673	508.9716	430.7160	255.8967	119.3087	0.0000	0.0000	0.0000	0.0000	249.4219	466.1941	667.2758	(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	187.6859	163.9485	170.5778	151.2939	146.4792	129.0107	123.6021	137.7873	139.3091	158.6311	169.3356	183.2784	(64)
Efficiency of water heater (217)m	87.7911	87.5753	87.1366	86.1974	84.3729	80.3000	80.3000	80.3000	80.3000	86.0172	87.3246	87.8879	(216)
Fuel for water heating, kWh/month	213.7870	187.2086	195.7591	175.5203	173.6093	160.6609	153.9254	171.5907	173.4857	184.4178	193.9152	208.5365	(219)
Water heating fuel used												2192.4165	(219)
Annual totals kWh/year													
Space heating fuel - main system												3347.3520	(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)												307.8522	(232)
Total delivered energy for all uses												5922.6207	(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	3347.3520	0.2160	723.0280 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2192.4165	0.2160	473.5620 (264)
Space and water heating			1196.5900 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	307.8522	0.5190	159.7753 (268)
Total CO2, kg/m2/year			1395.2903 (272)
Emissions per m2 for space and water heating			17.9184 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3926 (272b)
Emissions per m2 for pumps and fans			0.5829 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.9184 * 1.00) + 2.3926 + 0.5829, rounded to 2 d.p.			20.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-1	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 1, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	17.35
Environmental	88 B	% DER<TER	16.96
CO ₂ Emissions (t/year)	0.96	DFEE	51.06
General Requirements Compliance	Pass	% DFEE<TFEE	15.50
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

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	66.7800 (1b)	x 2.4500 (2b)	= 163.6110 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6110 (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) =				20.0000 / (5) =	0.1222 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3222	(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) =	0.2497 (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	0.3184	0.3122	0.3059	0.2747	0.2685	0.2373	0.2373	0.2310	0.2497	0.2685	0.2810	0.2934 (22b)
Effective ac	0.5507	0.5487	0.5468	0.5377	0.5360	0.5281	0.5281	0.5267	0.5312	0.5360	0.5395	0.5431 (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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			11.3800	1.3258	15.0871		(27)
exposed floor			59.5800	0.1500	8.9370		(28b)
commercial floor			4.6100	0.1000	0.4610		(28b)
semi exposed floor			2.5900	0.1500	0.3885		(28b)
External Wall	63.2800	11.3800	51.9000	0.2400	12.4560		(29a)
Corridor Wall	9.9200	1.8900	8.0300	0.2005	1.6103		(29a)
joists	10.3900		10.3900	0.1100	1.1429		(30)
Total net area of external elements Aum(A, m ²)			150.3700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7288		(33)
Party Wall 1			7.5900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.6844 (36)
Total fabric heat loss						(33) + (36) =	59.4132 (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	29.7329	29.6266	29.5224	29.0331	28.9415	28.5153	28.5153	28.4364	28.6795	28.9415	29.1267	29.3204 (38)
Heat transfer coeff	89.1461	89.0398	88.9356	88.4463	88.3547	87.9285	87.9285	87.8496	88.0927	88.3547	88.5399	88.7336 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average = Sum(39)m / 12 =												88.4458 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3349	1.3333	1.3318	1.3244	1.3231	1.3167	1.3167	1.3155	1.3191	1.3231	1.3258	1.3287 (40)
Days in month												1.3244 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1655 (42)
Average daily hot water use (litres/day)												85.6303 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	94.1934	90.7681	87.3429	83.9177	80.4925	77.0673	77.0673	80.4925	83.9177	87.3429	90.7681	94.1934 (44)
Energy content (annual)	139.6860	122.1703	126.0688	109.9098	105.4611	91.0049	84.3294	96.7692	97.9250	114.1221	124.5732	135.2785 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1347.2984 (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)
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	29.6833	25.9612	26.7896	23.3558	22.4105	19.3385	17.9200	20.5635	20.8091	24.2510	26.4718	28.7467 (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	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4319	15.4828	12.5915	9.5326	7.1257	6.0158	6.5003	8.4493	11.3407	14.3996	16.8065	17.9163 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.6683	191.6364	186.6767	176.1181	162.7897	150.2629	141.8943	139.9261	144.8858	155.4444	168.7728	181.2996 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274 (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)	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195 (71)
Water heating gains (Table 5)	39.8969	38.6327	36.0076	32.4387	30.1216	26.8591	24.0860	27.6391	28.9015	32.5954	36.7664	38.6380 (72)
Total internal gains	302.4793	301.2343	290.7581	273.5716	255.5194	238.6201	227.9629	231.4968	240.6103	257.9217	277.8280	293.3363 (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	
Northeast	2.4000				11.2829		0.7600		0.7000		0.7700		9.9834 (75)	
Southwest	8.9800				36.7938		0.7600		0.7000		0.7700		121.8137 (79)	
Solar gains	131.7971	227.8153	320.5150	411.8974	474.8350	477.3288	457.7291	409.8686	352.0193	254.1594	158.4665	112.4001 (83)		
Total gains	434.2765	529.0496	611.2731	685.4690	730.3544	715.9489	685.6920	641.3654	592.6296	512.0811	436.2945	405.7364 (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	52.0214	52.0835	52.1445	52.4330	52.4873	52.7417	52.7417	52.7891	52.6434	52.4873	52.3775	52.2632
alpha	4.4681	4.4722	4.4763	4.4955	4.4992	4.5161	4.5161	4.5193	4.5096	4.4992	4.4918	4.4842
util living area	0.9971	0.9927	0.9811	0.9469	0.8628	0.7089	0.5449	0.5987	0.8287	0.9668	0.9939	0.9979 (86)
MIT	19.5637	19.7638	20.0609	20.4260	20.7389	20.9246	20.9819	20.9726	20.8408	20.4222	19.9138	19.5211 (87)
Th 2	19.8136	19.8148	19.8160	19.8217	19.8228	19.8278	19.8278	19.8287	19.8259	19.8228	19.8206	19.8184 (88)
util rest of house	0.9961	0.9901	0.9742	0.9268	0.8109	0.6080	0.4094	0.4613	0.7471	0.9502	0.9913	0.9971 (89)
MIT 2	18.5206	18.7204	19.0146	19.3710	19.6518	19.7945	19.8235	19.8214	19.7417	19.3752	18.8752	18.4818 (90)
Living area fraction	18.9248	19.1248	19.4201	19.7798	20.0731	20.2325	20.2724	20.2675	20.1676	19.7809	19.2777	18.8846 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9248	19.1248	19.4201	19.7798	20.0731	20.2325	20.2724	20.2675	20.1676	19.7809	19.2777	18.8846 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9951	0.9882	0.9713	0.9259	0.8234	0.6453	0.4625	0.5152	0.7739	0.9494	0.9897	0.9963 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful gains	432.1399	522.7872	593.7568	634.6788	601.3532	461.9997	317.1239	330.4349	458.6339	486.1830	431.8005	404.2409 (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												
Month fracti	1303.7439	1266.5687	1149.0552	962.2792	739.8021	495.2567	322.9115	339.7615	534.5149	811.1794	1078.2138	1303.0154 (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	648.4734	499.8212	413.1420	235.8723	103.0059	0.0000	0.0000	0.0000	0.0000	241.7973	465.4176	668.6882 (98)
Space heating per m2												3276.2179 (98)
										(98) / (4) =		49.0599 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	826.5283	650.6712	667.6571	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8587	0.9180	0.8954	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	709.7482	597.2949	597.8461	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	917.5565	880.5955	830.1427	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	149.6220	210.7756	172.8286	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												533.2262 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor	0.0000	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	37.4055	52.6939	43.2072	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												133.3066 (107)
Space cooling per m2												1.9962 (108)
Energy for space heating												49.0599 (99)
Energy for space cooling												1.9962 (108)
Total												51.0561 (109)
Dwelling Fabric Energy Efficiency (DFEE)												51.1 (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	66.7800 (1b)	x 2.4500 (2b)	= 163.6110 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6110 (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) =				20.0000 / (5) = 0.1222 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3722 (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) =				0.2885 (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	0.3678	0.3606	0.3534	0.3173	0.3101	0.2741	0.2741	0.2669	0.2885	0.3101	0.3245	0.3390 (22b)
Effective ac	0.5676	0.5650	0.5624	0.5504	0.5481	0.5376	0.5376	0.5356	0.5416	0.5481	0.5527	0.5575 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			11.3800	1.3258	15.0871		(27)
exposed floor			59.5800	0.1300	7.7454		(28b)
commercial floor			4.6100	0.1300	0.5993		(28b)
semi exposed floor			2.5900	0.1300	0.3367		(28b)
External Wall	63.2800	11.3800	51.9000	0.1800	9.3420		(29a)
Corridor Wall	9.9200	1.8900	8.0300	0.1800	1.4454		(29a)
joists	10.3900		10.3900	0.1300	1.3507		(30)
Total net area of external elements Aum(A, m ²)			150.3700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.7966		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.0255 (36)
Total fabric heat loss						(33) + (36) =	57.8221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	30.6481	30.5063	30.3673	29.7143	29.5922	29.0235	29.0235	28.9182	29.2425	29.5922	29.8393	30.0977 (38)
Heat transfer coeff	88.4703	88.3284	88.1894	87.5365	87.4143	86.8456	86.8456	86.7403	87.0647	87.4143	87.6614	87.9198 (39)
Average = Sum(39)m / 12 =												87.5359 (39)
HLP	1.3248	1.3227	1.3206	1.3108	1.3090	1.3005	1.3005	1.2989	1.3038	1.3090	1.3127	1.3166 (40)
HLP (average)												1.3108 (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												2.1655 (42)
Average daily hot water use (litres/day)												85.6303 (43)
Daily hot water use	94.1934	90.7681	87.3429	83.9177	80.4925	77.0673	77.0673	80.4925	83.9177	87.3429	90.7681	94.1934 (44)
Energy conte	139.6860	122.1703	126.0688	109.9098	105.4611	91.0049	84.3294	96.7692	97.9250	114.1221	124.5732	135.2785 (45)
Energy content (annual)										Total = Sum(45)m =		1347.2984 (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:												
Total storage loss												

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 (56)
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 (57)
Heat gains from water heating, kWh/month	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)
	29.6833	25.9612	26.7896	23.3558	22.4105	19.3385	17.9200	20.5635	20.8091	24.2510	26.4718	28.7467 (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	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744	108.2744 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4319	15.4828	12.5915	9.5326	7.1257	6.0158	6.5003	8.4493	11.3407	14.3996	16.8065	17.9163 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.6683	191.6364	186.6767	176.1181	162.7897	150.2629	141.8943	139.9261	144.8858	155.4444	168.7728	181.2996 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274	33.8274 (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)	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195	-86.6195 (71)
Water heating gains (Table 5)	39.8969	38.6327	36.0076	32.4387	30.1216	26.8591	24.0860	27.6391	28.9015	32.5954	36.7664	38.6380 (72)
Total internal gains	302.4793	301.2343	290.7581	273.5716	255.5194	238.6201	227.9629	231.4968	240.6103	257.9217	277.8280	293.3363 (73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		Specific data g or Table 6b		Specific data FF or Table 6c		Access factor Table 6d		Gains W	
Northeast	2.4000				11.2829		0.6300		0.7000		0.7700		8.2757 (75)	
Southwest	8.9800				36.7938		0.6300		0.7000		0.7700		100.9772 (79)	
Solar gains	109.2529	188.8469	265.6901	341.4412	393.6132	395.6804	379.4333	339.7595	291.8055	210.6848	131.3604	93.1738 (83)		
Total gains	411.7322	490.0812	556.4481	615.0129	649.1326	634.3006	607.3962	571.2563	532.4158	468.6065	409.1884	386.5100 (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	52.4187	52.5029	52.5857	52.9779	53.0520	53.3994	53.3994	53.4642	53.2650	53.0520	52.9024	52.7469
alpha	4.4946	4.5002	4.5057	4.5319	4.5368	4.5600	4.5600	4.5643	4.5510	4.5368	4.5268	4.5165
util living area	0.9977	0.9946	0.9866	0.9624	0.8981	0.7621	0.5986	0.6511	0.8656	0.9754	0.9952	0.9983 (86)
MIT	19.5462	19.7256	20.0046	20.3615	20.6857	20.9009	20.9746	20.9629	20.8086	20.3822	19.8919	19.5106 (87)
Th 2	19.8215	19.8231	19.8247	19.8324	19.8338	19.8405	19.8405	19.8417	19.8379	19.8338	19.8309	19.8279 (88)
util rest of house	0.9969	0.9927	0.9816	0.9472	0.8546	0.6645	0.4558	0.5093	0.7928	0.9626	0.9932	0.9977 (89)
MIT 2	18.5093	18.6892	18.9669	19.3208	19.6202	19.7945	19.8342	19.8313	19.7319	19.3471	18.8617	18.4788 (90)
Living area fraction									fLA = Living area / (4) =			0.3875 (91)
MIT	18.9111	19.0908	19.3691	19.7241	20.0331	20.2233	20.2762	20.2699	20.1492	19.7482	19.2609	18.8786 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9111	19.0908	19.3691	19.7241	20.0331	20.2233	20.2762	20.2699	20.1492	19.7482	19.2609	18.8786 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9960	0.9911	0.9790	0.9455	0.8632	0.6998	0.5120	0.5650	0.8154	0.9614	0.9919	0.9970 (94)
Useful gains	410.0891	485.6957	544.7877	581.5036	560.3309	443.8521	310.9618	322.7792	434.1191	450.4969	405.8670	385.3398 (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	1292.6496	1253.4543	1134.9156	947.5063	728.4342	488.3557	319.2577	335.6742	526.6700	799.6863	1066.0463	1290.5432 (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	656.6250	515.9338	439.0551	263.5220	125.0689	0.0000	0.0000	0.0000	0.0000	259.7969	475.3291	673.4713 (98)
Space heating												3408.8021 (98)
Space heating per m2										(98) / (4) =		51.0453 (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	816.3486	642.6574	659.2262	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8230	0.8931	0.8680	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.8720	573.9330	572.2306	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	822.1234	789.0809	748.1970	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	108.1810	160.0701	130.9190	0.0000	0.0000	0.0000	0.0000 (104)

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											399.1701 (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	27.0452	40.0175	32.7297	0.0000	0.0000	0.0000 (107)
Space cooling											99.7925 (107)
Space cooling per m2											1.4943 (108)
Energy for space heating											51.0453 (99)
Energy for space cooling											1.4943 (108)
Total											52.5396 (109)
Target Fabric Energy Efficiency (TFEE)											60.4 (109)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	5552-1	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 1, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	17.35
Environmental	88 B	TER	20.89
CO ₂ Emissions (t/year)	0.96	% DER<TER	16.96
General Requirements Compliance	Pass	DFEE	51.06
		TFEE	60.42
		% DFEE<TFEE	15.50
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.89	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.35	kgCO ₂ /m ²	Pass
	-3.54 (-16.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.42	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.06	kWh/m ² /yr	
	-9.3 (-15.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC CODE COMBI ESP1 26 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

0.50

Maximum

1.5

Pass

MVHR efficiency

90

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

2.40 m², No overhang

Windows facing South West

8.98 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

Light-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K

Exposed floor U-value

0.10

W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	5552	Issued on Date	07/06/2022
Block Name	School & Downing Road		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

Block Compliance Report - DER

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
5552-1-002	1	66.78	17.35	20.89	16.96 %
5552-2-002	1	73.83	16.00	21.06	24.02 %
5552-3-002	1	54.63	16.74	20.49	18.32 %
5552-4-002	1	57.5	18.38	22.45	18.15 %
Totals:	4	252.74	68.47	84.90	
Average DER = 17.06 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 21.21 kgCO ₂ /m ²		19.57 %			

Block Compliance Report - DFEE

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
5552-1-002	1	66.78	51.06	60.42	15.50 %
5552-2-002	1	73.83	46.62	63.16	26.19 %
5552-3-002	1	54.63	42.67	51.09	16.48 %
5552-4-002	1	57.5	49.16	61.21	19.69 %
Totals:	4	252.74	189.50	235.88	
Average DFEE = 47.52 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 59.38 kWh/m ² /yr		19.97 %			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-2			Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref			
Property	Flat 2, School & Downing Road, Tilehurst, RG31				
SAP Rating	84 B	DER	16.00	TER	21.06
Environmental	88 B	% DER<TER	24.02		
CO ₂ Emissions (t/year)	0.97	DFEE	46.62	TFEE	63.16
General Requirements Compliance	Pass	% DFEE<TFEE	26.19		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk			Assessor ID	R434-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.06 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.00 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)63.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC CODE COMBI ESP1 26
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes 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: 0.53
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading:
Average
Windows facing South East: 3.10 m², No overhang
Windows facing South: 3.10 m², No overhang
Windows facing South West: 3.10 m², No overhang
Windows facing North West: 2.40 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Exposed floor U-value 0.10 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	73.8300 (1b)	x 2.4500 (2b)	= 180.8835 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.8835 (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)							
Air changes per hour												
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					2 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1700 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3343	0.3300	0.3258	0.3045	0.3003	0.2790	0.2790	0.2748	0.2875	0.3003	0.3088	0.3173 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
DTC			1.8900	1.4000	2.6460		(26)					
Window (Uw = 1.40)			11.7000	1.3258	15.5114		(27)					
commercial floor			73.8300	0.1000	7.3830		(28b)					
External Wall	63.5900	11.7000	51.8900	0.2400	12.4536		(29a)					
Corridor Wall	21.6800	1.8900	19.7900	0.2005	3.9686		(29a)					
joists	16.3400		16.3400	0.1100	1.7974		(30)					
Total net area of external elements Aum(A, m2)			175.4400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		43.7599		(33)					
Party Wall 1			7.5900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.6614 (36)					
Total fabric heat loss							(33) + (36) = 57.4213 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.9519	Feb 19.6982	Mar 19.4445	Apr 18.1761	May 17.9224	Jun 16.6539	Jul 16.6539	Aug 16.4003	Sep 17.1613	Oct 17.9224	Nov 18.4298	Dec 18.9371 (38)
Heat transfer coeff	77.3732	77.1195	76.8658	75.5974	75.3437	74.0752	74.0752	73.8216	74.5826	75.3437	75.8511	76.3584 (39)
Average = Sum(39)m / 12 =												75.5340 (39)
HLP	Jan 1.0480	Feb 1.0446	Mar 1.0411	Apr 1.0239	May 1.0205	Jun 1.0033	Jul 1.0033	Aug 0.9999	Sep 1.0102	Oct 1.0205	Nov 1.0274	Dec 1.0342 (40)
HLP (average)												1.0231 (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												2.3354 (42)
Average daily hot water use (litres/day)												89.6659 (43)
Daily hot water use	Jan 98.6325	Feb 95.0459	Mar 91.4592	Apr 87.8726	May 84.2860	Jun 80.6993	Jul 80.6993	Aug 84.2860	Sep 87.8726	Oct 91.4592	Nov 95.0459	Dec 98.6325 (44)
Energy conte	146.2692	127.9280	132.0102	115.0897	110.4313	95.2938	88.3037	101.3298	102.5400	119.5005	130.4441	141.6539 (45)
Energy content (annual)												Total = Sum(45)m = 1410.7941 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.9404	19.1892	19.8015	17.2635	16.5647	14.2941	13.2456	15.1995	15.3810	17.9251	19.5666	21.2481 (46)
Water storage loss:												
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)
Combi loss	3.0461	2.7513	3.0461	2.9478	3.0461	2.9478	3.0461	3.0461	2.9478	3.0461	2.9478	3.0461 (61)
Total heat required for water heating calculated for each month	149.3152	130.6792	135.0562	118.0375	113.4773	98.2416	91.3498	104.3759	105.4878	122.5466	133.3919	144.6999 (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)
FGHRS	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)
Output from w/h	149.3152	130.6792	135.0562	118.0375	113.4773	98.2416	91.3498	104.3759	105.4878	122.5466	133.3919	144.6999 (64)
Heat gains from water heating, kWh/month	49.3960	43.2239	44.6549	39.0043	37.4799	32.4221	30.1225	34.4537	34.8315	40.4954	44.1096	47.8614 (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	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2026	17.0555	13.8705	10.5009	7.8495	6.6269	7.1606	9.3076	12.4926	15.8623	18.5136	19.7363 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0661	208.2044	202.8159	191.3445	176.8638	163.2540	154.1618	152.0235	157.4120	168.8834	183.3641	196.9739 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770 (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	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163 (71)
Water heating gains (Table 5)	66.3925	64.3212	60.0200	54.1726	50.3762	45.0308	40.4872	46.3087	48.3771	54.4293	61.2634	64.3299 (72)
Total internal gains	352.6923	350.6123	337.7376	317.0490	296.1206	275.9427	262.8407	268.6709	279.3128	300.2062	324.1722	342.0712 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	3.1000	36.7938	0.7600	0.7000	0.7700	42.0515 (77)
South	3.1000	46.7521	0.7600	0.7000	0.7700	53.4327 (78)
Southwest	3.1000	36.7938	0.7600	0.7000	0.7700	42.0515 (79)
Northwest	2.4000	11.2829	0.7600	0.7000	0.7700	9.9834 (81)

Solar gains	147.5191	251.0891	344.0965	428.9844	484.1443	482.5790	464.4276	422.7603	373.2982	277.5524	176.6337	126.2984 (83)
Total gains	500.2114	601.7014	681.8341	746.0334	780.2649	758.5217	727.2683	691.4312	652.6110	577.7586	500.8060	468.3696 (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	66.2643	66.4823	66.7017	67.8209	68.0493	69.2145	69.2145	69.4524	68.7437	68.0493	67.5941	67.1449
alpha	5.4176	5.4322	5.4468	5.5214	5.5366	5.6143	5.6143	5.6302	5.5829	5.5366	5.5063	5.4763
util living area	0.9964	0.9898	0.9721	0.9186	0.7980	0.6075	0.4454	0.4865	0.7326	0.9437	0.9912	0.9974 (86)
MIT	19.9712	20.1621	20.4137	20.7013	20.8984	20.9826	20.9974	20.9958	20.9523	20.6895	20.2741	19.9401 (87)
Th 2	20.0435	20.0464	20.0492	20.0634	20.0663	20.0806	20.0806	20.0834	20.0748	20.0663	20.0606	20.0549 (88)
util rest of house	0.9952	0.9866	0.9632	0.8937	0.7445	0.5277	0.3538	0.3920	0.6548	0.9209	0.9879	0.9966 (89)
MIT 2	18.6761	18.9552	19.3180	19.7256	19.9720	20.0696	20.0796	20.0818	20.0399	19.7205	19.1300	18.6391 (90)
Living area fraction	19.2047	19.4477	19.7651	20.1238	20.3500	20.4422	20.4542	20.4548	20.4123	20.1160	19.5969	19.1701 (92)
MIT	19.2047	19.4477	19.7651	20.1238	20.3500	20.4422	20.4542	20.4548	20.4123	20.1160	19.5969	19.1701 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2047	19.4477	19.7651	20.1238	20.3500	20.4422	20.4542	20.4548	20.4123	20.1160	19.5969	19.1701 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9938	0.9840	0.9600	0.8955	0.7618	0.5598	0.3913	0.4307	0.6846	0.9223	0.9857	0.9955 (94)
Ext temp.	497.1288	592.0687	654.5633	668.0936	594.4320	424.6035	284.5859	297.8029	446.8081	532.8588	493.6537	466.2757 (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	1153.2212	1121.9131	1019.6365	848.4876	651.7261	432.7620	285.4981	299.3319	470.7844	716.9686	947.9020	1143.0900 (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	488.1327	356.0554	271.6145	129.8837	42.6268	0.0000	0.0000	0.0000	0.0000	136.9777	327.0588	503.5498 (98)
Space heating per m2												2255.8993 (98)
												(98) / (4) = 30.5553 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2492.7064	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	488.1327	356.0554	271.6145	129.8837	42.6268	0.0000	0.0000	0.0000	0.0000	136.9777	327.0588	503.5498	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	539.3732	393.4314	300.1265	143.5179	47.1014	0.0000	0.0000	0.0000	0.0000	151.3566	361.3909	556.4086	(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	149.3152	130.6792	135.0562	118.0375	113.4773	98.2416	91.3498	104.3759	105.4878	122.5466	133.3919	144.6999	(64)	
Efficiency of water heater (217)m	89.7296	89.6180	89.4116	88.9477	88.1511	87.3000	87.3000	87.3000	87.3000	88.9602	89.5491	89.7655	(216)	
Fuel for water heating, kWh/month	166.4058	145.8180	151.0501	132.7044	128.7304	112.5333	104.6389	119.5600	120.8337	137.7543	148.9596	161.1977	(219)	
Water heating fuel used												1630.1862	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2492.7064	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)														
mechanical ventilation fans (SFP = 0.6625)													146.1991	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													221.1991	(231)
Electricity for lighting (calculated in Appendix L)													339.1231	(232)
Total delivered energy for all uses													4683.2148	(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	2492.7064	0.2160	538.4246 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1630.1862	0.2160	352.1202 (264)
Space and water heating			890.5448 (265)
Pumps and fans	221.1991	0.5190	114.8023 (267)
Energy for lighting	339.1231	0.5190	176.0049 (268)
Total CO2, kg/year			1181.3520 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0000 (273)

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

DER		16.0000	ZC1
Total Floor Area	TFA	73.8300	
Assumed number of occupants	N	2.3354	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5394	ZC2
CO2 emissions from cooking, equation (L16)		2.3710	ZC3
Total CO2 emissions		34.9104	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		34.9104	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	73.8300 (1b)	x 2.4500 (2b)	= 180.8835 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.8835 (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					3 * 10 = 30.0000 (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					30.0000 / (5) = 0.1659 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4159 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3535 (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	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3977	0.4153 (22b)
Effective ac	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			11.7000	1.3258	15.5114			(27)					
commercial floor			73.8300	0.1300	9.5979			(28b)					
External Wall	63.5900	11.7000	51.8900	0.1800	9.3402			(29a)					
Corridor Wall	21.6800	1.8900	19.7900	0.1800	3.5622			(29a)					
joists	16.3400		16.3400	0.1300	2.1242			(30)					
Total net area of external elements Aum(A, m2)			175.4400					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			42.0259		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								22.1704 (36)					
Total fabric heat loss						(33) + (36) =		64.1963 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.9078	Feb 35.6724	Mar 35.4417	Apr 34.3579	May 34.1552	Jun 33.2113	Jul 33.2113	Aug 33.0365	Sep 33.5748	Oct 34.1552	Nov 34.5654	Dec 34.9942	(38)
Heat transfer coeff	100.1041	99.8687	99.6380	98.5542	98.3514	97.4075	97.4075	97.2327	97.7711	98.3514	98.7616	99.1905	(39)
Average = Sum(39)m / 12 =												98.5532	(39)
HLP	Jan 1.3559	Feb 1.3527	Mar 1.3496	Apr 1.3349	May 1.3321	Jun 1.3193	Jul 1.3193	Aug 1.3170	Sep 1.3243	Oct 1.3321	Nov 1.3377	Dec 1.3435	(40)
HLP (average)												1.3349	(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												2.3354 (42)
Average daily hot water use (litres/day)												89.6659 (43)
Daily hot water use	98.6325	95.0459	91.4592	87.8726	84.2860	80.6993	80.6993	84.2860	87.8726	91.4592	95.0459	98.6325 (44)
Energy conte	146.2692	127.9280	132.0102	115.0897	110.4313	95.2938	88.3037	101.3298	102.5400	119.5005	130.4441	141.6539 (45)
Energy content (annual)										Total = Sum(45)m =		1410.7941 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9404	19.1892	19.8015	17.2635	16.5647	14.2941	13.2456	15.1995	15.3810	17.9251	19.5666	21.2481 (46)
Water storage loss:												
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												

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Combi 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 (57)
Total heat required for water heating calculated for each month	50.2620	43.7471	46.6066	43.3344	42.9512	39.7969	41.1235	42.9512	43.3344	46.6066	46.8719	50.2620 (61)
Solar input	196.5312	171.6751	178.6168	158.4241	153.3825	135.0907	129.4272	144.2810	145.8744	166.1071	177.3161	191.9159 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	196.5312	171.6751	178.6168	158.4241	153.3825	135.0907	129.4272	144.2810	145.8744	166.1071	177.3161	191.9159 (64)
	61.2000	53.4728	55.5450	49.1009	47.4562	41.6344	39.6419	44.4300	44.9282	51.3856	55.0907	59.6654 (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	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2026	17.0555	13.8705	10.5009	7.8495	6.6269	7.1606	9.3076	12.4926	15.8623	18.5136	19.7363	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0661	208.2044	202.8159	191.3445	176.8638	163.2540	154.1618	152.0235	157.4120	168.8834	183.3641	196.9739	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	(71)
Water heating gains (Table 5)	82.2581	79.5727	74.6573	68.1957	63.7852	57.8256	53.2821	59.7177	62.4002	69.0666	76.5148	80.1955	(72)
Total internal gains	368.5579	365.8638	352.3749	331.0722	309.5296	288.7376	275.6356	282.0799	293.3360	314.8435	339.4237	357.9368	(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			
Southeast				3.1000	36.7938	0.6300	0.7000	0.7700	34.8585 (77)			
South				3.1000	46.7521	0.6300	0.7000	0.7700	44.2929 (78)			
Southwest				3.1000	36.7938	0.6300	0.7000	0.7700	34.8585 (79)			
Northwest				2.4000	11.2829	0.6300	0.7000	0.7700	8.2757 (81)			
Solar gains	122.2856	208.1396	285.2379	355.6055	401.3301	400.0326	384.9860	350.4460	309.4445	230.0763	146.4201	104.6947 (83)
Total gains	490.8435	574.0034	637.6127	686.6777	710.8598	688.7702	660.6216	632.5259	602.7805	544.9198	485.8438	462.6315 (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	51.2175	51.3382	51.4571	52.0230	52.1302	52.6354	52.6354	52.7300	52.4397	52.1302	51.9137	51.6893	
alpha	4.4145	4.4225	4.4305	4.4682	4.4753	4.5090	4.5090	4.5153	4.4960	4.4753	4.4609	4.4460	
util living area	0.9968	0.9932	0.9849	0.9621	0.9037	0.7755	0.6131	0.6563	0.8609	0.9712	0.9937	0.9976	(86)
MIT	19.5502	19.7269	19.9975	20.3455	20.6647	20.8898	20.9709	20.9603	20.8080	20.3922	19.9053	19.5195	(87)
Th 2	19.7973	19.7998	19.8022	19.8136	19.8157	19.8257	19.8257	19.8276	19.8219	19.8157	19.8114	19.8069	(88)
util rest of house	0.9957	0.9909	0.9793	0.9467	0.8613	0.6782	0.4667	0.5127	0.7863	0.9564	0.9911	0.9967	(89)
MIT 2	17.8891	18.1481	18.5420	19.0467	19.4805	19.7500	19.8151	19.8113	19.6675	19.1211	18.4172	17.8508	(90)
Living area fraction	18.5670	18.7924	19.1360	19.5768	19.9638	20.2152	20.2868	20.2802	20.1330	19.6398	19.0245	18.5318	(91)
Temperature adjustment	18.5670	18.7924	19.1360	19.5768	19.9638	20.2152	20.2868	20.2802	20.1330	19.6398	19.0245	18.5318	(92)
adjusted MIT	18.5670	18.7924	19.1360	19.5768	19.9638	20.2152	20.2868	20.2802	20.1330	19.6398	19.0245	18.5318	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9941	0.9881	0.9752	0.9429	0.8676	0.7137	0.5272	0.5717	0.8091	0.9535	0.9886	0.9954	(94)
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	1428.1882	1387.4143	1259.0251	1052.2396	812.7561	546.9586	359.1203	377.2828	589.8485	889.0811	1177.6839	1421.5754	(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	699.5389	551.2136	474.1150	291.4516	145.8594	0.0000	0.0000	0.0000	0.0000	274.8951	502.1143	715.0364	(98)
Space heating												3654.2242	(98)
Space heating per m2												49.4951	(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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3912.4457 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	699.5389	551.2136	474.1150	291.4516	145.8594	0.0000	0.0000	0.0000	0.0000	274.8951	502.1143	715.0364	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	748.9710	590.1645	507.6178	312.0466	156.1663	0.0000	0.0000	0.0000	0.0000	294.3202	537.5956	765.5636	(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	196.5312	171.6751	178.6168	158.4241	153.3825	135.0907	129.4272	144.2810	145.8744	166.1071	177.3161	191.9159	(64)
Efficiency of water heater (217)m	87.9731	87.7780	87.3921	86.5657	84.9249	80.3000	80.3000	80.3000	80.3000	86.3110	87.5269	88.0563	(216)
Fuel for water heating, kWh/month	223.3991	195.5787	204.3856	183.0102	180.6096	168.2325	161.1796	179.6775	181.6618	192.4519	202.5847	217.9467	(219)
Water heating fuel used												2290.7179	(219)
Annual totals kWh/year													
Space heating fuel - main system												3912.4457	(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)												339.1231	(232)
Total delivered energy for all uses												6617.2866	(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	3912.4457	0.2160	845.0883 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2290.7179	0.2160	494.7951 (264)
Space and water heating			1339.8833 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	339.1231	0.5190	176.0049 (268)
Total CO2, kg/m2/year			1554.8132 (272)
Emissions per m2 for space and water heating			18.1482 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3839 (272b)
Emissions per m2 for pumps and fans			0.5272 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.1482 * 1.00) + 2.3839 + 0.5272, rounded to 2 d.p.			21.0600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-2	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 2, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	16.00
Environmental	88 B	% DER<TER	24.02
CO ₂ Emissions (t/year)	0.97	DFEE	46.62
General Requirements Compliance	Pass	% DFEE<TFEE	26.19
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

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	73.8300		180.8835
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8300		
Dwelling volume			

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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1659 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3659	(18)
Number of sides sheltered				2	(19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3110 (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
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
Adj infilt rate	0.3965	0.3887	0.3809	0.3421	0.3343	0.2954	0.2954	0.2877	0.3110	0.3343	0.3498	0.3654
Effective ac	0.5786	0.5756	0.5726	0.5585	0.5559	0.5436	0.5436	0.5414	0.5484	0.5559	0.5612	0.5668

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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			11.7000	1.3258	15.5114		(27)
commercial floor			73.8300	0.1000	7.3830		(28b)
External Wall	63.5900	11.7000	51.8900	0.2400	12.4536		(29a)
Corridor Wall	21.6800	1.8900	19.7900	0.2005	3.9686		(29a)
joists	16.3400		16.3400	0.1100	1.7974		(30)
Total net area of external elements Aum(A, m ²)			175.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.7599	(33)
Party Wall 1			7.5900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.6614 (36)
Total fabric heat loss						(33) + (36) =	57.4213 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	34.5377	34.3555	34.1769	33.3381	33.1812	32.4506	32.4506
Heat transfer coeff	91.9590	91.7768	91.5982	90.7594	90.6025	89.8719	89.8719
Average = Sum(39)m / 12 =							90.7587 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2456	1.2431	1.2407	1.2293	1.2272	1.2173	1.2173	1.2154	1.2211	1.2272	1.2315	1.2360	(40)
Days in month												1.2293	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3354	(42)
Average daily hot water use (litres/day)													89.6659	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	98.6325	95.0459	91.4592	87.8726	84.2860	80.6993	80.6993	84.2860	87.8726	91.4592	95.0459	98.6325	(44)	
Energy conte	146.2692	127.9280	132.0102	115.0897	110.4313	95.2938	88.3037	101.3298	102.5400	119.5005	130.4441	141.6539	(45)	
Energy content (annual)														
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:														
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	31.0822	27.1847	28.0522	24.4566	23.4666	20.2499	18.7645	21.5326	21.7898	25.3939	27.7194	30.1015	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	19.2026	17.0555	13.8705	10.5009	7.8495	6.6269	7.1606	9.3076	12.4926	15.8623	18.5136	19.7363	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	206.0661	208.2044	202.8159	191.3445	176.8638	163.2540	154.1618	152.0235	157.4120	168.8834	183.3641	196.9739	(68)	
Pumps, fans	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	(69)	
Losses e.g. evaporation (negative values) (Table 5)	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)	
Water heating gains (Table 5)	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	(71)	
Total internal gains	41.7771	40.4534	37.7045	33.9674	31.5412	28.1249	25.2212	28.9416	30.2635	34.1315	38.4991	40.4589	(72)	
	325.0769	323.7445	312.4221	293.8439	274.2856	256.0369	244.5746	248.3038	258.1993	276.9084	298.4080	315.2002	(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				
Southeast				3.1000	36.7938	0.7600	0.7000	0.7700	42.0515 (77)				
South				3.1000	46.7521	0.7600	0.7000	0.7700	53.4327 (78)				
Southwest				3.1000	36.7938	0.7600	0.7000	0.7700	42.0515 (79)				
Northwest				2.4000	11.2829	0.7600	0.7000	0.7700	9.9834 (81)				
Solar gains	147.5191	251.0891	344.0965	428.9844	484.1443	482.5790	464.4276	422.7603	373.2982	277.5524	176.6337	126.2984	(83)
Total gains	472.5961	574.8336	656.5185	722.8283	758.4299	738.6159	709.0022	671.0641	631.4974	554.4608	475.0417	441.4986	(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)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	55.7540	55.8647	55.9736	56.4909	56.5888	57.0488	57.0488	57.1348	56.8707	56.5888	56.3912	56.1860		
util living area	4.7169	4.7243	4.7316	4.7661	4.7726	4.8033	4.8033	4.8090	4.7914	4.7726	4.7594	4.7457		
	0.9973	0.9929	0.9816	0.9488	0.8672	0.7110	0.5423	0.5908	0.8210	0.9656	0.9941	0.9981	(86)	
MIT	19.6692	19.8657	20.1444	20.4830	20.7681	20.9372	20.9862	20.9795	20.8699	20.4896	20.0078	19.6318	(87)	
Th 2	19.8837	19.8857	19.8876	19.8966	19.8983	19.9062	19.9062	19.9077	19.9032	19.8983	19.8949	19.8913	(88)	
util rest of house	0.9964	0.9905	0.9751	0.9298	0.8180	0.6153	0.4153	0.4624	0.7416	0.9490	0.9916	0.9974	(89)	
MIT 2	18.6807	18.8775	19.1542	19.4879	19.7448	19.8780	19.9029	19.9021	19.8342	19.5016	19.0272	18.6495	(90)	
Living area fraction														
MIT	19.0841	19.2808	19.5583	19.8940	20.1624	20.3103	20.3450	20.3418	20.2569	19.9048	19.4274	19.0504	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0841	19.2808	19.5583	19.8940	20.1624	20.3103	20.3450	20.3418	20.2569	19.9048	19.4274	19.0504	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9955	0.9888	0.9727	0.9298	0.8312	0.6528	0.4677	0.5154	0.7700	0.9491	0.9902	0.9967	(94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful gains	470.4805	568.3835	638.6116	672.0638	630.4286	482.2014	331.5673	345.8379	486.2662	526.2587	470.4064	440.0432 (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												
Month fracti	1359.5345	1319.8236	1196.1172	997.8082	766.7165	513.1913	336.5683	353.7208	555.0656	843.0390	1120.8050	1355.1272 (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	661.4562	504.9678	414.7842	234.5359	101.3982	0.0000	0.0000	0.0000	0.0000	235.6846	468.2870	680.8225 (98)
Space heating per m2											(98) / (4) =	44.7235 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	844.7959	665.0521	681.9983	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8726	0.9298	0.9119	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	737.1556	618.3592	621.8917	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	950.4642	914.1083	871.3027	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	153.5822	220.0373	185.5618	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												559.1813 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	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	38.3955	55.0093	46.3905	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												139.7953 (107)
Space cooling per m2												1.8935 (108)
Energy for space heating												44.7235 (99)
Energy for space cooling												1.8935 (108)
Total												46.6170 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.6 (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	73.8300 (1b)	x 2.4500 (2b)	= 180.8835 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.8835 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1659 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4159 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3535 (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												
	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3977	0.4153 (22b)
Effective ac	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			11.7000	1.3258	15.5114			(27)					
commercial floor			73.8300	0.1300	9.5979			(28b)					
External Wall	63.5900	11.7000	51.8900	0.1800	9.3402			(29a)					
Corridor Wall	21.6800	1.8900	19.7900	0.1800	3.5622			(29a)					
joists	16.3400		16.3400	0.1300	2.1242			(30)					
Total net area of external elements Aum(A, m2)			175.4400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	42.0259			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								22.1704 (36)					
Total fabric heat loss						(33) + (36) =		64.1963 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.9078	Feb 35.6724	Mar 35.4417	Apr 34.3579	May 34.1552	Jun 33.2113	Jul 33.2113	Aug 33.0365	Sep 33.5748	Oct 34.1552	Nov 34.5654	Dec 34.9942	(38)
Heat transfer coeff	100.1041	99.8687	99.6380	98.5542	98.3514	97.4075	97.4075	97.2327	97.7711	98.3514	98.7616	99.1905	(39)
Average = Sum(39)m / 12 =												98.5532	(39)
HLP	Jan 1.3559	Feb 1.3527	Mar 1.3496	Apr 1.3349	May 1.3321	Jun 1.3193	Jul 1.3193	Aug 1.3170	Sep 1.3243	Oct 1.3321	Nov 1.3377	Dec 1.3435	(40)
HLP (average)												1.3349	(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												2.3354 (42)
Average daily hot water use (litres/day)												89.6659 (43)
Daily hot water use	98.6325	95.0459	91.4592	87.8726	84.2860	80.6993	80.6993	84.2860	87.8726	91.4592	95.0459	98.6325 (44)
Energy conte	146.2692	127.9280	132.0102	115.0897	110.4313	95.2938	88.3037	101.3298	102.5400	119.5005	130.4441	141.6539 (45)
Energy content (annual)										Total = Sum(45)m =		1410.7941 (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:												
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (57)
Heat gains from water heating, kWh/month	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)
	31.0822	27.1847	28.0522	24.4566	23.4666	20.2499	18.7645	21.5326	21.7898	25.3939	27.7194	30.1015 (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	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704	116.7704 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2026	17.0555	13.8705	10.5009	7.8495	6.6269	7.1606	9.3076	12.4926	15.8623	18.5136	19.7363 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.0661	208.2044	202.8159	191.3445	176.8638	163.2540	154.1618	152.0235	157.4120	168.8834	183.3641	196.9739 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770	34.6770 (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)	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163	-93.4163 (71)
Water heating gains (Table 5)	41.7771	40.4534	37.7045	33.9674	31.5412	28.1249	25.2212	28.9416	30.2635	34.1315	38.4991	40.4589 (72)
Total internal gains	325.0769	323.7445	312.4221	293.8439	274.2856	256.0369	244.5746	248.3038	258.1993	276.9084	298.4080	315.2002 (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		
Southeast				3.1000	36.7938	0.6300	0.7000	0.7700		34.8585 (77)		
South				3.1000	46.7521	0.6300	0.7000	0.7700		44.2929 (78)		
Southwest				3.1000	36.7938	0.6300	0.7000	0.7700		34.8585 (79)		
Northwest				2.4000	11.2829	0.6300	0.7000	0.7700		8.2757 (81)		
Solar gains	122.2856	208.1396	285.2379	355.6055	401.3301	400.0326	384.9860	350.4460	309.4445	230.0763	146.4201	104.6947 (83)
Total gains	447.3625	531.8841	597.6599	649.4494	675.6157	656.0695	629.5607	598.7498	567.6438	506.9847	444.8281	419.8950 (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	51.2175	51.3382	51.4571	52.0230	52.1302	52.6354	52.6354	52.7300	52.4397	52.1302	51.9137	51.6893
alpha	4.4145	4.4225	4.4305	4.4682	4.4753	4.5090	4.5090	4.5153	4.4960	4.4753	4.4609	4.4460
util living area	0.9978	0.9950	0.9882	0.9687	0.9168	0.7970	0.6372	0.6837	0.8809	0.9777	0.9956	0.9984 (86)
MIT	19.4976	19.6767	19.9516	20.3067	20.6365	20.8759	20.9661	20.9532	20.7848	20.3509	19.8562	19.4675 (87)
Th 2	19.7973	19.7998	19.8022	19.8136	19.8157	19.8257	19.8257	19.8276	19.8219	19.8157	19.8114	19.8069 (88)
util rest of house	0.9971	0.9932	0.9837	0.9556	0.8784	0.7023	0.4880	0.5384	0.8120	0.9659	0.9937	0.9978 (89)
MIT 2	18.4421	18.6224	18.8970	19.2537	19.5636	19.7662	19.8171	19.8141	19.7004	19.3027	18.8110	18.4195 (90)
Living area fraction									fLA = Living area / (4) =			0.4081 (91)
MIT	18.8729	19.0527	19.3273	19.6834	20.0015	20.2191	20.2860	20.2790	20.1430	19.7305	19.2375	18.8472 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8729	19.0527	19.3273	19.6834	20.0015	20.2191	20.2860	20.2790	20.1430	19.7305	19.2375	18.8472 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9962	0.9917	0.9813	0.9538	0.8855	0.7375	0.5499	0.5985	0.8340	0.9647	0.9924	0.9971 (94)
Ext temp.	4.3000	4.9000	5.8650	6.1949	5.9823	4.8382	3.4619	3.5837	4.7342	4.8912	4.4153	4.1869 (95)
Heat loss rate W	1458.8050	1413.4072	1278.0909	1062.7541	816.4604	547.3389	359.0427	377.1614	590.8271	897.9962	1198.7199	1452.8649 (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	753.7657	595.3564	514.5348	319.1795	162.3607	0.0000	0.0000	0.0000	0.0000	304.2096	545.2316	769.4216 (98)
Space heating												3964.0599 (98)
Space heating per m2										(98) / (4) =		53.6917 (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	915.6307	720.8156	738.9687	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7888	0.8675	0.8434	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	722.2928	625.3108	623.2258	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	853.9814	821.2545	786.7796	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	94.8157	145.7821	121.6840	0.0000	0.0000	0.0000	0.0000 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											362.2819 (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	23.7039	36.4455	30.4210	0.0000	0.0000	0.0000 (107)
Space cooling											90.5705 (107)
Space cooling per m2											1.2267 (108)
Energy for space heating											53.6917 (99)
Energy for space cooling											1.2267 (108)
Total											54.9185 (109)
Target Fabric Energy Efficiency (TFEE)											63.2 (109)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	5552-2	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 2, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	16.00
Environmental	88 B	TER	21.06
CO ₂ Emissions (t/year)	0.97	% DER<TER	24.02
General Requirements Compliance	Pass	DFEE	46.62
		TFEE	63.16
		% DFEE<TFEE	26.19
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client			R434-0001

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	21.06	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.00	kgCO ₂ /m ²	Pass
	-5.06 (-24.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.16	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.62	kWh/m ² /yr	
	-16.6 (-26.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC CODE COMBI ESP1 26 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

0.53

Maximum

1.5

Pass

MVHR efficiency

90

%

Minimum

70

%

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing South East

3.10 m², No overhang

Windows facing South

3.10 m², No overhang

Windows facing South West

3.10 m², No overhang

Windows facing North West

2.40 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

Light-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K

Exposed floor U-value

0.10

W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	5552	Issued on Date	07/06/2022
Block Name	School & Downing Road		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

Block Compliance Report - DER

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
5552-1-002	1	66.78	17.35	20.89	16.96 %
5552-2-002	1	73.83	16.00	21.06	24.02 %
5552-3-002	1	54.63	16.74	20.49	18.32 %
5552-4-002	1	57.5	18.38	22.45	18.15 %
Totals:	4	252.74	68.47	84.90	
Average DER = 17.06 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 21.21 kgCO ₂ /m ²		19.57 %			

Block Compliance Report - DFEE

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
5552-1-002	1	66.78	51.06	60.42	15.50 %
5552-2-002	1	73.83	46.62	63.16	26.19 %
5552-3-002	1	54.63	42.67	51.09	16.48 %
5552-4-002	1	57.5	49.16	61.21	19.69 %
Totals:	4	252.74	189.50	235.88	
Average DFEE = 47.52 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 59.38 kWh/m ² /yr		19.97 %			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-3			Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref			
Property	Flat 3, School & Downing Road, Tilehurst, RG31				
SAP Rating	84 B	DER	16.74	TER	20.49
Environmental	89 B	% DER<TER	18.32		
CO ₂ Emissions (t/year)	0.79	DFEE	42.67	TFEE	51.09
General Requirements Compliance	Pass	% DFEE<TFEE	16.48		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk			Assessor ID	R434-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 55 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.49 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.74 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC CODE COMBI ESP1 26
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes 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: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 2.25 m², No overhang
Windows facing South: 1.55 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	54.6300 (1b)	x 2.2400 (2b)	= 122.3712 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.3712 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
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							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
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)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	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												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3151	0.3113	0.3074	0.2880	0.2841	0.2648	0.2648	0.2609	0.2725	0.2841	0.2919	0.2996 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
rooflight (Uw = 1.30)			1.1300	1.2357	1.3964		(27a)
External Wall	10.7100	1.5500	9.1600	0.2400	2.1984		(29a)
Corridor Wall	6.5000	1.8900	4.6100	0.2005	0.9245		(29a)
Dormer Wall	22.3000	2.2500	20.0500	0.2000	4.0100		(29a)
ashlar wall	23.5300		23.5300	0.1818	4.2782		(29a)
rafters	19.7100	1.1300	18.5800	0.1300	2.4154		(30)
flat roof	42.1000		42.1000	0.1500	6.3150		(30)
Total net area of external elements Aum(A, m2)			124.8500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.2217		(33)
Party Wall 1			4.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5585 (36)
Total fabric heat loss						(33) + (36) =	39.7802 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8265 (42)
Average daily hot water use (litres/day)												77.5796 (43)
Daily hot water use	Jan 85.3376	Feb 82.2344	Mar 79.1312	Apr 76.0280	May 72.9248	Jun 69.8217	Jul 69.8217	Aug 72.9248	Sep 76.0280	Oct 79.1312	Nov 82.2344	Dec 85.3376 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	126.5532	110.6842	114.2162	99.5764	95.5460	82.4489	76.4010	87.6713	88.7184	103.3927	112.8612	122.5600 (45)
Distribution loss (46)m = 0.15 x (45)m	18.9830	16.6026	17.1324	14.9365	14.3319	12.3673	11.4602	13.1507	13.3078	15.5089	16.9292	122.06294 (45)
Water storage loss:												
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)
Combi loss	3.0461	2.7513	3.0461	2.9478	3.0461	2.9478	3.0461	3.0461	2.9478	3.0461	2.9478	3.0461 (61)
Total heat required for water heating calculated for each month	129.5992	113.4355	117.2622	102.5242	98.5920	85.3967	79.4471	90.7174	91.6662	106.4388	115.8090	125.6060 (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)
FGHRS	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)
Output from w/h	129.5992	113.4355	117.2622	102.5242	98.5920	85.3967	79.4471	90.7174	91.6662	106.4388	115.8090	125.6060 (64)
Heat gains from water heating, kWh/month	42.8404	37.4903	38.7384	33.8461	32.5305	28.1512	26.1649	29.9122	30.2358	35.1396	38.2633	41.5127 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	16.5864	14.7319	11.9808	9.0702	6.7801	5.7240	6.1850	8.0395	10.7907	13.7012	15.9913	17.0474 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	159.2316	160.8839	156.7201	147.8558	136.6663	126.1497	119.1240	117.4717	121.6355	130.4997	141.6893	152.2059 (68)
Pumps, fans	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604 (71)
Total internal gains	57.5812	55.7892	52.0677	47.0085	43.7239	39.0989	35.1678	40.2046	41.9942	47.2306	53.1435	55.7966 (72)
	286.7969	284.8026	274.1663	257.3322	240.5679	224.3703	213.8745	219.1135	227.8180	244.8292	264.2218	278.4476 (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			
Southeast				2.2500	36.7938	0.7600	0.7000	0.7700	30.5213 (77)			
South				1.5500	46.7521	0.7600	0.7000	0.7700	26.7164 (78)			
Southwest				1.1300	39.9751	0.6300	0.7000	1.0000	17.9287 (82)			
Solar gains	75.1663	128.7004	177.1508	220.1152	246.2741	244.1496	235.5457	216.2303	192.1398	142.5948	90.1701	64.2281 (83)
Total gains	361.9632	413.5030	451.3171	477.4474	486.8420	468.5199	449.4202	435.3438	419.9578	387.4240	354.3918	342.6756 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	28.9016	28.9880	29.0749	29.5174	29.6075	30.0665	30.0665	30.1600	29.8812	29.6075	29.4278	29.2503
util living area	2.9268	2.9325	2.9383	2.9678	2.9738	3.0044	3.0044	3.0107	2.9921	2.9738	2.9619	2.9500
	0.9545	0.9328	0.8983	0.8369	0.7404	0.5990	0.4622	0.4913	0.6782	0.8528	0.9331	0.9604 (86)
MIT	19.1406	19.3987	19.7679	20.2156	20.5899	20.8496	20.9490	20.9376	20.7677	20.2848	19.6403	19.0936 (87)
Th 2	20.1159	20.1183	20.1207	20.1327	20.1352	20.1473	20.1473	20.1497	20.1424	20.1352	20.1303	20.1255 (88)
util rest of house	0.9484	0.9239	0.8846	0.8141	0.7024	0.5389	0.3829	0.4128	0.6229	0.8276	0.9228	0.9550 (89)
MIT 2	17.6191	17.9910	18.5200	19.1579	19.6679	20.0044	20.1111	20.1032	19.9077	19.2664	18.3513	17.5572 (90)
Living area fraction	18.3444	18.6620	19.1148	19.6621	20.1073	20.4073	20.5105	20.5009	20.3177	19.7518	18.9657	18.2895 (92)
MIT	18.3444	18.6620	19.1148	19.6621	20.1073	20.4073	20.5105	20.5009	20.3177	19.7518	18.9657	18.2895 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3444	18.6620	19.1148	19.6621	20.1073	20.4073	20.5105	20.5009	20.3177	19.7518	18.9657	18.2895 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9324	0.9057	0.8660	0.8002	0.7010	0.5580	0.4176	0.4462	0.6350	0.8148	0.9057	0.9402 (94)
Ext temp.	337.5059	374.5300	390.8560	382.0382	341.2927	261.4524	187.6681	194.2679	266.6532	315.6852	320.9659	322.1687 (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	737.4097	720.4306	658.4021	553.2826	430.9091	293.1025	197.3690	206.3370	315.7601	469.0661	611.8784	730.9631 (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	297.5284	232.4453	199.0543	123.2960	66.6746	0.0000	0.0000	0.0000	0.0000	114.1154	209.4570	304.1430 (98)
Space heating per m2												1546.7140 (98)
										(98) / (4) =		28.3125 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1709.0762 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	297.5284	232.4453	199.0543	123.2960	66.6746	0.0000	0.0000	0.0000	0.0000	114.1154	209.4570	304.1430	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	328.7606	256.8456	219.9495	136.2386	73.6736	0.0000	0.0000	0.0000	0.0000	126.0944	231.4442	336.0697	(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	129.5992	113.4355	117.2622	102.5242	98.5920	85.3967	79.4471	90.7174	91.6662	106.4388	115.8090	125.6060	(64)
Efficiency of water heater (217)m	89.5045	89.4250	89.2867	89.0186	88.5634	87.3000	87.3000	87.3000	87.3000	88.9269	89.3341	89.5407	(216)
Fuel for water heating, kWh/month	144.7963	126.8499	131.3322	115.1717	111.3237	97.8198	91.0047	103.9145	105.0013	119.6924	129.6358	140.2781	(219)
Water heating fuel used												1416.8205	(219)
Annual totals kWh/year													
Space heating fuel - main system												1709.0762	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6250)													
mechanical ventilation fans (SFP = 0.6250)													93.3080 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													168.3080 (231)
Electricity for lighting (calculated in Appendix L)													292.9213 (232)
Total delivered energy for all uses													3587.1260 (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	1709.0762	0.2160	369.1605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1416.8205	0.2160	306.0332 (264)
Space and water heating			675.1937 (265)
Pumps and fans	168.3080	0.5190	87.3519 (267)
Energy for lighting	292.9213	0.5190	152.0261 (268)
Total CO2, kg/year			914.5717 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.7400 (273)

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

DER			16.7400 ZC1
Total Floor Area		TFA	54.6300
Assumed number of occupants		N	1.8265
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.2721 ZC2
CO2 emissions from cooking, equation (L16)			2.9807 ZC3
Total CO2 emissions			36.9928 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			36.9928 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	54.6300 (1b)	x 2.2400 (2b)	= 122.3712 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.3712 (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) = 0.1634 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4134 (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) =	0.3204 (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												
	0.4085	0.4005	0.3925	0.3525	0.3444	0.3044	0.3044	0.2964	0.3204	0.3444	0.3605	0.3765 (22b)
Effective ac	0.5834	0.5802	0.5770	0.5621	0.5593	0.5463	0.5463	0.5439	0.5513	0.5593	0.5650	0.5709 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
TER Room Window (Uw = 1.70)			1.1300	1.5918	1.7987		(27a)
External Wall	10.7100	1.5500	9.1600	0.1800	1.6488		(29a)
Corridor Wall	6.5000	1.8900	4.6100	0.1800	0.8298		(29a)
Dormer Wall	22.3000	2.2500	20.0500	0.1800	3.6090		(29a)
ashlar wall	23.5300		23.5300	0.1800	4.2354		(29a)
rafters	19.7100	1.1300	18.5800	0.1300	2.4154		(30)
flat roof	42.1000		42.1000	0.1300	5.4730		(30)
Total net area of external elements Aum(A, m ²)			124.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.9380		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												11.7899 (36)
Total fabric heat loss												(33) + (36) = 38.7279 (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	23.5611	23.4302	23.3019	22.6995	22.5868	22.0621	22.0621	21.9649	22.2642	22.5868	22.8148	23.0532 (38)
Heat transfer coeff	62.2889	62.1581	62.0298	61.4274	61.3147	60.7899	60.7899	60.6928	60.9921	61.3147	61.5427	61.7811 (39)
Average = Sum(39)m / 12 =												61.4268 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1402	1.1378	1.1355	1.1244	1.1224	1.1128	1.1128	1.1110	1.1165	1.1224	1.1265	1.1309 (40)
HLP (average)												1.1244 (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												1.8265 (42)
Average daily hot water use (litres/day)												77.5796 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	85.3376	82.2344	79.1312	76.0280	72.9248	69.8217	69.8217	72.9248	76.0280	79.1312	82.2344	85.3376 (44)
Energy conte	126.5532	110.6842	114.2162	99.5764	95.5460	82.4489	76.4010	87.6713	88.7184	103.3927	112.8612	122.5600 (45)
Energy content (annual)												Total = Sum(45)m = 1220.6294 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.9830	16.6026	17.1324	14.9365	14.3319	12.3673	11.4602	13.1507	13.3078	15.5089	16.9292	18.3840 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 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)
Combi loss	43.4871	37.8503	40.3244	37.4933	37.1617	34.4326	35.5803	37.1617	37.4933	40.3244	40.5539	43.4871 (61)
Total heat required for water heating calculated for each month	170.0402	148.5345	154.5406	137.0697	132.7077	116.8815	111.9814	124.8330	126.2116	143.7171	153.4152	166.0471 (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)
Output from w/h	170.0402	148.5345	154.5406	137.0697	132.7077	116.8815	111.9814	124.8330	126.2116	143.7171	153.4152	166.0471 (64)
Heat gains from water heating, kWh/month	52.9507	46.2651	48.0580	42.4825	41.0595	36.0224	34.2984	38.4411	38.8722	44.4592	47.6648	51.6230 (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	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5864	14.7319	11.9808	9.0702	6.7801	5.7240	6.1850	8.0395	10.7907	13.7012	15.9913	17.0474 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.2316	160.8839	156.7201	147.8558	136.6663	126.1497	119.1240	117.4717	121.6355	130.4997	141.6893	152.2059 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325 (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	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604 (71)
Water heating gains (Table 5)	71.1703	68.8468	64.5941	59.0034	55.1874	50.0311	46.1000	51.6682	53.9891	59.7570	66.2012	69.3857 (72)
Total internal gains	300.3859	297.8603	286.6926	269.3272	252.0315	235.3026	224.8067	230.5771	239.8129	257.3556	277.2794	292.0366 (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			
Southeast				2.2500	36.7938	0.6300	0.7000	0.7700	25.3005 (77)			
South				1.5500	46.7521	0.6300	0.7000	0.7700	22.1465 (78)			
Southwest				1.1300	39.9751	0.6300	0.7000	1.0000	17.9287 (82)			
Solar gains	65.3757	112.3233	155.4495	194.2639	218.1591	216.5793	208.8250	191.1649	169.0058	124.6937	78.4999	55.8114 (83)
Total gains	365.7616	410.1836	442.1421	463.5910	470.1906	451.8819	433.6317	421.7420	408.8188	382.0493	355.7794	347.8480 (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	60.9057	61.0339	61.1601	61.7599	61.8735	62.4075	62.4075	62.5074	62.2007	61.8735	61.6442	61.4064
alpha	5.0604	5.0689	5.0773	5.1173	5.1249	5.1605	5.1605	5.1672	5.1467	5.1249	5.1096	5.0938
util living area	0.9967	0.9936	0.9860	0.9644	0.9058	0.7692	0.5962	0.6332	0.8492	0.9697	0.9934	0.9975 (86)
MIT	19.8364	19.9779	20.2011	20.4884	20.7506	20.9282	20.9846	20.9790	20.8726	20.5383	20.1333	19.8080 (87)
Th 2	19.9681	19.9701	19.9720	19.9809	19.9826	19.9904	19.9904	19.9919	19.9874	19.9826	19.9792	19.9757 (88)
util rest of house	0.9956	0.9914	0.9810	0.9506	0.8672	0.6811	0.4699	0.5085	0.7786	0.9551	0.9907	0.9966 (89)
MIT 2	18.4250	18.6324	18.9573	19.3739	19.7293	19.9400	19.9845	19.9829	19.8841	19.4502	18.8662	18.3890 (90)
Living area fraction	19.0977	19.2738	19.5502	19.9051	20.2161	20.4110	20.4612	20.4577	20.3553	19.9688	19.4702	19.0654 (92)
Temperature adjustment	19.0977	19.2738	19.5502	19.9051	20.2161	20.4110	20.4612	20.4577	20.3553	19.9688	19.4702	19.0654 (93)
adjusted MIT	19.0977	19.2738	19.5502	19.9051	20.2161	20.4110	20.4612	20.4577	20.3553	19.9688	19.4702	19.0654 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9944	0.9895	0.9784	0.9494	0.8773	0.7204	0.5306	0.5683	0.8071	0.9549	0.9890	0.9956 (94)
Ext temp.	363.7011	405.8563	432.5924	440.1180	412.4790	325.5343	230.0808	239.6743	329.9426	364.8083	351.8552	346.3060 (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	921.7343	893.4463	809.4999	676.0169	522.1634	353.2524	234.7202	246.2719	381.5214	574.4476	761.2934	918.3989 (97)
Space heating kWh	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 per m2	415.1767	327.6605	280.4192	169.8472	81.6052	0.0000	0.0000	0.0000	0.0000	155.9716	294.7955	425.6371 (98)
												2151.1129 (98)
												39.3760 (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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2303.1188 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.1767	327.6605	280.4192	169.8472	81.6052	0.0000	0.0000	0.0000	0.0000	155.9716	294.7955	425.6371	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	444.5147	350.8142	300.2346	181.8493	87.3717	0.0000	0.0000	0.0000	0.0000	166.9932	315.6268	455.7142	(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	170.0402	148.5345	154.5406	137.0697	132.7077	116.8815	111.9814	124.8330	126.2116	143.7171	153.4152	166.0471	(64)
Efficiency of water heater (217)m	87.2127	86.9873	86.5329	85.5921	83.8679	80.3000	80.3000	80.3000	80.3000	85.2575	86.6687	87.3179	(216)
Fuel for water heating, kWh/month	194.9718	170.7544	178.5916	160.1430	158.2341	145.5560	139.4538	155.4583	157.1751	168.5683	177.0132	190.1639	(219)
Water heating fuel used												1996.0836	(219)
Annual totals kWh/year													
Space heating fuel - main system												2303.1188	(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)												292.9213	(232)
Total delivered energy for all uses												4667.1236	(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	2303.1188	0.2160	497.4737 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1996.0836	0.2160	431.1540 (264)
Space and water heating			928.6277 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	292.9213	0.5190	152.0261 (268)
Total CO2, kg/m2/year			1119.5788 (272)
Emissions per m2 for space and water heating			16.9985 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.7828 (272b)
Emissions per m2 for pumps and fans			0.7125 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.9985 * 1.00) + 2.7828 + 0.7125, rounded to 2 d.p.			20.4900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-3	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 3, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	16.74
Environmental	89 B	% DER<TER	18.32
CO ₂ Emissions (t/year)	0.79	DFEE	42.67
General Requirements Compliance	Pass	% DFEE<TFEE	16.48
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

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	54.6300 (1b)	x 2.2400 (2b)	= 122.3712 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.3712 (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) =				20.0000 / (5) =	0.1634 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3634	(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) =		0.2817 (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	0.3591	0.3521	0.3450	0.3098	0.3028	0.2676	0.2676	0.2605	0.2817	0.3028	0.3169	0.3310 (22b)
Effective ac	0.5645	0.5620	0.5595	0.5480	0.5458	0.5358	0.5358	0.5339	0.5397	0.5458	0.5502	0.5548 (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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
rooflight (Uw = 1.30)			1.1300	1.2357	1.3964		(27a)
External Wall	10.7100	1.5500	9.1600	0.2400	2.1984		(29a)
Corridor Wall	6.5000	1.8900	4.6100	0.2005	0.9245		(29a)
Dormer Wall	22.3000	2.2500	20.0500	0.2000	4.0100		(29a)
ashlar wall	23.5300		23.5300	0.1818	4.2782		(29a)
rafters	19.7100	1.1300	18.5800	0.1300	2.4154		(30)
flat roof	42.1000		42.1000	0.1500	6.3150		(30)
Total net area of external elements Aum(A, m ²)			124.8500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2217		(33)
Party Wall 1			4.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5585 (36)
Total fabric heat loss						(33) + (36) =	39.7802 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.7953	22.6942	22.5950	22.1295	22.0424	21.6369	21.6369	21.5618	21.7931	22.0424	22.2186	22.4028 (38)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average = Sum(39)m / 12 =	62.5755	62.4744	62.3753	61.9097	61.8226	61.4171	61.4171	61.3421	61.5733	61.8226	61.9988	62.1830 (39)
												61.9093 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1454	1.1436	1.1418	1.1333	1.1317	1.1242	1.1242	1.1229	1.1271	1.1317	1.1349	1.1383 (40)
Days in month												1.1332 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8265 (42)
Average daily hot water use (litres/day)												77.5796 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	85.3376	82.2344	79.1312	76.0280	72.9248	69.8217	69.8217	72.9248	76.0280	79.1312	82.2344	85.3376 (44)
Energy content (annual)	126.5532	110.6842	114.2162	99.5764	95.5460	82.4489	76.4010	87.6713	88.7184	103.3927	112.8612	122.5600 (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:												
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	26.8925	23.5204	24.2709	21.1600	20.3035	17.5204	16.2352	18.6301	18.8527	21.9709	23.9830	26.0440 (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	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5864	14.7319	11.9808	9.0702	6.7801	5.7240	6.1850	8.0395	10.7907	13.7012	15.9913	17.0474 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.2316	160.8839	156.7201	147.8558	136.6663	126.1497	119.1240	117.4717	121.6355	130.4997	141.6893	152.2059 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325 (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)	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604 (71)
Water heating gains (Table 5)	36.1459	35.0006	32.6222	29.3889	27.2897	24.3339	21.8215	25.0405	26.1842	29.5308	33.3097	35.0054 (72)
Total internal gains	262.3615	261.0140	251.7208	236.7126	221.1337	206.6053	197.5282	200.9494	209.0080	224.1295	241.3880	254.6563 (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			
Southeast				2.2500	36.7938	0.7600	0.7000	0.7700	30.5213 (77)			
South				1.5500	46.7521	0.7600	0.7000	0.7700	26.7164 (78)			
Southwest				1.1300	39.9751	0.6300	0.7000	1.0000	17.9287 (82)			
Solar gains	75.1663	128.7004	177.1508	220.1152	246.2741	244.1496	235.5457	216.2303	192.1398	142.5948	90.1701	64.2281 (83)
Total gains	337.5279	389.7145	428.8716	456.8278	467.4078	450.7549	433.0739	417.1797	401.1479	366.7243	331.5581	318.8843 (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	24.2507	24.2900	24.3286	24.5115	24.5460	24.7081	24.7081	24.7383	24.6454	24.5460	24.4763	24.4038
alpha	2.6167	2.6193	2.6219	2.6341	2.6364	2.6472	2.6472	2.6492	2.6430	2.6364	2.6318	2.6269
util living area	0.9642	0.9472	0.9203	0.8729	0.7952	0.6745	0.5420	0.5741	0.7460	0.8876	0.9486	0.9688 (86)
MIT	18.6431	18.9131	19.3282	19.8476	20.3310	20.7062	20.8828	20.8592	20.5860	19.9552	19.2008	18.5841 (87)
Th 2	19.9639	19.9654	19.9669	19.9738	19.9751	19.9811	19.9811	19.9822	19.9788	19.9751	19.9724	19.9697 (88)
util rest of house	0.9588	0.9393	0.9079	0.8515	0.7569	0.6062	0.4412	0.4762	0.6873	0.8645	0.9396	0.9641 (89)
MIT 2	17.8134	18.0803	18.4890	18.9982	19.4557	19.7923	19.9264	19.9127	19.6944	19.1109	18.3729	17.7592 (90)
Living area fraction									fLA = Living area / (4) =			0.4767 (91)
MIT	18.2089	18.4773	18.8890	19.4031	19.8729	20.2279	20.3823	20.3638	20.1193	19.5134	18.7675	18.1524 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2089	18.4773	18.8890	19.4031	19.8729	20.2279	20.3823	20.3638	20.1193	19.5134	18.7675	18.1524 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9469	0.9250	0.8922	0.8376	0.7526	0.6241	0.4831	0.5152	0.6962	0.8520	0.9261	0.9531	(94)
Useful gains	319.6187	360.4937	382.6319	382.6476	351.7721	281.3065	209.2107	214.9474	279.2871	312.4537	307.0696	303.9412	(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													
Month fracti	870.3553	848.2329	772.7693	650.2416	505.2698	345.6480	232.2963	243.1506	370.6309	551.0469	723.3739	867.6031	(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	409.7480	327.7607	290.2622	192.6677	114.2022	0.0000	0.0000	0.0000	0.0000	177.5134	299.7391	419.3644	(98)
Space heating per m2											(98) / (4) =	40.8431	(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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	577.3211	454.4869	466.1996	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7291	0.7973	0.7804	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	420.9337	362.3708	363.8194	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	582.6048	561.3163	545.7561	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	116.4032	148.0154	135.3610	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												399.7796	(104)
Intermittency factor (Table 10b)												fC = cooled area / (4) =	1.0000 (105)
Space cooling kWh	0.0000	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	0.0000	0.0000	0.0000	0.0000	0.0000	29.1008	37.0039	33.8402	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2												99.9449	(107)
Energy for space heating												1.8295	(108)
Energy for space cooling												40.8431	(99)
Total												1.8295	(108)
Dwelling Fabric Energy Efficiency (DFEE)												42.6726	(109)
												42.7	(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	54.6300 (1b)	x 2.2400 (2b)	= 122.3712 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.3712 (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					0.4134 (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) =				0.3204 (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												
	0.4085	0.4005	0.3925	0.3525	0.3444	0.3044	0.3044	0.2964	0.3204	0.3444	0.3605	0.3765 (22b)
Effective ac	0.5834	0.5802	0.5770	0.5621	0.5593	0.5463	0.5463	0.5439	0.5513	0.5593	0.5650	0.5709 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
TER Room Window (Uw = 1.70)			1.1300	1.5918	1.7987		(27a)
External Wall	10.7100	1.5500	9.1600	0.1800	1.6488		(29a)
Corridor Wall	6.5000	1.8900	4.6100	0.1800	0.8298		(29a)
Dormer Wall	22.3000	2.2500	20.0500	0.1800	3.6090		(29a)
ashlar wall	23.5300		23.5300	0.1800	4.2354		(29a)
rafters	19.7100	1.1300	18.5800	0.1300	2.4154		(30)
flat roof	42.1000		42.1000	0.1300	5.4730		(30)
Total net area of external elements Aum(A, m ²)			124.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.9380		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.7899 (36)
Total fabric heat loss	(33) + (36) = 38.7279 (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	23.5611	23.4302	23.3019	22.6995	22.5868	22.0621	22.0621	21.9649	22.2642	22.5868	22.8148	23.0532 (38)
Heat transfer coeff	62.2889	62.1581	62.0298	61.4274	61.3147	60.7899	60.7899	60.6928	60.9921	61.3147	61.5427	61.7811 (39)
Average = Sum(39)m / 12 =												61.4268 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1402	1.1378	1.1355	1.1244	1.1224	1.1128	1.1128	1.1110	1.1165	1.1224	1.1265	1.1309 (40)
HLP (average)												1.1244 (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	1.8265 (42)
Average daily hot water use (litres/day)	77.5796 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	85.3376	82.2344	79.1312	76.0280	72.9248	69.8217	69.8217	72.9248	76.0280	79.1312	82.2344	85.3376 (44)
Energy conte	126.5532	110.6842	114.2162	99.5764	95.5460	82.4489	76.4010	87.6713	88.7184	103.3927	112.8612	122.5600 (45)
Energy content (annual)										Total = Sum(45)m =		1220.6294 (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 TARGET 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	26.8925	23.5204	24.2709	21.1600	20.3035	17.5204	16.2352	18.6301	18.8527	21.9709	23.9830	26.0440 (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	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	91.3255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5864	14.7319	11.9808	9.0702	6.7801	5.7240	6.1850	8.0395	10.7907	13.7012	15.9913	17.0474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.2316	160.8839	156.7201	147.8558	136.6663	126.1497	119.1240	117.4717	121.6355	130.4997	141.6893	152.2059	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	32.1325	(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)	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	-73.0604	(71)
Water heating gains (Table 5)	36.1459	35.0006	32.6222	29.3889	27.2897	24.3339	21.8215	25.0405	26.1842	29.5308	33.3097	35.0054	(72)
Total internal gains	262.3615	261.0140	251.7208	236.7126	221.1337	206.6053	197.5282	200.9494	209.0080	224.1295	241.3880	254.6563	(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
Southeast	2.2500	36.7938	0.6300	0.7000	0.7700	25.3005 (77)
South	1.5500	46.7521	0.6300	0.7000	0.7700	22.1465 (78)
Southwest	1.1300	39.9751	0.6300	0.7000	1.0000	17.9287 (82)

Solar gains	65.3757	112.3233	155.4495	194.2639	218.1591	216.5793	208.8250	191.1649	169.0058	124.6937	78.4999	55.8114	(83)
Total gains	327.7372	373.3373	407.1703	430.9764	439.2928	423.1846	406.3532	392.1143	378.0139	348.8232	319.8880	310.4677	(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	60.9057	61.0339	61.1601	61.7599	61.8735	62.4075	62.4075	62.5074	62.2007	61.8735	61.6442	61.4064	
alpha	5.0604	5.0689	5.0773	5.1173	5.1249	5.1605	5.1605	5.1672	5.1467	5.1249	5.1096	5.0938	
util living area	0.9980	0.9958	0.9901	0.9732	0.9244	0.8005	0.6301	0.6716	0.8787	0.9789	0.9959	0.9985	(86)
MIT	19.7718	19.9163	20.1446	20.4407	20.7164	20.9130	20.9802	20.9726	20.8466	20.4882	20.0731	19.7442	(87)
Th 2	19.9681	19.9701	19.9720	19.9809	19.9826	19.9904	19.9904	19.9919	19.9874	19.9826	19.9792	19.9757	(88)
util rest of house	0.9973	0.9943	0.9865	0.9623	0.8909	0.7155	0.4996	0.5437	0.8151	0.9682	0.9942	0.9980	(89)
MIT 2	18.8503	18.9957	19.2239	19.5216	19.7814	19.9473	19.9851	19.9836	19.8992	19.5722	19.1598	18.8288	(90)
Living area fraction	19.2895	19.4345	19.6628	19.9597	20.2271	20.4076	20.4594	20.4550	20.3508	20.0088	19.5951	19.2652	(91)
MIT	19.2895	19.4345	19.6628	19.9597	20.2271	20.4076	20.4594	20.4550	20.3508	20.0088	19.5951	19.2652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2895	19.4345	19.6628	19.9597	20.2271	20.4076	20.4594	20.4550	20.3508	20.0088	19.5951	19.2652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9933	0.9851	0.9620	0.9002	0.7536	0.5625	0.6053	0.8409	0.9685	0.9934	0.9975	(94)
Useful gains	326.6714	370.8418	401.1164	414.6182	395.4322	318.8918	228.5839	237.3562	317.8565	337.8526	317.7641	309.6958	(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	933.6829	903.4373	816.4834	679.3680	522.8335	353.0435	234.6132	246.1085	381.2503	576.8971	768.9847	930.7420	(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	451.6166	357.9042	309.0330	190.6198	94.7865	0.0000	0.0000	0.0000	0.0000	177.8491	324.8788	462.0584	(98)
Space heating												2368.7465	(98)
Space heating per m2												43.3598	(99)
										(98) / (4) =			

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	571.4254	449.8456	461.2651	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8216	0.8980	0.8813	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	469.4600	403.9612	406.4974	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	550.3798	530.0843	516.4590	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.2622	93.8356	81.8114	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												233.9092 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	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	14.5656	23.4589	20.4528	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling												58.4773 (107)
Space cooling per m2												1.0704 (108)
Energy for space heating												43.3598 (99)
Energy for space cooling												1.0704 (108)
Total												44.4302 (109)
Target Fabric Energy Efficiency (TFEE)												51.1 (109)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	5552-3	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 3, School & Downing Road, Tilehurst, RG31		
SAP Rating	84 B	DER	16.74
Environmental	89 B	TER	20.49
CO ₂ Emissions (t/year)	0.79	% DER<TER	18.32
General Requirements Compliance	Pass	DFEE	42.67
		TFEE	51.09
		% DFEE<TFEE	16.48
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client			R434-0001

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.49	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.74	kgCO ₂ /m ²	Pass
	-3.75 (-18.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.09	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.67	kWh/m ² /yr	
	-8.4 (-16.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.14 (max. 0.20)	0.15 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC CODE COMBI ESP1 26 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



5 Cylinder insulation

Hot water storage

6 Controls

Space heating controls

Hot water controls

Boiler interlock

7 Low energy lights

Percentage of fixed lights with low-energy fittings %

Minimum %

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

Maximum

MVHR efficiency %

Minimum %

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Based on:

Overshading

Windows facing South East

Windows facing South

Air change rate

Blinds/curtains

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

Maximum

10 Key features

Party wall U-value W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	5552	Issued on Date	07/06/2022
Block Name	School & Downing Road		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

Block Compliance Report - DER

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
5552-1-002	1	66.78	17.35	20.89	16.96 %
5552-2-002	1	73.83	16.00	21.06	24.02 %
5552-3-002	1	54.63	16.74	20.49	18.32 %
5552-4-002	1	57.5	18.38	22.45	18.15 %
Totals:	4	252.74	68.47	84.90	
Average DER = 17.06 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 21.21 kgCO ₂ /m ²		19.57 %			

Block Compliance Report - DFEE

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
5552-1-002	1	66.78	51.06	60.42	15.50 %
5552-2-002	1	73.83	46.62	63.16	26.19 %
5552-3-002	1	54.63	42.67	51.09	16.48 %
5552-4-002	1	57.5	49.16	61.21	19.69 %
Totals:	4	252.74	189.50	235.88	
Average DFEE = 47.52 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 59.38 kWh/m ² /yr		19.97 %			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-4			Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref			
Property	Flat 4, School & Downing Road, Tilehurst, RG31				
SAP Rating	83 B	DER	18.38	TER	22.45
Environmental	87 B	% DER<TER	18.15		
CO ₂ Emissions (t/year)	0.92	DFEE	49.16	TFEE	61.21
General Requirements Compliance	Pass	% DFEE<TFEE	19.69		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk			Assessor ID	R434-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 58 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.45 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC CODE COMBI ESP1 26
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

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: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South East: 2.25 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	57.5000 (1b)	x 2.2900 (2b)	= 131.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 131.6750 (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					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					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1700 (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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3343	0.3300	0.3258	0.3045	0.3003	0.2790	0.2790	0.2748	0.2875	0.3003	0.3088	0.3173 (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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			2.2500	1.3258	2.9830		(27)
rooflight (Uw = 1.30)			1.1300	1.2357	1.3964		(27a)
External Wall	19.6000	2.2500	17.3500	0.2400	4.1640		(29a)
Corridor Wall	21.2400	1.8900	19.3500	0.2005	3.8803		(29a)
Dormer Wall	4.2100		4.2100	0.2000	0.8420		(29a)
ashlar wall	24.9800		24.9800	0.1818	4.5418		(29a)
rafters	14.6100	1.1300	13.4800	0.1300	1.7524		(30)
flat roof	44.3000		44.3000	0.1500	6.6450		(30)
Total net area of external elements Aum(A, m ²)			128.9400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8509		(33)
Party Wall 1			4.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9227 (36)
Total fabric heat loss						(33) + (36) =	45.7736 (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	14.5241	14.3394	14.1547	13.2314	13.0467	12.1233	12.1233	11.9386	12.4927	13.0467	13.4160	13.7854 (38)
Heat transfer coeff	60.2977	60.1130	59.9283	59.0050	58.8203	57.8969	57.8969	57.7123	58.2663	58.8203	59.1896	59.5590 (39)
Average = Sum(39)m / 12 =												58.9588 (39)
HLP	1.0487	1.0454	1.0422	1.0262	1.0230	1.0069	1.0069	1.0037	1.0133	1.0230	1.0294	1.0358 (40)
HLP (average)												1.0254 (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												1.9101 (42)
Average daily hot water use (litres/day)												79.5658 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.5224	84.3398	81.1572	77.9745	74.7919	71.6093	71.6093	74.7919	77.9745	81.1572	84.3398	87.5224 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	129.7932	113.5180	117.1404	102.1258	97.9922	84.5598	78.3571	89.9159	90.9898	106.0398	115.7508	125.6978 (45)
Energy content (annual)										Total = Sum (45)m =		1251.8806 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.4690	17.0277	17.5711	15.3189	14.6988	12.6840	11.7536	13.4874	13.6485	15.9060	17.3626	18.8547 (46)
Water storage loss:												
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)
Combi loss	3.0461	2.7513	3.0461	2.9478	3.0461	2.9478	3.0461	3.0461	2.9478	3.0461	2.9478	3.0461 (61)
Total heat required for water heating calculated for each month												
	132.8393	116.2693	120.1865	105.0736	101.0382	87.5076	81.4031	92.9620	93.9376	109.0859	118.6986	128.7439 (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)
FGHRS	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)
Output from w/h												
	132.8393	116.2693	120.1865	105.0736	101.0382	87.5076	81.4031	92.9620	93.9376	109.0859	118.6986	128.7439 (64)
Heat gains from water heating, kWh/month												
	43.9178	38.4326	39.7107	34.6938	33.3439	28.8531	26.8152	30.6586	30.9911	36.0198	39.2241	42.5560 (65)
Total per year (kWh/year) = Sum (64)m =												
												1287.7455 (64)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.6875	16.5981	13.4985	10.2192	7.6390	6.4492	6.9685	9.0580	12.1576	15.4369	18.0171	19.2069 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	166.6008	168.3296	163.9731	154.6986	142.9912	131.9880	124.6371	122.9083	127.2648	136.5393	148.2467	159.2500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507 (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	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056 (71)
Water heating gains (Table 5)												
	59.0293	57.1913	53.3746	48.1858	44.8171	40.0737	36.0420	41.2077	43.0431	48.4136	54.4779	57.1990 (72)
Total internal gains	298.9697	296.7711	285.4983	267.7558	250.0994	233.1630	222.2997	227.8261	237.1176	255.0419	275.3938	290.3080 (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
Southeast					2.2500	36.7938	0.7600	0.7000	0.7700			30.5213 (77)
Southwest					1.1300	39.9751	0.6300	0.7000	1.0000			17.9287 (82)
Solar gains	48.4500	84.9459	121.4153	157.1220	180.6313	180.9773	173.8225	156.2885	133.9175	95.4014	58.5021	41.1427 (83)
Total gains	347.4197	381.7171	406.9136	424.8778	430.7307	414.1403	396.1223	384.1146	371.0352	350.4433	333.8958	331.4506 (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	26.4889	26.5703	26.6522	27.0693	27.1543	27.5873	27.5873	27.6756	27.4125	27.1543	26.9848	26.8175
alpha	2.7659	2.7714	2.7768	2.8046	2.8103	2.8392	2.8392	2.8450	2.8275	2.8103	2.7990	2.7878
util living area	0.9649	0.9526	0.9314	0.8903	0.8183	0.6971	0.5628	0.5927	0.7676	0.8986	0.9508	0.9688 (86)
MIT	18.8368	19.0522	19.4186	19.9103	20.3677	20.7325	20.8960	20.8763	20.6177	20.0353	19.3616	18.8018 (87)
Th 2	20.0430	20.0456	20.0483	20.0616	20.0642	20.0776	20.0776	20.0803	20.0722	20.0642	20.0589	20.0536 (88)
util rest of house	0.9598	0.9457	0.9209	0.8721	0.7844	0.6346	0.4687	0.5019	0.7146	0.8782	0.9425	0.9643 (89)
MIT 2	17.1385	17.4513	17.9816	18.6919	19.3306	19.8175	20.0026	19.9863	19.6765	18.8793	17.9107	17.0940 (90)
Living area fraction									fLA = Living area / (4) =			0.4529 (91)
MIT	17.9076	18.1763	18.6324	19.2436	19.8003	20.2319	20.4072	20.3893	20.1027	19.4028	18.5678	17.8674 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9076	18.1763	18.6324	19.2436	19.8003	20.2319	20.4072	20.3893	20.1027	19.4028	18.5678	17.8674 (93)

8. Space heating requirement

Utilisation	0.9443	0.9280	0.9011	0.8529	0.7735	0.6459	0.5042	0.5343	0.7165	0.8606	0.9252	0.9499 (94)
Useful gains	328.0642	354.2213	366.6649	362.3735	333.1900	267.5138	199.7341	205.2401	265.8632	301.5915	308.9206	314.8479 (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												
	820.5081	798.0760	727.0721	610.3263	476.4609	326.0676	220.4257	230.2335	349.7568	517.7833	678.7721	814.0179 (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												
	366.3782	298.2704	268.1430	178.5260	106.5935	0.0000	0.0000	0.0000	0.0000	160.8467	266.2931	371.3825 (98)
Space heating												2016.4333 (98)
Space heating per m ²												(98) / (4) = 35.0684 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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 %)												90.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2228.1031 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	366.3782	298.2704	268.1430	178.5260	106.5935	0.0000	0.0000	0.0000	0.0000	160.8467	266.2931	371.3825 (98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)
Space heating fuel (main heating system)	404.8378	329.5805	296.2906	197.2663	117.7829	0.0000	0.0000	0.0000	0.0000	177.7312	294.2465	410.3674 (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	132.8393	116.2693	120.1865	105.0736	101.0382	87.5076	81.4031	92.9620	93.9376	109.0859	118.6986	128.7439 (64)
Efficiency of water heater (217)m	89.6258	89.5790	89.4848	89.2874	88.9140	87.3000	87.3000	87.3000	87.3000	89.1790	89.4887	87.3000 (216)
Fuel for water heating, kWh/month	148.2155	129.7952	134.3093	117.6802	113.6359	100.2378	93.2453	106.4856	107.6032	122.3224	132.6409	143.6008 (219)
Water heating fuel used												1449.7721 (219)
Annual totals kWh/year												
Space heating fuel - main system												2228.1031 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6250)												
mechanical ventilation fans (SFP = 0.6250)												100.4022 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												175.4022 (231)
Electricity for lighting (calculated in Appendix L)												330.0278 (232)
Total delivered energy for all uses												4183.3052 (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	2228.1031	0.2160	481.2703 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1449.7721	0.2160	313.1508 (264)
Space and water heating			794.4210 (265)
Pumps and fans	175.4022	0.5190	91.0337 (267)
Energy for lighting	330.0278	0.5190	171.2844 (268)
Total CO2, kg/year			1056.7392 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.3800 (273)

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

DER		18.3800 ZC1
Total Floor Area	TFA	57.5000
Assumed number of occupants	N	1.9101
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.1694 ZC2
CO2 emissions from cooking, equation (L16)		2.8668 ZC3
Total CO2 emissions		38.4163 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		38.4163 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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	57.5000 (1b)	x 2.2900 (2b)	= 131.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 131.6750 (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) = 0.1519 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4019 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3416 (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												
	0.4355	0.4270	0.4185	0.3758	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4014 (22b)
Effective ac	0.5949	0.5912	0.5876	0.5706	0.5674	0.5527	0.5527	0.5499	0.5583	0.5674	0.5738	0.5806 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			2.2500	1.3258	2.9830		(27)
TER Room Window (Uw = 1.70)			1.1300	1.5918	1.7987		(27a)
External Wall	19.6000	2.2500	17.3500	0.1800	3.1230		(29a)
Corridor Wall	21.2400	1.8900	19.3500	0.1800	3.4830		(29a)
Dormer Wall	4.2100		4.2100	0.1800	0.7578		(29a)
ashlar wall	24.9800		24.9800	0.1800	4.4964		(29a)
rafters	14.6100	1.1300	13.4800	0.1300	1.7524		(30)
flat roof	44.3000		44.3000	0.1300	5.7590		(30)
Total net area of external elements Aum(A, m ²)			128.9400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.0432		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2191 (36)
Total fabric heat loss						(33) + (36) =	45.2623 (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	25.8479	25.6879	25.5310	24.7941	24.6563	24.0145	24.0145	23.8957	24.2617	24.6563	24.9352	25.2267 (38)
Heat transfer coeff	71.1102	70.9502	70.7933	70.0565	69.9186	69.2769	69.2769	69.1580	69.5241	69.9186	70.1975	70.4891 (39)
Average = Sum(39)m / 12 =												70.0558 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2367	1.2339	1.2312	1.2184	1.2160	1.2048	1.2048	1.2027	1.2091	1.2160	1.2208	1.2259 (40)
HLP (average)												1.2184 (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												1.9101 (42)
Average daily hot water use (litres/day)												79.5658 (43)
Daily hot water use	87.5224	84.3398	81.1572	77.9745	74.7919	71.6093	71.6093	74.7919	77.9745	81.1572	84.3398	87.5224 (44)
Energy conte	129.7932	113.5180	117.1404	102.1258	97.9922	84.5598	84.5598	89.9159	90.9898	106.0398	115.7508	125.6978 (45)
Energy content (annual)										Total = Sum(45)m =		1251.8806 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.4690	17.0277	17.5711	15.3189	14.6988	12.6840	11.7536	13.4874	13.6485	15.9060	17.3626	18.8547 (46)
Water storage loss:												

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CALCULATION OF TARGET EMISSIONS 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)
Combi loss	44.6005	38.8194	41.3568	38.4532	38.1131	35.3142	36.4913	38.1131	38.4532	41.3568	41.5922	44.6005 (61)
Total heat required for water heating calculated for each month	174.3937	152.3374	158.4972	140.5790	136.1053	119.8740	114.8484	128.0290	129.4430	147.3966	157.3430	170.2983 (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)
Output from w/h	174.3937	152.3374	158.4972	140.5790	136.1053	119.8740	114.8484	128.0290	129.4430	147.3966	157.3430	170.2983 (64)
Heat gains from water heating, kWh/month	54.3064	47.4496	49.2884	43.5701	42.1107	36.9447	35.1766	39.4253	39.8674	45.5974	48.8852	52.9446 (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	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6875	16.5981	13.4985	10.2192	7.6390	6.4492	6.9685	9.0580	12.1576	15.4369	18.0171	19.2069	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.6008	168.3296	163.9731	154.6986	142.9912	131.9880	124.6371	122.9083	127.2648	136.5393	148.2467	159.2500	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	(71)
Water heating gains (Table 5)	72.9924	70.6095	66.2478	60.5141	56.6004	51.3120	47.2803	52.9910	55.3714	61.2869	67.8961	71.1622	(72)
Total internal gains	312.9329	310.1893	298.3715	280.0840	261.8827	244.4013	233.5381	239.6094	249.4459	267.9151	288.8120	304.2711	(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			
Southeast				2.2500	36.7938	0.6300	0.7000	0.7700	25.3005 (77)			
Southwest				1.1300	39.9751	0.6300	0.7000	1.0000	17.9287 (82)			
Solar gains	43.2292	76.0531	109.2477	142.0458	163.7446	164.2128	157.6597	141.4764	120.7426	85.5729	52.2488	36.6748 (83)
Total gains	356.1622	386.2424	407.6193	422.1298	425.6273	408.6141	391.1978	381.0858	370.1885	353.4881	341.0608	340.9460 (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	56.1530	56.2797	56.4044	56.9977	57.1100	57.6391	57.6391	57.7381	57.4341	57.1100	56.8831	56.6479	
alpha	4.7435	4.7520	4.7603	4.7998	4.8073	4.8426	4.8426	4.8492	4.8289	4.8073	4.7922	4.7765	
util living area	0.9977	0.9962	0.9925	0.9820	0.9508	0.8608	0.7122	0.7467	0.9162	0.9837	0.9958	0.9981	(86)
MIT	19.6619	19.7813	19.9990	20.3012	20.6037	20.8518	20.9576	20.9457	20.7729	20.3876	19.9742	19.6404	(87)
Th 2	19.8908	19.8930	19.8951	19.9053	19.9072	19.9161	19.9161	19.9178	19.9127	19.9072	19.9034	19.8993	(88)
util rest of house	0.9969	0.9948	0.9897	0.9741	0.9254	0.7831	0.5680	0.6102	0.8626	0.9750	0.9940	0.9975	(89)
MIT 2	18.1160	18.2919	18.6107	19.0552	19.4819	19.8018	19.8983	19.8923	19.7121	19.1837	18.5814	18.0906	(90)
Living area fraction									fLA = Living area / (4) =			0.4529	(91)
MIT	18.8161	18.9664	19.2394	19.6195	19.9899	20.2773	20.3780	20.3694	20.1925	19.7289	19.2122	18.7925	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8161	18.9664	19.2394	19.6195	19.9899	20.2773	20.3780	20.3694	20.1925	19.7289	19.2122	18.7925	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	354.6601	383.6300	402.4694	410.0613	394.8874	332.0572	248.0532	256.1761	325.4377	343.9727	338.4831	339.7767	(94)
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	1032.2407	998.0141	901.8639	750.9695	579.6180	393.3061	261.7302	274.5125	423.5731	638.2806	850.2434	1028.6097	(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	504.1199	412.8661	371.5495	245.4539	137.4396	0.0000	0.0000	0.0000	0.0000	218.9650	368.4674	512.4917	(98)
Space heating												2771.3531	(98)
Space heating per m2												(98) / (4) =	48.1974 (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 %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2967.1875 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	504.1199	412.8661	371.5495	245.4539	137.4396	0.0000	0.0000	0.0000	0.0000	218.9650	368.4674	512.4917 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	539.7430	442.0407	397.8046	262.7986	147.1516	0.0000	0.0000	0.0000	0.0000	234.4379	394.5047	548.7063 (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	174.3937	152.3374	158.4972	140.5790	136.1053	119.8740	114.8484	128.0290	129.4430	147.3966	157.3430	170.2983 (64)
Efficiency of water heater (217)m	87.5691	87.4359	87.1232	86.4407	85.0758	80.3000	80.3000	80.3000	80.3000	86.0458	87.1210	80.3000 (216)
Fuel for water heating, kWh/month	199.1499	174.2276	181.9230	162.6306	159.9813	149.2826	143.0241	159.4384	161.1992	171.3003	180.6029	194.2928 (219)
Water heating fuel used												2037.0529 (219)
Annual totals kWh/year												
Space heating fuel - main system												2967.1875 (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)												330.0278 (232)
Total delivered energy for all uses												5409.2682 (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	2967.1875	0.2160	640.9125 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2037.0529	0.2160	440.0034 (264)
Space and water heating			1080.9159 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	330.0278	0.5190	171.2844 (268)
Total CO2, kg/m2/year			1291.1254 (272)
Emissions per m2 for space and water heating			18.7985 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.9789 (272b)
Emissions per m2 for pumps and fans			0.6770 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.7985 * 1.00) + 2.9789 + 0.6770, rounded to 2 d.p.			22.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	5552-4	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 4, School & Downing Road, Tilehurst, RG31		
SAP Rating	83 B	DER	18.38
Environmental	87 B	% DER<TER	18.15
CO ₂ Emissions (t/year)	0.92	DFEE	49.16
General Requirements Compliance	Pass	% DFEE<TFEE	19.69
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

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	57.5000 (1b)	x 2.2900 (2b)	= 131.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 131.6750 (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) =				20.0000 / (5) =	0.1519 (8)
Pressure test				Yes	
Measured/design AP50				4.0000	
Infiltration rate				0.3519	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2991 (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	0.3814	0.3739	0.3664	0.3290	0.3215	0.2842	0.2842	0.2767	0.2991	0.3215	0.3365	0.3514 (22b)
Effective ac	0.5727	0.5699	0.5671	0.5541	0.5517	0.5404	0.5404	0.5383	0.5447	0.5517	0.5566	0.5618 (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
DTC			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.40)			2.2500	1.3258	2.9830		(27)
rooflight (Uw = 1.30)			1.1300	1.2357	1.3964		(27a)
External Wall	19.6000	2.2500	17.3500	0.2400	4.1640		(29a)
Corridor Wall	21.2400	1.8900	19.3500	0.2005	3.8803		(29a)
Dormer Wall	4.2100		4.2100	0.2000	0.8420		(29a)
ashlar wall	24.9800		24.9800	0.1818	4.5418		(29a)
rafters	14.6100	1.1300	13.4800	0.1300	1.7524		(30)
flat roof	44.3000		44.3000	0.1500	6.6450		(30)
Total net area of external elements Aum(A, m ²)			128.9400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8509		(33)
Party Wall 1			4.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9227 (36)
Total fabric heat loss						(33) + (36) =	45.7736 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	24.8862	24.7635	24.6432	24.0783	23.9726	23.4806	23.4806	23.3895	23.6701	23.9726	24.1864	24.4099 (38)
Heat transfer coeff												

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Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average =	Sum(39)m / 12 =	70.6598	70.5371	70.4168	69.8519	69.7462	69.2542	69.2542	69.1631	69.4437	69.7462	69.9600	70.1836 (39)
													69.8514 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2289	1.2267	1.2246	1.2148	1.2130	1.2044	1.2044	1.2028	1.2077	1.2130	1.2167	1.2206 (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													1.9101 (42)
Average daily hot water use (litres/day)													79.5658 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	87.5224	84.3398	81.1572	77.9745	74.7919	71.6093	71.6093	74.7919	77.9745	81.1572	84.3398	87.5224 (44)	
Energy content (annual)	129.7932	113.5180	117.1404	102.1258	97.9922	84.5598	78.3571	89.9159	90.9898	106.0398	115.7508	125.6978 (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:													
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	27.5811	24.1226	24.8923	21.7017	20.8233	17.9690	16.6509	19.1071	19.3353	22.5335	24.5970	26.7108 (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	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6875	16.5981	13.4985	10.2192	7.6390	6.4492	6.9685	9.0580	12.1576	15.4369	18.0171	19.2069 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.6008	168.3296	163.9731	154.6986	142.9912	131.9880	124.6371	122.9083	127.2648	136.5393	148.2467	159.2500 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507 (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)	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056 (71)	
Water heating gains (Table 5)	37.0713	35.8967	33.4574	30.1413	27.9884	24.9569	22.3802	25.6816	26.8546	30.2869	34.1625	35.9016 (72)	
Total internal gains	274.0118	272.4765	262.5812	246.7113	230.2707	215.0461	205.6380	209.3000	217.9291	233.9152	252.0784	266.0106 (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

Southeast					2.2500	36.7938	0.7600	0.7000	0.7700			30.5213 (77)
Southwest					1.1300	39.9751	0.6300	0.7000	1.0000			17.9287 (82)

Solar gains	48.4500	84.9459	121.4153	157.1220	180.6313	180.9773	173.8225	156.2885	133.9175	95.4014	58.5021	41.1427 (83)
Total gains	322.4618	357.4224	383.9965	403.8333	410.9020	396.0234	379.4605	365.5885	351.8467	329.3166	310.5805	307.1533 (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	22.6044	22.6437	22.6824	22.8658	22.9005	23.0632	23.0632	23.0936	23.0002	22.9005	22.8305	22.7578	
alpha	2.5070	2.5096	2.5122	2.5244	2.5267	2.5375	2.5375	2.5396	2.5333	2.5267	2.5220	2.5172	
util living area	0.9716	0.9617	0.9447	0.9126	0.8555	0.7564	0.6351	0.6661	0.8171	0.9209	0.9610	0.9747 (86)	
MIT	18.3787	18.6032	19.0063	19.5515	20.0965	20.5619	20.8056	20.7722	20.4161	19.7165	18.9532	18.3320 (87)	
Th 2	19.8970	19.8987	19.9003	19.9082	19.9096	19.9165	19.9165	19.9177	19.9138	19.9096	19.9067	19.9036 (88)	
util rest of house	0.9671	0.9555	0.9353	0.8958	0.8230	0.6907	0.5248	0.5618	0.7644	0.9024	0.9537	0.9707 (89)	
MIT 2	17.5070	17.7303	18.1301	18.6708	19.1968	19.6278	19.8234	19.8021	19.5032	18.8389	18.0853	17.4652 (90)	
Living area fraction	17.9017	18.1256	18.5269	19.0696	19.6042	20.0508	20.2682	20.2414	19.9166	19.2363	18.4784	17.8577 (92)	
MIT	17.9017	18.1256	18.5269	19.0696	19.6042	20.0508	20.2682	20.2414	19.9166	19.2363	18.4784	17.8577 (93)	
Temperature adjustment												0.0000	
adjusted MIT	17.9017	18.1256	18.5269	19.0696	19.6042	20.0508	20.2682	20.2414	19.9166	19.2363	18.4784	17.8577 (93)	

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.9560	0.9425	0.9201	0.8799	0.8122	0.6999	0.5640	0.5963	0.7645	0.8881	0.9411	0.9605 (94)
Useful gains	308.2884	336.8636	353.3116	355.3252	333.7399	277.1882	214.0322	218.0010	269.0000	292.4731	292.2755	295.0348 (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	961.0950	932.8947	846.8966	710.3678	551.2909	377.4938	254.0393	265.6857	403.9297	602.3525	796.0305	958.5493 (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	485.6882	400.5329	367.2272	255.6307	161.8580	0.0000	0.0000	0.0000	0.0000	230.5503	362.7036	493.6548 (98)
Space heating												2757.8456 (98)
Space heating per m2												(98) / (4) = 47.9625 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	650.9895	512.4811	525.6395	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6346	0.7100	0.6913	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	413.1452	363.8593	363.3752	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	522.1747	502.1763	489.2539	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	78.5012	102.9078	93.6538	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												275.0628 (104)
Cooled fraction												FC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	19.6253	25.7270	23.4134	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												68.7657 (107)
Space cooling per m2												1.1959 (108)
Energy for space heating												47.9625 (99)
Energy for space cooling												1.1959 (108)
Total												49.1585 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.2 (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	57.5000 (1b)	x 2.2900 (2b)	= 131.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 131.6750 (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) = 0.1519 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4019 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3416 (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	0.4355	0.4270	0.4185	0.3758	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4014 (22b)
Effective ac	0.5949	0.5912	0.5876	0.5706	0.5674	0.5527	0.5527	0.5499	0.5583	0.5674	0.5738	0.5806 (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			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			2.2500	1.3258	2.9830		(27)
TER Room Window (Uw = 1.70)			1.1300	1.5918	1.7987		(27a)
External Wall	19.6000	2.2500	17.3500	0.1800	3.1230		(29a)
Corridor Wall	21.2400	1.8900	19.3500	0.1800	3.4830		(29a)
Dormer Wall	4.2100		4.2100	0.1800	0.7578		(29a)
ashlar wall	24.9800		24.9800	0.1800	4.4964		(29a)
rafters	14.6100	1.1300	13.4800	0.1300	1.7524		(30)
flat roof	44.3000		44.3000	0.1300	5.7590		(30)
Total net area of external elements Aum(A, m ²)			128.9400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.0432		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2191 (36)
Total fabric heat loss						(33) + (36) =	45.2623 (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	25.8479	25.6879	25.5310	24.7941	24.6563	24.0145	24.0145	23.8957	24.2617	24.6563	24.9352	25.2267 (38)
Heat transfer coeff	71.1102	70.9502	70.7933	70.0565	69.9186	69.2769	69.2769	69.1580	69.5241	69.9186	70.1975	70.4891 (39)
Average = Sum(39)m / 12 =												70.0558 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2367	1.2339	1.2312	1.2184	1.2160	1.2048	1.2048	1.2027	1.2091	1.2160	1.2208	1.2259 (40)
HLP (average)												1.2184 (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												1.9101 (42)
Average daily hot water use (litres/day)												79.5658 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.5224	84.3398	81.1572	77.9745	74.7919	71.6093	71.6093	74.7919	77.9745	81.1572	84.3398	87.5224 (44)
Energy conte	129.7932	113.5180	117.1404	102.1258	97.9922	84.5598	78.3571	89.9159	90.9898	106.0398	115.7508	125.6978 (45)
Energy content (annual)										Total = Sum(45)m =		1251.8806 (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 TARGET 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	27.5811	24.1226	24.8923	21.7017	20.8233	17.9690	16.6509	19.1071	19.3353	22.5335	24.5970	26.7108 (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	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	95.5071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6875	16.5981	13.4985	10.2192	7.6390	6.4492	6.9685	9.0580	12.1576	15.4369	18.0171	19.2069	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.6008	168.3296	163.9731	154.6986	142.9912	131.9880	124.6371	122.9083	127.2648	136.5393	148.2467	159.2500	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	32.5507	(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)	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	-76.4056	(71)
Water heating gains (Table 5)	37.0713	35.8967	33.4574	30.1413	27.9884	24.9569	22.3802	25.6816	26.8546	30.2869	34.1625	35.9016	(72)
Total internal gains	274.0118	272.4765	262.5812	246.7113	230.2707	215.0461	205.6380	209.3000	217.9291	233.9152	252.0784	266.0106	(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
Southeast				2.2500	36.7938	0.6300		0.7000		0.7700		25.3005
Southwest				1.1300	39.9751	0.6300		0.7000		1.0000		17.9287 (77)

Solar gains	43.2292	76.0531	109.2477	142.0458	163.7446	164.2128	157.6597	141.4764	120.7426	85.5729	52.2488	36.6748 (83)
Total gains	317.2410	348.5296	371.8289	388.7571	394.0153	379.2589	363.2977	350.7764	338.6717	319.4881	304.3273	302.6854 (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	56.1530	56.2797	56.4044	56.9977	57.1100	57.6391	57.6391	57.7381	57.4341	57.1100	56.8831	56.6479	
alpha	4.7435	4.7520	4.7603	4.7998	4.8073	4.8426	4.8426	4.8492	4.8289	4.8073	4.7922	4.7765	
util living area	0.9986	0.9975	0.9949	0.9870	0.9625	0.8866	0.7490	0.7862	0.9370	0.9892	0.9974	0.9989	(86)
MIT	19.5999	19.7217	19.9432	20.2515	20.5626	20.8268	20.9471	20.9315	20.7376	20.3365	19.9161	19.5793	(87)
Th 2	19.8908	19.8930	19.8951	19.9053	19.9072	19.9161	19.9161	19.9178	19.9127	19.9072	19.9034	19.8993	(88)
util rest of house	0.9981	0.9966	0.9929	0.9811	0.9421	0.8165	0.6052	0.6527	0.8927	0.9831	0.9963	0.9985	(89)
MIT 2	18.6172	18.7405	18.9631	19.2768	19.5802	19.8213	19.9002	19.8946	19.7482	19.3639	18.9430	18.6034	(90)
Living area fraction									fLA = Living area / (4) =			0.4529	(91)
MIT	19.0623	19.1848	19.4070	19.7182	20.0251	20.2767	20.3743	20.3642	20.1963	19.8043	19.3837	19.0454	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0623	19.1848	19.4070	19.7182	20.0251	20.2767	20.3743	20.3642	20.1963	19.8043	19.3837	19.0454	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9976	0.9959	0.9917	0.9798	0.9448	0.8435	0.6717	0.7139	0.9068	0.9823	0.9956	0.9981	(94)
Ext temp.	316.4818	347.0935	368.7590	380.9085	372.2535	319.9093	244.0128	250.4136	307.0948	313.8394	302.9852	302.1102	(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	1049.7478	1013.5110	913.7267	757.8879	582.0790	393.2609	261.4732	274.1551	423.8382	643.5545	862.2836	1046.4351	(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 per m2	545.5499	447.8326	405.4560	271.4251	156.1102	0.0000	0.0000	0.0000	0.0000	245.3080	402.6949	553.7778	(98)
												3028.1544	(98)
												52.6636	(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	651.2026	512.6488	525.6010	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7074	0.8035	0.7816	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	460.6334	411.9196	410.7836	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	502.5798	483.2847	471.9410	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	30.2014	53.0957	45.5011	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												128.7982 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	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	0.0000	0.0000	0.0000	0.0000	0.0000	7.5504	13.2739	11.3753	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												32.1995 (107)
Energy for space heating												0.5600 (108)
Energy for space cooling												52.6636 (99)
Total												0.5600 (108)
Target Fabric Energy Efficiency (TFEE)												53.2235 (109)
												61.2 (109)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



Property Reference	5552-4	Issued on Date	07/06/2022
Assessment Reference	002	Prop Type Ref	
Property	Flat 4, School & Downing Road, Tilehurst, RG31		
SAP Rating	83 B	DER	18.38
Environmental	87 B	TER	22.45
CO ₂ Emissions (t/year)	0.92	% DER<TER	18.15
General Requirements Compliance	Pass	DFEE	49.16
		TFEE	61.21
		% DFEE<TFEE	19.69
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client			R434-0001

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.45	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.38	kgCO ₂ /m ²	Pass
	-4.07 (-18.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.16	kWh/m ² /yr	
	-12.0 (-19.6%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC CODE COMBI ESP1 26 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)



5 Cylinder insulation

Hot water storage

6 Controls

Space heating controls

Hot water controls

Boiler interlock

7 Low energy lights

Percentage of fixed lights with low-energy fittings %

Minimum %

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power

Maximum

MVHR efficiency %

Minimum %

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Based on:

Overshading

Windows facing South East

Air change rate

Blinds/curtains

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

Maximum

10 Key features

Party wall U-value W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Block Reference	5552	Issued on Date	07/06/2022
Block Name	School & Downing Road		
Assessor Details	Mr. Harry Davey, energytest, Tel: 01892 315466, hdavey@energy-test.co.uk		Assessor ID
Client	R434-0001		

Block Compliance Report - DER

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
5552-1-002	1	66.78	17.35	20.89	16.96 %
5552-2-002	1	73.83	16.00	21.06	24.02 %
5552-3-002	1	54.63	16.74	20.49	18.32 %
5552-4-002	1	57.5	18.38	22.45	18.15 %
Totals:	4	252.74	68.47	84.90	
Average DER = 17.06 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 21.21 kgCO ₂ /m ²		19.57 %			

Block Compliance Report - DFEE

Block Reference: 5552		Block Name: School & Downing Road			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
5552-1-002	1	66.78	51.06	60.42	15.50 %
5552-2-002	1	73.83	46.62	63.16	26.19 %
5552-3-002	1	54.63	42.67	51.09	16.48 %
5552-4-002	1	57.5	49.16	61.21	19.69 %
Totals:	4	252.74	189.50	235.88	
Average DFEE = 47.52 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 59.38 kWh/m ² /yr		19.97 %			