Supporting SAP Worksheets for Energy and Sustainability Statement

DP9 Ltd

21 Belsize Park
LONDON
NW3 4DU

SRE

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	DP9X-BELS-2596	**Issued on Date**	19/11/2021
Assessment Reference	Baseline	**Prop Type Ref**	House
Property	21, Belsize Park, Camden, London, NW3 4DU		

SAP Rating	68 D	**DER**	35.14	**TER**	13.16
Environmental	57 D	**% DER<TER**	-167.06		
CO_2 Emissions (t/year)	18.53	**DFEE**	124.84	**TFEE**	58.92
General Requirements Compliance	Fail	**% DFEE<TFEE**	-111.86		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client	DP9 Ltd, DP9X		

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 613 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) 13.16 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 35.14 kgCO□/m²Fail
Excess emissions =21.98 kgCO□/m² (167.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)58.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)124.8 kWh/m²/yrFail
Excess energy =65.9 kWh/m²/yr (112.0%)
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2 Fabric U-values

Element	Average	Highest	
External wall	0.90 (max. 0.30)	2.50 (max. 0.70)	Fail
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.41 (max. 0.25)	0.41 (max. 0.70)	Fail
Roof	0.24 (max. 0.20)	0.68 (max. 0.35)	Fail
Openings	3.11 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15
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3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK
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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Post 98 Regular condens. with auto ign.

SAP default data Fail

Secondary heating system: None
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5 Cylinder insulation
Hot water storage Nominal cylinder loss: 11.20 kWh/day
Permitted by DBSCG 4.26 Fail
Primary pipework insulated: No Fail
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6 Controls
Space heating controls: Programmer, room thermostat and TRVs Fail (TFA > 150)

Hot water controls: Cylinderstat OK
Not independent timer for DHW Fail

Boiler interlock Yes OK
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7 Low energy lights
Percentage of fixed lights with low-energy fittings:75%
Minimum 75% OK
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8 Mechanical ventilation
Not applicable
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9 Summertime temperature
Overheating risk (South East England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.80 m², No overhang
Windows facing East: 2.43 m², No overhang
Windows facing South East: 28.45 m², No overhang
Windows facing South: 2.43 m², No overhang
Windows facing South West: 16.27 m², No overhang
Windows facing West: 3.80 m², No overhang
Windows facing North West: 33.05 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 10% of daylight hours
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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
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Party wall U-value 0.00 W/m²K

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 613.4200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 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							10 * 10 =	100.0000	(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) =	100.0000 / (5) =	0.0508	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8008	(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) =	0.6806	(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	0.8678	0.8508	0.8338	0.7487	0.7317	0.6466	0.6466	0.6296	0.6806	0.7317	0.7657	0.7998	(22b)
Effective ac	0.8766	0.8619	0.8476	0.7803	0.7677	0.7091	0.7091	0.6982	0.7316	0.7677	0.7932	0.8198	(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	
Retained Window (Uw = 4.80)			43.7200	4.0268	176.0537			(27)
New Window (Uw = 1.60)			29.5400	1.5038	44.4211			(27)
New Solid Door			2.0400	1.8000	3.6720			(26)
Half Glazed Door			2.7300	1.6000	4.3680			(26a)
Retained Glazed Door (Uw = 4.80)			4.9100	4.0268	19.7718			(27)
Retained Solid Door			2.5100	3.0000	7.5300			(26)
New Glazed Door (Uw = 1.60)			12.0600	1.5038	18.1353			(27)
New Rooflight (Uw = 1.60)			7.9400	1.5038	11.9398			(27a)
Lower GF			132.7300	0.4100	54.4193			(28a)
Upper Ground Floor Exposed			9.7200	0.3446	3.3492			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	1.7000	35.3090			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.3000	8.9520			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	1.7000	93.7210			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.3000	15.2220			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	1.7000	78.3360			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.3000	17.7390			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.3000	4.2690			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	1.7000	22.0830			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	1.7000	39.5250			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	1.7000	73.1680			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.3000	16.5390			(29a)
3rd Floor Dwarf Wall	36.6500		36.6500	0.3000	10.9950			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.3000	11.3100			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	2.5000	4.9250			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	2.5000	9.5750			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.6800	6.3376			(30)
Loft Insulation	64.5400		64.5400	0.1567	10.1123			(30)
Ceiling Insulation	39.7300		39.7300	0.1567	6.2250			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.6800	3.0396			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1800	1.7928			(30)
Dormer Roofs	6.1800		6.1800	0.6800	4.2024			(30)
Total net area of external elements Aum(A, m2)			872.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		817.0378			(33)
Lower GF Party Wall			44.1100	0.0000	0.0000			(32)
Upper GF Party Wall			69.8400	0.0000	0.0000			(32)
1st Floor Party Wall			66.0300	0.0000	0.0000			(32)
2nd Floor Party Wall			58.7900	0.0000	0.0000			(32)
3rd Floor Party Wall			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)		130.8870	(36)
Total fabric heat loss	(33) + (36) =	947.9248	(37)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	569.8596	560.3536	551.0357	507.2701	499.0817	460.9633	460.9633	453.9044	475.6460	499.0817	515.6468	532.9648	(38)
Heat transfer coeff	1517.7845	1508.2784	1498.9606	1455.1950	1447.0066	1408.8882	1408.8882	1401.8292	1423.5708	1447.0066	1463.5716	1480.8896	(39)
Average = Sum(39)m / 12 =												1455.1558	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4743	2.4588	2.4436	2.3723	2.3589	2.2968	2.2968	2.2853	2.3207	2.3589	2.3859	2.4142	(40)
HLP (average)												2.3722	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394	(42)
Average daily hot water use (litres/day)												124.4844	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.9328	131.9535	126.9741	121.9947	117.0153	112.0360	112.0360	117.0153	121.9947	126.9741	131.9535	136.9328	(44)
Energy conte	203.0674	177.6041	183.2715	159.7805	153.3132	132.2977	122.5932	140.6775	142.3577	165.9041	181.0973	196.6600	(45)
Energy content (annual)										Total = Sum(45)m =		1958.6243	(45)
Distribution loss (46)m = 0.15 x (45)m	30.4601	26.6406	27.4907	23.9671	22.9970	19.8446	18.3890	21.1016	21.3536	24.8856	27.1646	29.4990	(46)
Water storage loss:													
Store volume												570.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0330	(51)
Volume factor from Table 2a												0.5949	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												6.7191	(55)
Total storage loss	208.2919	188.1346	208.2919	201.5728	208.2919	201.5728	208.2919	208.2919	201.5728	208.2919	201.5728	208.2919	(56)
If cylinder contains dedicated solar storage	208.2919	188.1346	208.2919	201.5728	208.2919	201.5728	208.2919	208.2919	201.5728	208.2919	201.5728	208.2919	(57)
Primary loss	64.5792	58.3296	64.5792	62.4960	64.5792	41.9160	43.3132	43.3132	41.9160	64.5792	62.4960	64.5792	(59)
Total heat required for water heating calculated for each month	475.9385	424.0683	456.1426	423.8493	426.1843	375.7865	374.1983	392.2826	385.8465	438.7752	445.1661	469.5311	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	475.9385	424.0683	456.1426	423.8493	426.1843	375.7865	374.1983	392.2826	385.8465	438.7752	445.1661	469.5311	(64)
								Total per year (kWh/year) = Sum(64)m =				5087.7694	(64)
Heat gains from water heating, kWh/month	285.8168	256.2247	279.2347	264.3821	269.2735	238.7800	242.0463	248.0594	242.1250	273.4600	271.4699	283.6863	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.9584	69.2419	56.3113	42.6313	31.8674	26.9038	29.0705	37.7869	50.7175	64.3976	75.1615	80.1251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)	384.1624	381.2868	375.3154	367.1973	361.9268	331.6389	325.3311	333.4131	336.2847	367.5538	377.0415	381.2988	(72)
Total internal gains	1221.3362	1216.8017	1180.1149	1120.4550	1056.6268	976.4559	942.3059	952.0468	985.6338	1068.4447	1136.4902	1190.6304	(73)

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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	
North	3.8000	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
East	2.4300	19.6403	0.0000	0.7000	0.7700	0.0000	(76)
Southeast	28.4500	36.7938	0.0000	0.7000	0.7700	0.0000	(77)
South	2.4300	46.7521	0.0000	0.7000	0.7700	0.0000	(78)
West	2.3200	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	4.2900	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
Northwest	13.2700	11.2829	0.6300	0.7000	0.7700	45.7578	(81)
Southwest	7.9400	37.0308	0.7200	0.7000	1.0000	133.3696	(82)
West	1.4800	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	3.4300	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Northwest	12.0600	11.2829	0.7200	0.7000	0.7700	47.5262	(81)

Solar gains	409.6044	754.6477	1171.4093	1663.9795	2043.1660	2103.3826	1996.9651	1705.1947	1341.9484	872.6841	501.2810	343.4698	(83)
Total gains	1630.9406	1971.4495	2351.5242	2784.4345	3099.7928	3079.8385	2939.2710	2657.2415	2327.5822	1941.1289	1637.7711	1534.1003	(84)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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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	28.0663	28.2432	28.4188	29.2735	29.4391	30.2356	30.2356	30.3879	29.9238	29.4391	29.1059	28.7656	
alpha	2.8711	2.8829	2.8946	2.9516	2.9626	3.0157	3.0157	3.0259	2.9949	2.9626	2.9404	2.9177	
util living area	0.9996	0.9993	0.9986	0.9964	0.9900	0.9739	0.9417	0.9586	0.9897	0.9980	0.9994	0.9997	(86)
MIT	18.0746	18.2414	18.5978	19.1425	19.6965	20.2379	20.5654	20.5051	20.0512	19.3548	18.6622	18.0947	(87)
Th 2	19.0359	19.0450	19.0540	19.0967	19.1048	19.1428	19.1428	19.1499	19.1281	19.1048	19.0885	19.0715	(88)
util rest of house	0.9995	0.9991	0.9979	0.9942	0.9818	0.9397	0.8197	0.8702	0.9764	0.9965	0.9992	0.9996	(89)
MIT 2	16.4781	16.6509	17.0131	17.5852	18.1422	18.6987	18.9942	18.9542	18.5116	17.8033	17.1002	16.5216	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	16.7913	16.9629	17.3239	17.8907	18.4471	19.0006	19.3024	19.2584	18.8136	18.1077	17.4066	16.8302	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.7913	16.9629	17.3239	17.8907	18.4471	19.0006	19.3024	19.2584	18.8136	18.1077	17.4066	16.8302	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9992	0.9985	0.9968	0.9918	0.9770	0.9351	0.8383	0.8798	0.9722	0.9950	0.9987	0.9994	(94)
Useful gains	1629.6386	1968.5478	2344.0160	2761.6108	3028.3548	2879.8881	2464.0990	2337.8466	2262.8489	1931.4184	1635.6378	1533.1456	(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	18959.0539	18194.1685	16224.6124	13083.2099	9763.1204	6200.0150	3807.4118	4007.0122	6710.1304	10863.6376	15084.4673	18703.9267	(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	12893.0850	10903.6171	10327.1637	7431.5513	5010.6656	0.0000	0.0000	0.0000	0.0000	6645.5711	9683.1573	12775.0612	(98)
Space heating												75669.8723	(98)
Space heating per m2											(98) / (4) =	123.3574	(99)

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 %) 84.0000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 90083.1814 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	12893.0850	10903.6171	10327.1637	7431.5513	5010.6656	0.0000	0.0000	0.0000	0.0000	6645.5711	9683.1573	12775.0612	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	15348.9107	12980.4966	12294.2425	8847.0849	5965.0781	0.0000	0.0000	0.0000	0.0000	7911.3942	11527.5682	15208.4061	(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													
Water heating requirement	475.9385	424.0683	456.1426	423.8493	426.1843	375.7865	374.1983	392.2826	385.8465	438.7752	445.1661	469.5311	(64)
Efficiency of water heater												74.0000	(216)
(217)m	83.5978	83.5772	83.5226	83.3920	83.1195	74.0000	74.0000	74.0000	74.0000	83.3028	83.5040	83.5995	(217)
Fuel for water heating, kWh/month	569.3193	507.3972	546.1310	508.2617	512.7368	507.8195	505.6734	530.1117	521.4141	526.7234	533.1074	561.6434	(219)
Water heating fuel used												6330.3389	(219)
Annual totals kWh/year													
Space heating fuel - main system												90083.1814	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												1376.7692	(232)
Total delivered energy for all uses												97820.2894	(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	90083.1814	0.2160	19457.9672	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	6330.3389	0.2160	1367.3532	(264)
Space and water heating			20825.3204	(265)
Pumps and fans	30.0000	0.5190	15.5700	(267)
Energy for lighting	1376.7692	0.5190	714.5432	(268)
Total CO2, kg/year			21555.4336	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			35.1400	(273)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

DER		35.1400	ZC1
Total Floor Area	TFA	613.4200	
Assumed number of occupants	N	3.5394	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		6.5702	ZC2
CO2 emissions from cooking, equation (L16)		0.3325	ZC3
Total CO2 emissions		42.0426	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		42.0426	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	613.4200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 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							4 * 10	=	40.0000	(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) =			40.0000 / (5) =	0.0203	(8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2703	(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) =	0.2298	(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	0.2929	0.2872	0.2815	0.2527	0.2470	0.2183	0.2183	0.2125	0.2298	0.2470	0.2585	0.2700	(22b)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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			4.5500	1.0000	4.5500			(26)
TER Semi-glazed door			2.7300	1.2000	3.2760			(26a)
TER Opening Type (Uw = 1.40)			90.2300	1.3258	119.6231			(27)
TER Room Window (Uw = 1.70)			7.9400	1.5918	12.6386			(27a)
Lower GF			132.7300	0.1300	17.2549			(28a)
Upper Ground Floor Exposed			9.7200	0.1300	1.2636			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	0.1800	3.7386			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.1800	5.3712			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	0.1800	9.9234			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.1800	9.1332			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	0.1800	8.2944			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.1800	10.6434			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.1800	2.5614			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	0.1800	2.3382			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	0.1800	4.1850			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	0.1800	7.7472			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.1800	9.9234			(29a)
3rd Floor Dwarf Wall	36.6500		36.6500	0.1800	6.5970			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.1800	6.7860			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	0.1800	0.3546			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	0.1800	0.6894			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.1300	1.2116			(30)
Loft Insulation	64.5400		64.5400	0.1300	8.3902			(30)
Ceiling Insulation	39.7300		39.7300	0.1300	5.1649			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.1300	0.5811			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1300	1.2948			(30)
Dormer Roofs	6.1800		6.1800	0.1300	0.8034			(30)
Total net area of external elements Aum(A, m2)			872.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		264.3386			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		43.6290	(36)
Total fabric heat loss	(33) + (36) =	307.9676	(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	352.9493	351.8661	350.8044	345.8175	344.8844	340.5410	340.5410	339.7366	342.2140	344.8844	346.7720	348.7453	(38)
Heat transfer coeff	660.9169	659.8337	658.7720	653.7851	652.8520	648.5086	648.5086	647.7042	650.1816	652.8520	654.7396	656.7129	(39)
Average = Sum(39)m / 12 =												653.7806	(39)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

HLP	1.0774	1.0757	1.0739	1.0658	1.0643	1.0572	1.0572	1.0559	1.0599	1.0643	1.0674	1.0706 (40)
HLP (average)												1.0658 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394 (42)
Average daily hot water use (litres/day)												118.2602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862 (44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270 (45)
Energy content (annual)										Total = Sum(45)m =		1860.6931 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240 (46)
Water storage loss:												
Store volume												570.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1502 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.7011 (55)
Total storage loss												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (56)
If cylinder contains dedicated solar storage												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (64)
								Total per year (kWh/year) = Sum(64)m =				2755.4849 (64)
Heat gains from water heating, kWh/month												
	124.9407	111.0139	118.6877	109.3063	109.2246	100.6251	99.5209	105.2333	103.8028	113.2018	116.0397	122.9168 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	63.0523	56.0025	45.5443	34.4800	25.7742	21.7596	23.5121	30.5619	41.0201	52.0844	60.7902	64.8047	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)													
	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)													
	167.9311	165.1993	159.5265	151.8143	146.8073	139.7571	133.7647	141.4426	144.1706	152.1529	161.1663	165.2107	(72)
Total internal gains													
	990.1988	987.4748	953.5589	896.9206	835.4141	779.4300	745.1811	752.8512	783.8223	840.7307	906.2436	959.2220	(73)

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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	
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489	(74)
East	2.4300	19.6403	0.6300	0.7000	0.7700	14.5856	(76)
Southeast	28.4500	36.7938	0.6300	0.7000	0.7700	319.9110	(77)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199	(78)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
West	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088	(80)
Northwest	33.0500	11.2829	0.6300	0.7000	0.7700	113.9635	(81)
Southwest	7.9400	37.0308	0.6300	0.7000	1.0000	116.6984	(82)

Solar gains	817.9869	1463.6396	2175.4806	2962.6021	3545.7260	3615.7134	3446.4604	2999.7026	2447.7447	1665.5831	992.8994	691.3418 (83)
Total gains	1808.1857	2451.1144	3129.0396	3859.5227	4381.1401	4395.1433	4191.6414	3752.5538	3231.5670	2506.3138	1899.1431	1650.5638 (84)

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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	64.4538	64.5596	64.6637	65.1569	65.2500	65.6870	65.6870	65.7686	65.5180	65.2500	65.0619	64.8664
alpha	5.2969	5.3040	5.3109	5.3438	5.3500	5.3791	5.3791	5.3846	5.3679	5.3500	5.3375	5.3244
util living area												
	0.9999	0.9997	0.9982	0.9888	0.9444	0.8181	0.6507	0.7327	0.9451	0.9969	0.9998	1.0000 (86)
MIT	19.5681	19.7315	20.0019	20.3634	20.6992	20.9136	20.9804	20.9642	20.7771	20.3326	19.8805	19.5425 (87)
Th 2	20.0193	20.0208	20.0222	20.0289	20.0301	20.0359	20.0359	20.0370	20.0337	20.0301	20.0276	20.0249 (88)
util rest of house												
	0.9999	0.9996	0.9975	0.9839	0.9181	0.7379	0.5231	0.6077	0.9073	0.9951	0.9997	1.0000 (89)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

MIT 2	18.0693	18.3097	18.7063	19.2366	19.7075	19.9716	20.0278	20.0198	19.8226	19.1958	18.5328	18.0359	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	18.3633	18.5886	18.9604	19.4576	19.9020	20.1564	20.2147	20.2051	20.0098	19.4188	18.7972	18.3314	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3633	18.5886	18.9604	19.4576	19.9020	20.1564	20.2147	20.2051	20.0098	19.4188	18.7972	18.3314	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9963	0.9798	0.9137	0.7492	0.5482	0.6316	0.9060	0.9934	0.9996	0.9999	(94)
Useful gains	1807.9361	2449.3457	3117.4666	3781.4162	4003.2014	3292.9187	2297.6680	2370.1753	2927.9198	2489.6917	1898.3064	1650.4259	(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	9294.6553	9032.1878	8208.5822	6902.4339	5354.7222	3603.3473	2344.1504	2464.5547	3842.4360	5757.3818	7658.5903	9280.2554	(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	5570.1191	4423.6699	3787.7900	2247.1327	1005.5315	0.0000	0.0000	0.0000	0.0000	2431.1615	4147.4044	5676.5932	(98)
Space heating												29289.4022	(98)
Space heating per m2											(98) / (4) =	47.7477	(99)

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	31325.5639	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5570.1191	4423.6699	3787.7900	2247.1327	1005.5315	0.0000	0.0000	0.0000	0.0000	2431.1615	4147.4044	5676.5932	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	5957.3466	4731.1977	4051.1123	2403.3505	1075.4347	0.0000	0.0000	0.0000	0.0000	2600.1727	4435.7266	6071.2227	(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													
Water heating requirement	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.9446	89.8862	89.7546	89.4074	88.3601	79.8000	79.8000	79.8000	79.8000	89.4486	89.8267	89.9662	(217)
Fuel for water heating, kWh/month	298.9731	264.0732	278.6531	252.0328	250.8411	249.6583	241.1774	262.7063	261.6345	261.1612	273.4010	292.1353	(219)
Water heating fuel used												3186.4473	(219)
Annual totals kWh/year													
Space heating fuel - main system												31325.5639	(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)												1113.5234	(232)
Total delivered energy for all uses												35700.5346	(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	31325.5639	0.2160	6766.3218	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3186.4473	0.2160	688.2726	(264)
Space and water heating			7454.5944	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1113.5234	0.5190	577.9186	(268)
Total CO2, kg/m2/year			8071.4381	(272)
Emissions per m2 for space and water heating			12.1525	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			0.9421	(272b)
Emissions per m2 for pumps and fans			0.0635	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.1525 * 1.00) + 0.9421 + 0.0635, rounded to 2 d.p.			13.1600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	DP9X-BELS-2596	**Issued on Date**	19/11/2021
Assessment Reference	Lean	**Prop Type Ref**	House
Property	21, Belsize Park, Camden, London, NW3 4DU		

SAP Rating	74 C	**DER**	27.96	**TER**	13.18
Environmental	66 D	**% DER<TER**	-112.11		
CO_2 Emissions (t/year)	14.72	**DFEE**	123.54	**TFEE**	59.05
General Requirements Compliance	Fail	**% DFEE<TFEE**	-109.21		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client	DP9 Ltd, DP9X		

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Semi-Detached House, total floor area 613 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) 13.18 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 27.96 kgCO□/m²Fail
Excess emissions =14.78 kgCO□/m² (112.0%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)123.5 kWh/m²/yrFail
Excess energy =64.5 kWh/m²/yr (109.0%)
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.87 (max. 0.30)	2.50 (max. 0.70)	Fail
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.41 (max. 0.25)	0.41 (max. 0.70)	Fail
Roof	0.24 (max. 0.20)	0.68 (max. 0.35)	Fail
Openings	3.01 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15
---
3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK
---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 430 VU 306/6-3 OV (H-GB)

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage: Measured cylinder loss: 2.44 kWh/day
Permitted by DBSCG 4.26 OK
Primary pipework insulated: Yes OK
---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK
---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Not applicable
---
9 Summertime temperature
Overheating risk (South East England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.80 m², No overhang
Windows facing East: 2.43 m², No overhang
Windows facing South East: 28.45 m², No overhang
Windows facing South: 2.43 m², No overhang
Windows facing South West: 16.27 m², No overhang
Windows facing West: 3.80 m², No overhang
Windows facing North West: 33.05 m², No overhang
Air change rate: 1.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 10% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 613.4200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 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							10 * 10 =	100.0000	(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) =	100.0000 / (5) =	0.0508	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8008	(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) =	0.6806	(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	0.8678	0.8508	0.8338	0.7487	0.7317	0.6466	0.6466	0.6296	0.6806	0.7317	0.7657	0.7998	(22b)
Effective ac	0.8766	0.8619	0.8476	0.7803	0.7677	0.7091	0.7091	0.6982	0.7316	0.7677	0.7932	0.8198	(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	
Retained Window (Uw = 4.80)			43.7200	4.0268	176.0537			(27)
New Window (Uw = 1.40)			29.5400	1.3258	39.1629			(27)
New Solid Door			2.0400	1.4000	2.8560			(26)
Half Glazed Door			2.7300	1.4000	3.8220			(26a)
Retained Glazed Door (Uw = 4.80)			4.9100	4.0268	19.7718			(27)
Retained Solid Door			2.5100	3.0000	7.5300			(26)
New Glazed Door (Uw = 1.40)			12.0600	1.3258	15.9886			(27)
New Rooflight (Uw = 1.40)			7.9400	1.3258	10.5265			(27a)
Lower GF			132.7300	0.4100	54.4193			(28a)
Upper Ground Floor Exposed			9.7200	0.3446	3.3492			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	1.7000	35.3090			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.2600	7.7584			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	1.7000	93.7210			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.2600	13.1924			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	1.7000	78.3360			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.2600	15.3738			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.2762	3.9297			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	1.7000	22.0830			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	1.7000	39.5250			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	1.7000	73.1680			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.2600	14.3338			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.2759	11.4952			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.2759	10.4000			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	2.5000	4.9250			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	2.5000	9.5750			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.6800	6.3376			(30)
Loft Insulation	64.5400		64.5400	0.1567	10.1123			(30)
Ceiling Insulation	39.7300		39.7300	0.1567	6.2250			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.6800	3.0396			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1800	1.7928			(30)
Dormer Roofs Retained	6.1800		6.1800	0.6800	4.2024			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		798.3149			(33)
Lower GF Party Wall			44.1100	0.0000	0.0000			(32)
Upper GF Party Wall			69.8400	0.0000	0.0000			(32)
1st Floor Party Wall			66.0300	0.0000	0.0000			(32)
2nd Floor Party Wall			58.7900	0.0000	0.0000			(32)
3rd Floor Party Wall			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)		131.6400	(36)
Total fabric heat loss	(33) + (36) =	929.9549	(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	569.8596	560.3536	551.0357	507.2701	499.0817	460.9633	460.9633	453.9044	475.6460	499.0817	515.6468	532.9648	(38)
Heat transfer coeff	1499.8145	1490.3084	1480.9906	1437.2250	1429.0366	1390.9182	1390.9182	1383.8592	1405.6008	1429.0366	1445.6016	1462.9196	(39)
Average = Sum(39)m / 12 =												1437.1858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4450	2.4295	2.4143	2.3430	2.3296	2.2675	2.2675	2.2560	2.2914	2.3296	2.3566	2.3849	(40)
HLP (average)												2.3429	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394	(42)
Average daily hot water use (litres/day)												118.2602	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862	(44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270	(45)
Energy content (annual)										Total = Sum(45)m =		1860.6931	(45)
Distribution loss (46)m = 0.15 x (45)m	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240	(46)
Water storage loss:													
Store volume												570.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.4400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3176	(55)
Total storage loss	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(56)
If cylinder contains dedicated solar storage	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
								Total per year (kWh/year) = Sum(64)m =				2615.5131	(64)
Heat gains from water heating, kWh/month	115.4303	102.4239	109.1773	100.1027	99.7142	91.4215	90.0105	95.7229	94.5992	103.6914	106.8361	113.4064	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3667	55.3935	45.0491	34.1050	25.4939	21.5230	23.2564	30.2296	40.5740	51.5181	60.1292	64.1001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)	155.1483	152.4165	146.7437	139.0315	134.0245	126.9743	120.9819	128.6598	131.3878	139.3701	148.3835	152.4279	(72)
Total internal gains	976.7304	974.0831	940.2809	883.7629	822.3510	766.4106	732.1426	739.7361	770.5934	827.3816	892.7998	945.7345	(73)

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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	
North	3.8000	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
East	2.4300	19.6403	0.0000	0.7000	0.7700	0.0000	(76)
Southeast	28.4500	36.7938	0.0000	0.7000	0.7700	0.0000	(77)
South	2.4300	46.7521	0.0000	0.7000	0.7700	0.0000	(78)
West	2.3200	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	4.2900	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
Northwest	13.2700	11.2829	0.6300	0.7000	0.7700	45.7578	(81)
Southwest	7.9400	37.0308	0.7200	0.7000	1.0000	133.3696	(82)
West	1.4800	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	3.4300	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Northwest	12.0600	11.2829	0.7200	0.7000	0.7700	47.5262	(81)

Solar gains	409.6044	754.6477	1171.4093	1663.9795	2043.1660	2103.3826	1996.9651	1705.1947	1341.9484	872.6841	501.2810	343.4698	(83)
Total gains	1386.3348	1728.7308	2111.6902	2547.7424	2865.5170	2869.7932	2729.1077	2444.9308	2112.5418	1700.0657	1394.0808	1289.2043	(84)

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7. Mean internal temperature (heating season)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	28.4026	28.5838	28.7636	29.6395	29.8093	30.6263	30.6263	30.7825	30.3063	29.8093	29.4677	29.1189	
alpha	2.8935	2.9056	2.9176	2.9760	2.9873	3.0418	3.0418	3.0522	3.0204	2.9873	2.9645	2.9413	
util living area	0.9998	0.9996	0.9990	0.9972	0.9920	0.9781	0.9506	0.9661	0.9921	0.9986	0.9997	0.9998	(86)
MIT	18.0688	18.2353	18.5901	19.1323	19.6833	20.2247	20.5515	20.4898	20.0364	19.3410	18.6528	18.0892	(87)
Th 2	19.0532	19.0624	19.0714	19.1145	19.1226	19.1610	19.1610	19.1681	19.1461	19.1226	19.1062	19.0891	(88)
util rest of house	0.9997	0.9994	0.9985	0.9955	0.9853	0.9489	0.8422	0.8904	0.9818	0.9976	0.9995	0.9998	(89)
MIT 2	15.2898	15.5382	16.0622	16.8774	17.6859	18.4863	18.9256	18.8595	18.2144	17.1876	16.1716	15.3376	(90)
Living area fraction									fLA = Living area / (4) =			0.1961	(91)
MIT	15.8349	16.0672	16.5581	17.3196	18.0777	18.8273	19.2445	19.1792	18.5718	17.6100	16.6583	15.8773	(92)
Temperature adjustment												-0.1500	
adjusted MIT	15.6849	15.9172	16.4081	17.1696	17.9277	18.6773	19.0945	19.0292	18.4218	17.4600	16.5083	15.7273	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9987	0.9970	0.9920	0.9768	0.9336	0.8344	0.8782	0.9728	0.9956	0.9990	0.9995	(94)
Useful gains	1385.4441	1726.4976	2105.3656	2527.2384	2798.9955	2679.1041	2277.2289	2147.1053	2055.0046	1692.5647	1392.6197	1288.5856	(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	17075.2744	16419.0603	14673.7653	11885.3460	8899.5750	5671.2091	3469.6123	3638.5048	6074.6911	9803.1954	13600.6404	16863.5389	(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	11673.2337	9873.4021	9350.8894	6737.8375	4538.8311	0.0000	0.0000	0.0000	0.0000	6034.3092	8789.7749	11587.7652	(98)
Space heating												68586.0432	(98)
Space heating per m2											(98) / (4) =	111.8093	(99)

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 %) 93.2000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 73590.1751 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	11673.2337	9873.4021	9350.8894	6737.8375	4538.8311	0.0000	0.0000	0.0000	0.0000	6034.3092	8789.7749	11587.7652	(98)
Space heating efficiency (main heating system 1)	93.2000	93.2000	93.2000	93.2000	93.2000	0.0000	0.0000	0.0000	0.0000	93.2000	93.2000	93.2000	(210)
Space heating fuel (main heating system)	12524.9289	10593.7791	10033.1431	7229.4394	4869.9905	0.0000	0.0000	0.0000	0.0000	6474.5807	9431.0890	12433.2245	(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
Water heating requirement

257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
Efficiency of water heater											80.1000	(216)
(217)m 90.5394	90.5287	90.4997	90.4284	90.2674	80.1000	80.1000	80.1000	80.1000	90.3722	90.4864	90.5436	(217)
Fuel for water heating, kWh/month												
283.8786	250.3383	263.2230	236.4649	232.3714	234.3605	225.4327	246.8810	246.2919	245.3377	258.6934	277.1426	(219)
Water heating fuel used												3000.4159 (219)

Annual totals kWh/year
Space heating fuel - main system 73590.1751 (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) 1101.4154 (232)
Total delivered energy for all uses 77767.0064 (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	73590.1751	0.2160	15895.4778	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3000.4159	0.2160	648.0898	(264)
Space and water heating			16543.5677	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1101.4154	0.5190	571.6346	(268)
Total CO2, kg/year			17154.1272	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.9600	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES
DER 27.9600 ZC1

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total Floor Area	TFA	613.4200	
Assumed number of occupants	N	3.5394	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		6.5702	ZC2
CO2 emissions from cooking, equation (L16)		0.3325	ZC3
Total CO2 emissions		34.8626	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		34.8626	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	613.4200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 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							4 * 10	=	40.0000	(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) =			40.0000 / (5) =	0.0203	(8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2703	(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) =	0.2298	(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	0.2929	0.2872	0.2815	0.2527	0.2470	0.2183	0.2183	0.2125	0.2298	0.2470	0.2585	0.2700	(22b)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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			4.5500	1.0000	4.5500			(26)
TER Semi-glazed door			2.7300	1.2000	3.2760			(26a)
TER Opening Type (Uw = 1.40)			90.2300	1.3258	119.6231			(27)
TER Room Window (Uw = 1.70)			7.9400	1.5918	12.6386			(27a)
Lower GF			132.7300	0.1300	17.2549			(28a)
Upper Ground Floor Exposed			9.7200	0.1300	1.2636			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	0.1800	3.7386			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.1800	5.3712			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	0.1800	9.9234			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.1800	9.1332			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	0.1800	8.2944			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.1800	10.6434			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.1800	2.5614			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	0.1800	2.3382			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	0.1800	4.1850			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	0.1800	7.7472			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.1800	9.9234			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.1800	7.5006			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.1800	6.7860			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	0.1800	0.3546			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	0.1800	0.6894			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.1300	1.2116			(30)
Loft Insulation	64.5400		64.5400	0.1300	8.3902			(30)
Ceiling Insulation	39.7300		39.7300	0.1300	5.1649			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.1300	0.5811			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1300	1.2948			(30)
Dormer Roofs Retained	6.1800		6.1800	0.1300	0.8034			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		265.2422			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		43.8800	(36)
Total fabric heat loss	(33) + (36) =	309.1222	(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	352.9493	351.8661	350.8044	345.8175	344.8844	340.5410	340.5410	339.7366	342.2140	344.8844	346.7720	348.7453	(38)
Heat transfer coeff	662.0715	660.9883	659.9266	654.9397	654.0066	649.6632	649.6632	648.8588	651.3362	654.0066	655.8942	657.8675	(39)
Average = Sum(39)m / 12 =												654.9352	(39)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

HLP	1.0793	1.0775	1.0758	1.0677	1.0662	1.0591	1.0591	1.0578	1.0618	1.0662	1.0692	1.0725 (40)
HLP (average)												1.0677 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394 (42)
Average daily hot water use (litres/day)												118.2602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862 (44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270 (45)
Energy content (annual)										Total = Sum(45)m =		1860.6931 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240 (46)
Water storage loss:												
Store volume												570.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1502 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.7011 (55)
Total storage loss												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (56)
If cylinder contains dedicated solar storage												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (64)
								Total per year (kWh/year) = Sum(64)m =				2755.4849 (64)
Heat gains from water heating, kWh/month												
	124.9407	111.0139	118.6877	109.3063	109.2246	100.6251	99.5209	105.2333	103.8028	113.2018	116.0397	122.9168 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	63.0523	56.0025	45.5443	34.4800	25.7742	21.7596	23.5121	30.5619	41.0201	52.0844	60.7902	64.8047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969 (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)												
	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750 (71)
Water heating gains (Table 5)												
	167.9311	165.1993	159.5265	151.8143	146.8073	139.7571	133.7647	141.4426	144.1706	152.1529	161.1663	165.2107 (72)
Total internal gains												
	990.1988	987.4748	953.5589	896.9206	835.4141	779.4300	745.1811	752.8512	783.8223	840.7307	906.2436	959.2220 (73)

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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
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489 (74)
East	2.4300	19.6403	0.6300	0.7000	0.7700	14.5856 (76)
Southeast	28.4500	36.7938	0.6300	0.7000	0.7700	319.9110 (77)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508 (79)
West	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (80)
Northwest	33.0500	11.2829	0.6300	0.7000	0.7700	113.9635 (81)
Southwest	7.9400	37.0308	0.6300	0.7000	1.0000	116.6984 (82)

Solar gains	817.9869	1463.6396	2175.4806	2962.6021	3545.7260	3615.7134	3446.4604	2999.7026	2447.7447	1665.5831	992.8994	691.3418 (83)
Total gains	1808.1857	2451.1144	3129.0396	3859.5227	4381.1401	4395.1433	4191.6414	3752.5538	3231.5670	2506.3138	1899.1431	1650.5638 (84)

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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	64.3414	64.4468	64.5505	65.0420	65.1348	65.5703	65.5703	65.6516	65.4019	65.1348	64.9474	64.7526
alpha	5.2894	5.2965	5.3034	5.3361	5.3423	5.3714	5.3714	5.3768	5.3601	5.3423	5.3298	5.3168
util living area												
	0.9999	0.9997	0.9982	0.9888	0.9446	0.8187	0.6516	0.7335	0.9453	0.9969	0.9998	1.0000 (86)
MIT	19.5656	19.7291	19.9997	20.3614	20.6978	20.9129	20.9802	20.9638	20.7760	20.3310	19.8784	19.5400 (87)
Th 2	20.0178	20.0192	20.0206	20.0273	20.0286	20.0344	20.0344	20.0355	20.0321	20.0286	20.0260	20.0234 (88)
util rest of house												
	0.9999	0.9996	0.9975	0.9839	0.9183	0.7385	0.5237	0.6083	0.9075	0.9951	0.9997	1.0000 (89)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

MIT 2	18.0645	18.3050	18.7019	19.2327	19.7044	19.9695	20.0262	20.0181	19.8199	19.1923	18.5286	18.0311	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9963	0.9798	0.9140	0.7498	0.5488	0.6323	0.9063	0.9934	0.9996	0.9999	(94)
Useful gains	1807.9349	2449.3409	3117.4602	3781.5318	4004.1746	3295.5245	2300.3915	2372.6340	2928.6708	2489.6930	1898.3035	1650.4251	(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	9308.0370	9045.1860	8220.3408	6912.3026	5362.3565	3608.5785	2347.4353	2468.0012	3847.7573	5765.5119	7669.6141	9293.7209	(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	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating												29352.8343	(98)
Space heating per m2											(98) / (4) =	47.8511	(99)

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	31393.4057	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	5967.9957	4740.5433	4060.4740	2410.8610	1080.7351	0.0000	0.0000	0.0000	0.0000	2606.6409	4444.2178	6081.9381	(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													
Water heating requirement	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.9455	89.8874	89.7562	89.4105	88.3685	79.8000	79.8000	79.8000	79.8000	89.4509	89.8279	89.9671	(217)
Fuel for water heating, kWh/month	298.9700	264.0699	278.6482	252.0242	250.8173	249.6583	241.1774	262.7063	261.6345	261.1543	273.3973	292.1324	(219)
Water heating fuel used												3186.3900	(219)
Annual totals kWh/year													
Space heating fuel - main system												31393.4057	(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)												1113.5234	(232)
Total delivered energy for all uses												35768.3191	(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	31393.4057	0.2160	6780.9756	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3186.3900	0.2160	688.2602	(264)
Space and water heating			7469.2359	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1113.5234	0.5190	577.9186	(268)
Total CO2, kg/m2/year			8086.0795	(272)
Emissions per m2 for space and water heating			12.1764	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			0.9421	(272b)
Emissions per m2 for pumps and fans			0.0635	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.1764 * 1.00) + 0.9421 + 0.0635, rounded to 2 d.p.			13.1800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	DP9X-BELS-2596	**Issued on Date**	19/11/2021
Assessment Reference	Green - PV & Gas Boiler	**Prop Type Ref**	House
Property	21, Belsize Park, Camden, London, NW3 4DU		

SAP Rating	79 C	**DER**	24.57	**TER**	13.18
Environmental	70 C	**% DER<TER**	-86.39		
CO_2 Emissions (t/year)	12.55	**DFEE**	123.54	**TFEE**	59.05
General Requirements Compliance	Fail	**% DFEE<TFEE**	-109.21		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client	DP9 Ltd, DP9X		

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

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Semi-Detached House, total floor area 613 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.
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1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 13.18 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 24.57 kgCO□/m²Fail
Excess emissions =11.39 kgCO□/m²  (86.4%)
-------------------------------------------------------------------------------------------------
1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)123.5 kWh/m²/yrFail
Excess energy =64.5 kWh/m²/yr  (109.0%)
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2 Fabric U-values
Element         Average                 Highest
External wall   0.87 (max. 0.30)        2.50 (max. 0.70)          Fail
Party wall      0.00 (max. 0.20)         -                        OK
Floor           0.41 (max. 0.25)        0.41 (max. 0.70)          Fail
Roof            0.24 (max. 0.20)        0.68 (max. 0.35)          Fail
Openings        3.01 (max. 2.00)        4.80 (max. 3.30)          Fail
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2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15
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3 Air permeability
Air permeability at 50 pascals:         15.00 (assumed)                                 OK
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4 Heating efficiency
Main heating system:                    Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 430 VU 306/6-3 OV (H-GB)

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%                                  OK

Secondary heating system:               None
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5 Cylinder insulation
Hot water storage                       Measured cylinder loss: 2.44 kWh/day
Permitted by DBSCG 4.26                         OK
Primary pipework insulated:             Yes                                             OK
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6 Controls
Space heating controls:                 Time and temperature zone control               OK


Hot water controls:                     Cylinderstat                                    OK
                                        Independent timer for DHW                       OK

Boiler interlock                        Yes                                             OK
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7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum                                 75%                                             OK
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8 Mechanical ventilation
Not applicable
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9 Summertime temperature
Overheating risk (South East England):  Not significant                                 OK
Based on:
Overshading:                            Average
Windows facing North:                   3.80 m², No overhang
Windows facing East:                    2.43 m², No overhang
Windows facing South East:              28.45 m², No overhang
Windows facing South:                   2.43 m², No overhang
Windows facing South West:              16.27 m², No overhang
Windows facing West:                    3.80 m², No overhang
Windows facing North West:              33.05 m², No overhang
Air change rate:                        1.00 ach
Blinds/curtains:                        Light-coloured curtain or roller blind, closed 10% of daylight hours
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10 Key features
Party wall U-value                      0.00 W/m²K
Party wall U-value                      0.00 W/m²K
Party wall U-value                      0.00 W/m²K
Party wall U-value                      0.00 W/m²K
Party wall U-value                      0.00 W/m²K
Photovoltaic array                      6.10 kW



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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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 613.4200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 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							10 * 10 =	100.0000	(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) =	100.0000 / (5) =	0.0508	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8008	(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) =	0.6806	(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	0.8678	0.8508	0.8338	0.7487	0.7317	0.6466	0.6466	0.6296	0.6806	0.7317	0.7657	0.7998	(22b)
Effective ac	0.8766	0.8619	0.8476	0.7803	0.7677	0.7091	0.7091	0.6982	0.7316	0.7677	0.7932	0.8198	(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	
Retained Window (Uw = 4.80)			43.7200	4.0268	176.0537			(27)
New Window (Uw = 1.40)			29.5400	1.3258	39.1629			(27)
New Solid Door			2.0400	1.4000	2.8560			(26)
Half Glazed Door			2.7300	1.4000	3.8220			(26a)
Retained Glazed Door (Uw = 4.80)			4.9100	4.0268	19.7718			(27)
Retained Solid Door			2.5100	3.0000	7.5300			(26)
New Glazed Door (Uw = 1.40)			12.0600	1.3258	15.9886			(27)
New Rooflight (Uw = 1.40)			7.9400	1.3258	10.5265			(27a)
Lower GF			132.7300	0.4100	54.4193			(28a)
Upper Ground Floor Exposed			9.7200	0.3446	3.3492			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	1.7000	35.3090			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.2600	7.7584			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	1.7000	93.7210			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.2600	13.1924			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	1.7000	78.3360			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.2600	15.3738			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.2762	3.9297			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	1.7000	22.0830			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	1.7000	39.5250			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	1.7000	73.1680			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.2600	14.3338			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.2759	11.4952			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.2759	10.4000			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	2.5000	4.9250			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	2.5000	9.5750			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.6800	6.3376			(30)
Loft Insulation	64.5400		64.5400	0.1567	10.1123			(30)
Ceiling Insulation	39.7300		39.7300	0.1567	6.2250			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.6800	3.0396			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1800	1.7928			(30)
Dormer Roofs Retained	6.1800		6.1800	0.6800	4.2024			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		798.3149			(33)
Lower GF Party Wall			44.1100	0.0000	0.0000			(32)
Upper GF Party Wall			69.8400	0.0000	0.0000			(32)
1st Floor Party Wall			66.0300	0.0000	0.0000			(32)
2nd Floor Party Wall			58.7900	0.0000	0.0000			(32)
3rd Floor Party Wall			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)		131.6400	(36)
Total fabric heat loss	(33) + (36) =	929.9549	(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	569.8596	560.3536	551.0357	507.2701	499.0817	460.9633	460.9633	453.9044	475.6460	499.0817	515.6468	532.9648	(38)
Heat transfer coeff	1499.8145	1490.3084	1480.9906	1437.2250	1429.0366	1390.9182	1390.9182	1383.8592	1405.6008	1429.0366	1445.6016	1462.9196	(39)
Average = Sum(39)m / 12 =												1437.1858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4450	2.4295	2.4143	2.3430	2.3296	2.2675	2.2675	2.2560	2.2914	2.3296	2.3566	2.3849	(40)
HLP (average)												2.3429	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394	(42)
Average daily hot water use (litres/day)												118.2602	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862	(44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270	(45)
Energy content (annual)										Total = Sum(45)m =		1860.6931	(45)
Distribution loss (46)m = 0.15 x (45)m	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240	(46)
Water storage loss:													
Store volume												570.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.4400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3176	(55)
Total storage loss	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(56)
If cylinder contains dedicated solar storage	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
								Total per year (kWh/year) = Sum(64)m =				2615.5131	(64)
Heat gains from water heating, kWh/month	115.4303	102.4239	109.1773	100.1027	99.7142	91.4215	90.0105	95.7229	94.5992	103.6914	106.8361	113.4064	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3667	55.3935	45.0491	34.1050	25.4939	21.5230	23.2564	30.2296	40.5740	51.5181	60.1292	64.1001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)	155.1483	152.4165	146.7437	139.0315	134.0245	126.9743	120.9819	128.6598	131.3878	139.3701	148.3835	152.4279	(72)
Total internal gains	976.7304	974.0831	940.2809	883.7629	822.3510	766.4106	732.1426	739.7361	770.5934	827.3816	892.7998	945.7345	(73)

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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	
North	3.8000	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
East	2.4300	19.6403	0.0000	0.7000	0.7700	0.0000	(76)
Southeast	28.4500	36.7938	0.0000	0.7000	0.7700	0.0000	(77)
South	2.4300	46.7521	0.0000	0.7000	0.7700	0.0000	(78)
West	2.3200	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	4.2900	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
Northwest	13.2700	11.2829	0.6300	0.7000	0.7700	45.7578	(81)
Southwest	7.9400	37.0308	0.7200	0.7000	1.0000	133.3696	(82)
West	1.4800	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	3.4300	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Northwest	12.0600	11.2829	0.7200	0.7000	0.7700	47.5262	(81)

Solar gains	409.6044	754.6477	1171.4093	1663.9795	2043.1660	2103.3826	1996.9651	1705.1947	1341.9484	872.6841	501.2810	343.4698	(83)
Total gains	1386.3348	1728.7308	2111.6902	2547.7424	2865.5170	2869.7932	2729.1077	2444.9308	2112.5418	1700.0657	1394.0808	1289.2043	(84)

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7. Mean internal temperature (heating season)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	28.4026	28.5838	28.7636	29.6395	29.8093	30.6263	30.6263	30.7825	30.3063	29.8093	29.4677	29.1189	
alpha	2.8935	2.9056	2.9176	2.9760	2.9873	3.0418	3.0418	3.0522	3.0204	2.9873	2.9645	2.9413	
util living area													
	0.9998	0.9996	0.9990	0.9972	0.9920	0.9781	0.9506	0.9661	0.9921	0.9986	0.9997	0.9998	(86)
MIT	18.0688	18.2353	18.5901	19.1323	19.6833	20.2247	20.5515	20.4898	20.0364	19.3410	18.6528	18.0892	(87)
Th 2	19.0532	19.0624	19.0714	19.1145	19.1226	19.1610	19.1610	19.1681	19.1461	19.1226	19.1062	19.0891	(88)
util rest of house													
	0.9997	0.9994	0.9985	0.9955	0.9853	0.9489	0.8422	0.8904	0.9818	0.9976	0.9995	0.9998	(89)
MIT 2	15.2898	15.5382	16.0622	16.8774	17.6859	18.4863	18.9256	18.8595	18.2144	17.1876	16.1716	15.3376	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	15.8349	16.0672	16.5581	17.3196	18.0777	18.8273	19.2445	19.1792	18.5718	17.6100	16.6583	15.8773	(92)
Temperature adjustment												-0.1500	
adjusted MIT	15.6849	15.9172	16.4081	17.1696	17.9277	18.6773	19.0945	19.0292	18.4218	17.4600	16.5083	15.7273	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9987	0.9970	0.9920	0.9768	0.9336	0.8344	0.8782	0.9728	0.9956	0.9990	0.9995	(94)
Useful gains	1385.4441	1726.4976	2105.3656	2527.2384	2798.9955	2679.1041	2277.2289	2147.1053	2055.0046	1692.5647	1392.6197	1288.5856	(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													
	17075.2744	16419.0603	14673.7653	11885.3460	8899.5750	5671.2091	3469.6123	3638.5048	6074.6911	9803.1954	13600.6404	16863.5389	(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													
	11673.2337	9873.4021	9350.8894	6737.8375	4538.8311	0.0000	0.0000	0.0000	0.0000	6034.3092	8789.7749	11587.7652	(98)
Space heating												68586.0432	(98)
Space heating per m2											(98) / (4) =	111.8093	(99)

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 %)												93.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												73590.1751	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	11673.2337	9873.4021	9350.8894	6737.8375	4538.8311	0.0000	0.0000	0.0000	0.0000	6034.3092	8789.7749	11587.7652	(98)
Space heating efficiency (main heating system 1)													
	93.2000	93.2000	93.2000	93.2000	93.2000	0.0000	0.0000	0.0000	0.0000	93.2000	93.2000	93.2000	(210)
Space heating fuel (main heating system)													
	12524.9289	10593.7791	10033.1431	7229.4394	4869.9905	0.0000	0.0000	0.0000	0.0000	6474.5807	9431.0890	12433.2245	(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													
Water heating requirement													
	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
Efficiency of water heater												80.1000	(216)
(217)m	90.5394	90.5287	90.4997	90.4284	90.2674	80.1000	80.1000	80.1000	80.1000	90.3722	90.4864	90.5436	(217)
Fuel for water heating, kWh/month													
	283.8786	250.3383	263.2230	236.4649	232.3714	234.3605	225.4327	246.8810	246.2919	245.3377	258.6934	277.1426	(219)
Water heating fuel used												3000.4159	(219)
Annual totals kWh/year													
Space heating fuel - main system												73590.1751	(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)												1101.4154	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 6.10 * 1029 * 0.80) =												-4017.9449	(233)
Total delivered energy for all uses												73749.0614	(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	73590.1751	0.2160	15895.4778	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3000.4159	0.2160	648.0898	(264)
Space and water heating			16543.5677	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1101.4154	0.5190	571.6346	(268)
Energy saving/generation technologies				
PV Unit	-4017.9449	0.5190	-2085.3134	(269)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total CO2, kg/year		15068.8138	(272)
Dwelling Carbon Dioxide Emission Rate (DER)		24.5700	(273)

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

DER		24.5700	ZC1
Total Floor Area	TFA	613.4200	
Assumed number of occupants	N	3.5394	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		6.5702	ZC2
CO2 emissions from cooking, equation (L16)		0.3325	ZC3
Total CO2 emissions		31.4726	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		31.4726	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	613.4200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 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							4 * 10	=	40.0000	(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) =			40.0000 / (5) =	0.0203	(8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2703	(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) =	0.2298	(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	0.2929	0.2872	0.2815	0.2527	0.2470	0.2183	0.2183	0.2125	0.2298	0.2470	0.2585	0.2700	(22b)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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			4.5500	1.0000	4.5500			(26)
TER Semi-glazed door			2.7300	1.2000	3.2760			(26a)
TER Opening Type (Uw = 1.40)			90.2300	1.3258	119.6231			(27)
TER Room Window (Uw = 1.70)			7.9400	1.5918	12.6386			(27a)
Lower GF			132.7300	0.1300	17.2549			(28a)
Upper Ground Floor Exposed			9.7200	0.1300	1.2636			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	0.1800	3.7386			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.1800	5.3712			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	0.1800	9.9234			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.1800	9.1332			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	0.1800	8.2944			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.1800	10.6434			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.1800	2.5614			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	0.1800	2.3382			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	0.1800	4.1850			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	0.1800	7.7472			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.1800	9.9234			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.1800	7.5006			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.1800	6.7860			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	0.1800	0.3546			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	0.1800	0.6894			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.1300	1.2116			(30)
Loft Insulation	64.5400		64.5400	0.1300	8.3902			(30)
Ceiling Insulation	39.7300		39.7300	0.1300	5.1649			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.1300	0.5811			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1300	1.2948			(30)
Dormer Roofs Retained	6.1800		6.1800	0.1300	0.8034			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		265.2422			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		43.8800	(36)
Total fabric heat loss	(33) + (36) =	309.1222	(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	352.9493	351.8661	350.8044	345.8175	344.8844	340.5410	340.5410	339.7366	342.2140	344.8844	346.7720	348.7453	(38)
Heat transfer coeff	662.0715	660.9883	659.9266	654.9397	654.0066	649.6632	649.6632	648.8588	651.3362	654.0066	655.8942	657.8675	(39)
Average = Sum(39)m / 12 =												654.9352	(39)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

HLP	1.0793	1.0775	1.0758	1.0677	1.0662	1.0591	1.0591	1.0578	1.0618	1.0662	1.0692	1.0725 (40)
HLP (average)												1.0677 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394 (42)
Average daily hot water use (litres/day)												118.2602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862 (44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270 (45)
Energy content (annual)										Total = Sum(45)m =		1860.6931 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240 (46)
Water storage loss:												
Store volume												570.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1502 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.7011 (55)
Total storage loss												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (56)
If cylinder contains dedicated solar storage												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (64)
								Total per year (kWh/year) = Sum(64)m =				2755.4849 (64)
Heat gains from water heating, kWh/month												
	124.9407	111.0139	118.6877	109.3063	109.2246	100.6251	99.5209	105.2333	103.8028	113.2018	116.0397	122.9168 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	63.0523	56.0025	45.5443	34.4800	25.7742	21.7596	23.5121	30.5619	41.0201	52.0844	60.7902	64.8047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969 (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)												
	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750 (71)
Water heating gains (Table 5)												
	167.9311	165.1993	159.5265	151.8143	146.8073	139.7571	133.7647	141.4426	144.1706	152.1529	161.1663	165.2107 (72)
Total internal gains												
	990.1988	987.4748	953.5589	896.9206	835.4141	779.4300	745.1811	752.8512	783.8223	840.7307	906.2436	959.2220 (73)

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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
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489 (74)
East	2.4300	19.6403	0.6300	0.7000	0.7700	14.5856 (76)
Southeast	28.4500	36.7938	0.6300	0.7000	0.7700	319.9110 (77)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508 (79)
West	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (80)
Northwest	33.0500	11.2829	0.6300	0.7000	0.7700	113.9635 (81)
Southwest	7.9400	37.0308	0.6300	0.7000	1.0000	116.6984 (82)

Solar gains	817.9869	1463.6396	2175.4806	2962.6021	3545.7260	3615.7134	3446.4604	2999.7026	2447.7447	1665.5831	992.8994	691.3418 (83)
Total gains	1808.1857	2451.1144	3129.0396	3859.5227	4381.1401	4395.1433	4191.6414	3752.5538	3231.5670	2506.3138	1899.1431	1650.5638 (84)

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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	64.3414	64.4468	64.5505	65.0420	65.1348	65.5703	65.5703	65.6516	65.4019	65.1348	64.9474	64.7526
alpha	5.2894	5.2965	5.3034	5.3361	5.3423	5.3714	5.3714	5.3768	5.3601	5.3423	5.3298	5.3168
util living area												
	0.9999	0.9997	0.9982	0.9888	0.9446	0.8187	0.6516	0.7335	0.9453	0.9969	0.9998	1.0000 (86)
MIT	19.5656	19.7291	19.9997	20.3614	20.6978	20.9129	20.9802	20.9638	20.7760	20.3310	19.8784	19.5400 (87)
Th 2	20.0178	20.0192	20.0206	20.0273	20.0286	20.0344	20.0344	20.0355	20.0321	20.0286	20.0260	20.0234 (88)
util rest of house												
	0.9999	0.9996	0.9975	0.9839	0.9183	0.7385	0.5237	0.6083	0.9075	0.9951	0.9997	1.0000 (89)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

MIT 2	18.0645	18.3050	18.7019	19.2327	19.7044	19.9695	20.0262	20.0181	19.8199	19.1923	18.5286	18.0311	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9963	0.9798	0.9140	0.7498	0.5488	0.6323	0.9063	0.9934	0.9996	0.9999	(94)
Useful gains	1807.9349	2449.3409	3117.4602	3781.5318	4004.1746	3295.5245	2300.3915	2372.6340	2928.6708	2489.6930	1898.3035	1650.4251	(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	9308.0370	9045.1860	8220.3408	6912.3026	5362.3565	3608.5785	2347.4353	2468.0012	3847.7573	5765.5119	7669.6141	9293.7209	(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	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating												29352.8343	(98)
Space heating per m2											(98) / (4) =	47.8511	(99)

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	31393.4057	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	5967.9957	4740.5433	4060.4740	2410.8610	1080.7351	0.0000	0.0000	0.0000	0.0000	2606.6409	4444.2178	6081.9381	(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													
Water heating requirement	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.9455	89.8874	89.7562	89.4105	88.3685	79.8000	79.8000	79.8000	79.8000	89.4509	89.8279	89.9671	(217)
Fuel for water heating, kWh/month	298.9700	264.0699	278.6482	252.0242	250.8173	249.6583	241.1774	262.7063	261.6345	261.1543	273.3973	292.1324	(219)
Water heating fuel used												3186.3900	(219)
Annual totals kWh/year													
Space heating fuel - main system												31393.4057	(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)												1113.5234	(232)
Total delivered energy for all uses												35768.3191	(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	31393.4057	0.2160	6780.9756	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3186.3900	0.2160	688.2602	(264)
Space and water heating			7469.2359	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1113.5234	0.5190	577.9186	(268)
Total CO2, kg/m2/year			8086.0795	(272)
Emissions per m2 for space and water heating			12.1764	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			0.9421	(272b)
Emissions per m2 for pumps and fans			0.0635	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.1764 * 1.00) + 0.9421 + 0.0635, rounded to 2 d.p.			13.1800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	DP9X-BELS-2596	**Issued on Date**	19/11/2021
Assessment Reference	Green - ASHP & PV	**Prop Type Ref**	House
Property	21, Belsize Park, Camden, London, NW3 4DU		

SAP Rating	70 C	**DER**	22.56	**TER**	19.88
Environmental	73 C	**% DER<TER**	-13.49		
CO_2 Emissions (t/year)	11.32	**DFEE**	123.54	**TFEE**	59.05
General Requirements Compliance	Fail	**% DFEE<TFEE**	-109.21		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client	DP9 Ltd, DP9X		

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 613 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 19.88 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.56 kgCO□/m²Fail
Excess emissions =2.68 kgCO□/m² (13.5%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)123.5 kWh/m²/yrFail
Excess energy =64.5 kWh/m²/yr (109.0%)
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2 Fabric U-values

Element	Average	Highest	
External wall	0.87 (max. 0.30)	2.50 (max. 0.70)	Fail
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.41 (max. 0.25)	0.41 (max. 0.70)	Fail
Roof	0.24 (max. 0.20)	0.68 (max. 0.35)	Fail
Openings	3.01 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15
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3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK
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4 Heating efficiency
Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 14.0 kW PUZ-HWM140YHA

Secondary heating system: None
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5 Cylinder insulation
Hot water storage Measured cylinder loss: 2.44 kWh/day
Permitted by DBSCG 4.26 OK
Primary pipework insulated: Yes OK
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6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

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7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
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8 Mechanical ventilation
Not applicable
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9 Summertime temperature
Overheating risk (South East England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.80 m², No overhang
Windows facing East: 2.43 m², No overhang
Windows facing South East: 28.45 m², No overhang
Windows facing South: 2.43 m², No overhang
Windows facing South West: 16.27 m², No overhang
Windows facing West: 3.80 m², No overhang
Windows facing North West: 33.05 m², No overhang
Air change rate: 1.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 10% of daylight hours
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10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Photovoltaic array 6.10 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 613.4200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 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							10 * 10 =	100.0000	(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) =	100.0000 / (5) =	0.0508	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8008	(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) =	0.6806	(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	0.8678	0.8508	0.8338	0.7487	0.7317	0.6466	0.6466	0.6296	0.6806	0.7317	0.7657	0.7998	(22b)
Effective ac	0.8766	0.8619	0.8476	0.7803	0.7677	0.7091	0.7091	0.6982	0.7316	0.7677	0.7932	0.8198	(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	
Retained Window (Uw = 4.80)			43.7200	4.0268	176.0537			(27)
New Window (Uw = 1.40)			29.5400	1.3258	39.1629			(27)
New Solid Door			2.0400	1.4000	2.8560			(26)
Half Glazed Door			2.7300	1.4000	3.8220			(26a)
Retained Glazed Door (Uw = 4.80)			4.9100	4.0268	19.7718			(27)
Retained Solid Door			2.5100	3.0000	7.5300			(26)
New Glazed Door (Uw = 1.40)			12.0600	1.3258	15.9886			(27)
New Rooflight (Uw = 1.40)			7.9400	1.3258	10.5265			(27a)
Lower GF			132.7300	0.4100	54.4193			(28a)
Upper Ground Floor Exposed			9.7200	0.3446	3.3492			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	1.7000	35.3090			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.2600	7.7584			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	1.7000	93.7210			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.2600	13.1924			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	1.7000	78.3360			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.2600	15.3738			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.2762	3.9297			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	1.7000	22.0830			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	1.7000	39.5250			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	1.7000	73.1680			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.2600	14.3338			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.2759	11.4952			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.2759	10.4000			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	2.5000	4.9250			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	2.5000	9.5750			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.6800	6.3376			(30)
Loft Insulation	64.5400		64.5400	0.1567	10.1123			(30)
Ceiling Insulation	39.7300		39.7300	0.1567	6.2250			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.6800	3.0396			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1800	1.7928			(30)
Dormer Roofs Retained	6.1800		6.1800	0.6800	4.2024			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		798.3149			(33)
Lower GF Party Wall			44.1100	0.0000	0.0000			(32)
Upper GF Party Wall			69.8400	0.0000	0.0000			(32)
1st Floor Party Wall			66.0300	0.0000	0.0000			(32)
2nd Floor Party Wall			58.7900	0.0000	0.0000			(32)
3rd Floor Party Wall			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)		131.6400	(36)
Total fabric heat loss	(33) + (36) =	929.9549	(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	569.8596	560.3536	551.0357	507.2701	499.0817	460.9633	460.9633	453.9044	475.6460	499.0817	515.6468	532.9648	(38)
Heat transfer coeff	1499.8145	1490.3084	1480.9906	1437.2250	1429.0366	1390.9182	1390.9182	1383.8592	1405.6008	1429.0366	1445.6016	1462.9196	(39)
Average = Sum(39)m / 12 =												1437.1858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4450	2.4295	2.4143	2.3430	2.3296	2.2675	2.2675	2.2560	2.2914	2.3296	2.3566	2.3849	(40)
HLP (average)												2.3429	(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												3.5394	(42)
Average daily hot water use (litres/day)												118.2602	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862	(44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270	(45)
Energy content (annual)										Total = Sum(45)m =		1860.6931	(45)
Distribution loss (46)m = 0.15 x (45)m	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240	(46)
Water storage loss:													
Store volume												570.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.4400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3176	(55)
Total storage loss	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(56)
If cylinder contains dedicated solar storage	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
								Total per year (kWh/year) = Sum(64)m =				2615.5131	(64)
Heat gains from water heating, kWh/month	115.4303	102.4239	109.1773	100.1027	99.7142	91.4215	90.0105	95.7229	94.5992	103.6914	106.8361	113.4064	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3667	55.3935	45.0491	34.1050	25.4939	21.5230	23.2564	30.2296	40.5740	51.5181	60.1292	64.1001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)	155.1483	152.4165	146.7437	139.0315	134.0245	126.9743	120.9819	128.6598	131.3878	139.3701	148.3835	152.4279	(72)
Total internal gains	973.7304	971.0831	937.2809	880.7629	819.3510	763.4106	729.1426	736.7361	767.5934	824.3816	889.7998	942.7345	(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	
North	3.8000	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
East	2.4300	19.6403	0.0000	0.7000	0.7700	0.0000	(76)
Southeast	28.4500	36.7938	0.0000	0.7000	0.7700	0.0000	(77)
South	2.4300	46.7521	0.0000	0.7000	0.7700	0.0000	(78)
West	2.3200	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	4.2900	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
Northwest	13.2700	11.2829	0.6300	0.7000	0.7700	45.7578	(81)
Southwest	7.9400	37.0308	0.7200	0.7000	1.0000	133.3696	(82)
West	1.4800	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	3.4300	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Northwest	12.0600	11.2829	0.7200	0.7000	0.7700	47.5262	(81)

Solar gains	409.6044	754.6477	1171.4093	1663.9795	2043.1660	2103.3826	1996.9651	1705.1947	1341.9484	872.6841	501.2810	343.4698	(83)
Total gains	1383.3348	1725.7308	2108.6902	2544.7424	2862.5170	2866.7932	2726.1077	2441.9308	2109.5418	1697.0657	1391.0808	1286.2043	(84)

7. Mean internal temperature (heating season)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	28.4026	28.5838	28.7636	29.6395	29.8093	30.6263	30.6263	30.7825	30.3063	29.8093	29.4677	29.1189	
alpha	2.8935	2.9056	2.9176	2.9760	2.9873	3.0418	3.0418	3.0522	3.0204	2.9873	2.9645	2.9413	
util living area													
	0.9998	0.9996	0.9990	0.9972	0.9920	0.9782	0.9507	0.9662	0.9922	0.9986	0.9997	0.9998	(86)
Tweekday	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
Tweekend	19.1049	19.2125	19.4419	19.7923	20.1486	20.4985	20.7098	20.6700	20.3768	19.9273	19.4824	19.1180	
24 / 16	9	8	9	0	0	0	0	0	0	0	4	9	
24 / 9	22	20	22	0	0	0	0	0	0	0	10	22	
16 / 9	0	0	0	10	0	0	0	0	0	0	12	0	
MIT	21.0000	21.0000	21.0000	19.4225	19.6860	20.2298	20.5522	20.4906	20.0269	19.3444	20.1906	21.0000	(87)
Th 2	19.0532	19.0624	19.0714	19.1145	19.1226	19.1610	19.1610	19.1681	19.1461	19.1226	19.1062	19.0891	(88)
util rest of house													
	0.9997	0.9994	0.9985	0.9955	0.9853	0.9490	0.8426	0.8906	0.9818	0.9976	0.9995	0.9998	(89)
Tweekday	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
Tweekend	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
MIT 2	19.0532	19.0624	19.0714	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	17.5408	19.0891	(90)
Living area fraction											fLA = Living area / (4) =	0.1961	(91)
MIT	19.4350	19.4424	19.4497	17.3761	18.0778	18.8279	19.2444	19.1791	18.5695	17.6102	18.0605	19.4639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4350	19.4424	19.4497	17.3761	18.0778	18.8279	19.2444	19.1791	18.5695	17.6102	18.0605	19.4639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9997	0.9994	0.9986	0.9925	0.9782	0.9390	0.8517	0.8915	0.9751	0.9959	0.9993	0.9998	(94)
Useful gains	1382.9388	1724.7124	2105.6970	2525.6506	2800.1673	2692.0314	2321.9446	2177.0363	2057.0067	1690.0507	1390.1446	1285.9304	(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													
	22699.7378	21672.7018	19178.3971	12182.1164	9114.0675	5880.7304	3678.0989	3845.8951	6282.3361	10017.8761	15844.5701	22329.8871	(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													
	15859.6985	13405.0488	12702.0889	6952.6554	4697.5418	0.0000	0.0000	0.0000	0.0000	6195.9021	10407.1864	15656.7038	(98)
Space heating												85876.8256	(98)
Space heating per m2											(98) / (4) =	139.9968	(99)

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)												0.1150	(201)
Fraction of space heat from main system(s)												0.8850	(202)
Efficiency of main space heating system 1 (in %)												418.6615	(206)
Efficiency of secondary/supplementary heating system, %												100.0000	(208)
Space heating requirement												18153.3273	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	15859.6985	13405.0488	12702.0889	6952.6554	4697.5418	0.0000	0.0000	0.0000	0.0000	6195.9021	10407.1864	15656.7038	(98)
Space heating efficiency (main heating system 1)													
	418.6615	418.6615	418.6615	418.6615	418.6615	0.0000	0.0000	0.0000	0.0000	418.6615	418.6615	418.6615	(210)
Space heating fuel (main heating system)													
	3352.5494	2833.6660	2685.0687	1469.7077	993.0038	0.0000	0.0000	0.0000	0.0000	1309.7391	2199.9539	3309.6387	(211)
Water heating requirement													
	1823.8653	1541.5806	1460.7402	799.5554	540.2173	0.0000	0.0000	0.0000	0.0000	712.5287	1196.8264	1800.5209	(215)
Water heating													
Water heating requirement													
	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
Efficiency of water heater												168.7200	(216)
(217)m	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	(217)
Fuel for water heating, kWh/month													
	152.3365	134.3219	141.1901	126.7375	124.3217	111.2629	107.0244	117.2070	116.9273	131.4112	138.7402	148.7287	(219)
Water heating fuel used												1550.2093	(219)
Annual totals kWh/year													
Space heating fuel - main system												18153.3273	(211)
Space heating fuel - secondary												9875.8349	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												1101.4154	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 6.10 * 1029 * 0.80) =										-4017.9449		-4017.9449	(233)
Total delivered energy for all uses												26662.8420	(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	18153.3273	0.5190	9421.5769	(261)
Space heating - secondary	9875.8349	0.5190	5125.5583	(263)
Water heating (other fuel)	1550.2093	0.5190	804.5586	(264)
Space and water heating			15351.6938	(265)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	1101.4154	0.5190	571.6346	(268)
Energy saving/generation technologies				
PV Unit	-4017.9449	0.5190	-2085.3134	(269)
Total CO2, kg/year			13838.0150	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.5600	(273)

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

DER		22.5600	ZC1
Total Floor Area	TFA	613.4200	
Assumed number of occupants	N	3.5394	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		6.5702	ZC2
CO2 emissions from cooking, equation (L16)		0.3325	ZC3
Total CO2 emissions		29.4626	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		29.4626	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	613.4200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 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							4 * 10	=	40.0000	(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) =			40.0000 / (5) =	0.0203	(8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2703	(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) =	0.2298	(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	0.2929	0.2872	0.2815	0.2527	0.2470	0.2183	0.2183	0.2125	0.2298	0.2470	0.2585	0.2700	(22b)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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			4.5500	1.0000	4.5500			(26)
TER Semi-glazed door			2.7300	1.2000	3.2760			(26a)
TER Opening Type (Uw = 1.40)			90.2300	1.3258	119.6231			(27)
TER Room Window (Uw = 1.70)			7.9400	1.5918	12.6386			(27a)
Lower GF			132.7300	0.1300	17.2549			(28a)
Upper Ground Floor Exposed			9.7200	0.1300	1.2636			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	0.1800	3.7386			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.1800	5.3712			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	0.1800	9.9234			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.1800	9.1332			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	0.1800	8.2944			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.1800	10.6434			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.1800	2.5614			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	0.1800	2.3382			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	0.1800	4.1850			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	0.1800	7.7472			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.1800	9.9234			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.1800	7.5006			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.1800	6.7860			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	0.1800	0.3546			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	0.1800	0.6894			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.1300	1.2116			(30)
Loft Insulation	64.5400		64.5400	0.1300	8.3902			(30)
Ceiling Insulation	39.7300		39.7300	0.1300	5.1649			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.1300	0.5811			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1300	1.2948			(30)
Dormer Roofs Retained	6.1800		6.1800	0.1300	0.8034			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		265.2422			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		43.8800	(36)
Total fabric heat loss	(33) + (36) =	309.1222	(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	352.9493	351.8661	350.8044	345.8175	344.8844	340.5410	340.5410	339.7366	342.2140	344.8844	346.7720	348.7453	(38)
Heat transfer coeff	662.0715	660.9883	659.9266	654.9397	654.0066	649.6632	649.6632	648.8588	651.3362	654.0066	655.8942	657.8675	(39)
Average = Sum(39)m / 12 =												654.9352	(39)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

HLP	1.0793	1.0775	1.0758	1.0677	1.0662	1.0591	1.0591	1.0578	1.0618	1.0662	1.0692	1.0725 (40)
HLP (average)												1.0677 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394 (42)
Average daily hot water use (litres/day)												118.2602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862 (44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270 (45)
Energy content (annual)										Total = Sum(45)m =		1860.6931 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240 (46)
Water storage loss:												
Store volume												570.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1502 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.7011 (55)
Total storage loss												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (56)
If cylinder contains dedicated solar storage												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (64)
								Total per year (kWh/year) = Sum(64)m =				2755.4849 (64)
Heat gains from water heating, kWh/month												
	124.9407	111.0139	118.6877	109.3063	109.2246	100.6251	99.5209	105.2333	103.8028	113.2018	116.0397	122.9168 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	63.0523	56.0025	45.5443	34.4800	25.7742	21.7596	23.5121	30.5619	41.0201	52.0844	60.7902	64.8047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969 (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)												
	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750 (71)
Water heating gains (Table 5)												
	167.9311	165.1993	159.5265	151.8143	146.8073	139.7571	133.7647	141.4426	144.1706	152.1529	161.1663	165.2107 (72)
Total internal gains												
	990.1988	987.4748	953.5589	896.9206	835.4141	779.4300	745.1811	752.8512	783.8223	840.7307	906.2436	959.2220 (73)

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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
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489 (74)
East	2.4300	19.6403	0.6300	0.7000	0.7700	14.5856 (76)
Southeast	28.4500	36.7938	0.6300	0.7000	0.7700	319.9110 (77)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508 (79)
West	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (80)
Northwest	33.0500	11.2829	0.6300	0.7000	0.7700	113.9635 (81)
Southwest	7.9400	37.0308	0.6300	0.7000	1.0000	116.6984 (82)

Solar gains	817.9869	1463.6396	2175.4806	2962.6021	3545.7260	3615.7134	3446.4604	2999.7026	2447.7447	1665.5831	992.8994	691.3418 (83)
Total gains	1808.1857	2451.1144	3129.0396	3859.5227	4381.1401	4395.1433	4191.6414	3752.5538	3231.5670	2506.3138	1899.1431	1650.5638 (84)

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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	64.3414	64.4468	64.5505	65.0420	65.1348	65.5703	65.5703	65.6516	65.4019	65.1348	64.9474	64.7526
alpha	5.2894	5.2965	5.3034	5.3361	5.3423	5.3714	5.3714	5.3768	5.3601	5.3423	5.3298	5.3168
util living area												
	0.9999	0.9997	0.9982	0.9888	0.9446	0.8187	0.6516	0.7335	0.9453	0.9969	0.9998	1.0000 (86)
MIT	19.5656	19.7291	19.9997	20.3614	20.6978	20.9129	20.9802	20.9638	20.7760	20.3310	19.8784	19.5400 (87)
Th 2	20.0178	20.0192	20.0206	20.0273	20.0286	20.0344	20.0344	20.0355	20.0321	20.0286	20.0260	20.0234 (88)
util rest of house												
	0.9999	0.9996	0.9975	0.9839	0.9183	0.7385	0.5237	0.6083	0.9075	0.9951	0.9997	1.0000 (89)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

MIT 2	18.0645	18.3050	18.7019	19.2327	19.7044	19.9695	20.0262	20.0181	19.8199	19.1923	18.5286	18.0311	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9963	0.9798	0.9140	0.7498	0.5488	0.6323	0.9063	0.9934	0.9996	0.9999	(94)
Useful gains	1807.9349	2449.3409	3117.4602	3781.5318	4004.1746	3295.5245	2300.3915	2372.6340	2928.6708	2489.6930	1898.3035	1650.4251	(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	9308.0370	9045.1860	8220.3408	6912.3026	5362.3565	3608.5785	2347.4353	2468.0012	3847.7573	5765.5119	7669.6141	9293.7209	(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	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating												29352.8343	(98)
Space heating per m2											(98) / (4) =	47.8511	(99)

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	31393.4057	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	5967.9957	4740.5433	4060.4740	2410.8610	1080.7351	0.0000	0.0000	0.0000	0.0000	2606.6409	4444.2178	6081.9381	(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													
Water heating requirement	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.9455	89.8874	89.7562	89.4105	88.3685	79.8000	79.8000	79.8000	79.8000	89.4509	89.8279	89.9671	(217)
Fuel for water heating, kWh/month	298.9700	264.0699	278.6482	252.0242	250.8173	249.6583	241.1774	262.7063	261.6345	261.1543	273.3973	292.1324	(219)
Water heating fuel used												3186.3900	(219)
Annual totals kWh/year													
Space heating fuel - main system												31393.4057	(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)												1113.5234	(232)
Total delivered energy for all uses												35768.3191	(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	31393.4057	0.2160	6780.9756	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3186.3900	0.2160	688.2602	(264)
Space and water heating			7469.2359	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1113.5234	0.5190	577.9186	(268)
Total CO2, kg/m2/year			8086.0795	(272)
Emissions per m2 for space and water heating			12.1764	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			0.9421	(272b)
Emissions per m2 for pumps and fans			0.0635	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.1764 * 1.55) + 0.9421 + 0.0635, rounded to 2 d.p.			19.8800	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	DP9X-BELS-2596	**Issued on Date**	19/11/2021
Assessment Reference	Green - Int. Gas & ASHP & PV	**Prop Type Ref**	House
Property	21, Belsize Park, Camden, London, NW3 4DU		

SAP Rating	68 D	**DER**	22.60	**TER**	13.18
Environmental	73 C	**% DER<TER**	-71.45		
CO_2 Emissions (t/year)	11.34	**DFEE**	123.54	**TFEE**	59.05
General Requirements Compliance	Fail	**% DFEE<TFEE**	-109.21		

Assessor Details	Mr. Malcolm Maclean, SRE Limited, Tel: 01730 710044, malcolm@sre.co.uk	**Assessor ID**	V497-0002
Client	DP9 Ltd, DP9X		

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 613 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 13.18 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.60 kgCO□/m²Fail
Excess emissions =9.42 kgCO□/m² (71.5%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)123.5 kWh/m²/yrFail
Excess energy =64.5 kWh/m²/yr (109.0%)
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.87 (max. 0.30)	2.50 (max. 0.70)	Fail
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.41 (max. 0.25)	0.41 (max. 0.70)	Fail
Roof	0.24 (max. 0.20)	0.68 (max. 0.35)	Fail
Openings	3.01 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15
---
3 Air permeability
Air permeability at 50 pascals: 15.00 (assumed) OK
---
4 Heating efficiency
Main heating system 1: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 14.0 kW PUZ-HWM140YHA

Main heating system 2: Boiler system - Mains gas
Data from database
Vaillant ecoFIT sustain 430 VU 306/6-3 OV (H-GB)

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage: Measured cylinder loss: 2.44 kWh/day
Permitted by DBSCG 4.26 OK
Primary pipework insulated: Yes OK
---
6 Controls
Space heating controls 1: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Not applicable
---
9 Summertime temperature
Overheating risk (South East England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.80 m², No overhang
Windows facing East: 2.43 m², No overhang
Windows facing South East: 28.45 m², No overhang
Windows facing South: 2.43 m², No overhang
Windows facing South West: 16.27 m², No overhang
Windows facing West: 3.80 m², No overhang
Windows facing North West: 33.05 m², No overhang
Air change rate: 1.00 ach
Blinds/curtains: Light-coloured curtain or roller blind, closed 10% of daylight hours
---
10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Photovoltaic array 6.10 kW

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 613.4200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 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							10 * 10 =	100.0000	(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) =	100.0000 / (5) =	0.0508	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8008	(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) =	0.6806	(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	0.8678	0.8508	0.8338	0.7487	0.7317	0.6466	0.6466	0.6296	0.6806	0.7317	0.7657	0.7998	(22b)
Effective ac	0.8766	0.8619	0.8476	0.7803	0.7677	0.7091	0.7091	0.6982	0.7316	0.7677	0.7932	0.8198	(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	
Retained Window (Uw = 4.80)			43.7200	4.0268	176.0537			(27)
New Window (Uw = 1.40)			29.5400	1.3258	39.1629			(27)
New Solid Door			2.0400	1.4000	2.8560			(26)
Half Glazed Door			2.7300	1.4000	3.8220			(26a)
Retained Glazed Door (Uw = 4.80)			4.9100	4.0268	19.7718			(27)
Retained Solid Door			2.5100	3.0000	7.5300			(26)
New Glazed Door (Uw = 1.40)			12.0600	1.3258	15.9886			(27)
New Rooflight (Uw = 1.40)			7.9400	1.3258	10.5265			(27a)
Lower GF			132.7300	0.4100	54.4193			(28a)
Upper Ground Floor Exposed			9.7200	0.3446	3.3492			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	1.7000	35.3090			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.2600	7.7584			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	1.7000	93.7210			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.2600	13.1924			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	1.7000	78.3360			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.2600	15.3738			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.2762	3.9297			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	1.7000	22.0830			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	1.7000	39.5250			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	1.7000	73.1680			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.2600	14.3338			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.2759	11.4952			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.2759	10.4000			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	2.5000	4.9250			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	2.5000	9.5750			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.6800	6.3376			(30)
Loft Insulation	64.5400		64.5400	0.1567	10.1123			(30)
Ceiling Insulation	39.7300		39.7300	0.1567	6.2250			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.6800	3.0396			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1800	1.7928			(30)
Dormer Roofs Retained	6.1800		6.1800	0.6800	4.2024			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		798.3149			(33)
Lower GF Party Wall			44.1100	0.0000	0.0000			(32)
Upper GF Party Wall			69.8400	0.0000	0.0000			(32)
1st Floor Party Wall			66.0300	0.0000	0.0000			(32)
2nd Floor Party Wall			58.7900	0.0000	0.0000			(32)
3rd Floor Party Wall			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)		131.6400	(36)
Total fabric heat loss	(33) + (36) =	929.9549	(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	569.8596	560.3536	551.0357	507.2701	499.0817	460.9633	460.9633	453.9044	475.6460	499.0817	515.6468	532.9648	(38)
Heat transfer coeff	1499.8145	1490.3084	1480.9906	1437.2250	1429.0366	1390.9182	1390.9182	1383.8592	1405.6008	1429.0366	1445.6016	1462.9196	(39)
Average = Sum(39)m / 12 =												1437.1858	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4450	2.4295	2.4143	2.3430	2.3296	2.2675	2.2675	2.2560	2.2914	2.3296	2.3566	2.3849	(40)
HLP (average)												2.3429	(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												3.5394	(42)
Average daily hot water use (litres/day)												118.2602	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862	(44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270	(45)
Energy content (annual)										Total = Sum(45)m =		1860.6931	(45)
Distribution loss (46)m = 0.15 x (45)m	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240	(46)
Water storage loss:													
Store volume												570.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.4400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3176	(55)
Total storage loss	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(56)
If cylinder contains dedicated solar storage	40.8456	36.8928	40.8456	39.5280	40.8456	39.5280	40.8456	40.8456	39.5280	40.8456	39.5280	40.8456	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
								Total per year (kWh/year) = Sum(64)m =				2615.5131	(64)
Heat gains from water heating, kWh/month	115.4303	102.4239	109.1773	100.1027	99.7142	91.4215	90.0105	95.7229	94.5992	103.6914	106.8361	113.4064	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3667	55.3935	45.0491	34.1050	25.4939	21.5230	23.2564	30.2296	40.5740	51.5181	60.1292	64.1001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	(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)	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	(71)
Water heating gains (Table 5)	155.1483	152.4165	146.7437	139.0315	134.0245	126.9743	120.9819	128.6598	131.3878	139.3701	148.3835	152.4279	(72)
Total internal gains	973.7304	971.0831	937.2809	880.7629	819.3510	763.4106	729.1426	736.7361	767.5934	824.3816	889.7998	942.7345	(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	
North	3.8000	10.6334	0.0000	0.7000	0.7700	0.0000	(74)
East	2.4300	19.6403	0.0000	0.7000	0.7700	0.0000	(76)
Southeast	28.4500	36.7938	0.0000	0.7000	0.7700	0.0000	(77)
South	2.4300	46.7521	0.0000	0.7000	0.7700	0.0000	(78)
West	2.3200	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	4.2900	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508	(79)
Northwest	13.2700	11.2829	0.6300	0.7000	0.7700	45.7578	(81)
Southwest	7.9400	37.0308	0.7200	0.7000	1.0000	133.3696	(82)
West	1.4800	19.6403	0.0000	0.7000	0.7700	0.0000	(80)
Northwest	3.4300	11.2829	0.0000	0.7000	0.7700	0.0000	(81)
Northwest	12.0600	11.2829	0.7200	0.7000	0.7700	47.5262	(81)

Solar gains	409.6044	754.6477	1171.4093	1663.9795	2043.1660	2103.3826	1996.9651	1705.1947	1341.9484	872.6841	501.2810	343.4698	(83)
Total gains	1383.3348	1725.7308	2108.6902	2544.7424	2862.5170	2866.7932	2726.1077	2441.9308	2109.5418	1697.0657	1391.0808	1286.2043	(84)

7. Mean internal temperature (heating season)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	28.4026	28.5838	28.7636	29.6395	29.8093	30.6263	30.6263	30.7825	30.3063	29.8093	29.4677	29.1189	
alpha	2.8935	2.9056	2.9176	2.9760	2.9873	3.0418	3.0418	3.0522	3.0204	2.9873	2.9645	2.9413	
util living area	0.9998	0.9996	0.9990	0.9972	0.9920	0.9782	0.9507	0.9662	0.9922	0.9986	0.9997	0.9998	(86)
Tweekday	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
Tweekend	19.1049	19.2125	19.4419	19.7923	20.1486	20.4985	20.7098	20.6700	20.3768	19.9273	19.4824	19.1180	
24 / 16	9	8	9	0	0	0	0	0	0	0	4	9	
24 / 9	22	20	22	0	0	0	0	0	0	0	10	22	
16 / 9	0	0	0	10	0	0	0	0	0	0	12	0	
MIT	21.0000	21.0000	21.0000	19.4225	19.6860	20.2298	20.5522	20.4906	20.0269	19.3444	20.1906	21.0000	(87)
Th 2	19.0532	19.0624	19.0714	19.1145	19.1226	19.1610	19.1610	19.1681	19.1461	19.1226	19.1062	19.0891	(88)
util rest of house	0.9997	0.9994	0.9985	0.9955	0.9853	0.9490	0.8426	0.8906	0.9818	0.9976	0.9995	0.9998	(89)
Tweekday	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
Tweekend	15.2893	15.5376	16.0617	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	16.1711	15.3370	
MIT 2	19.0532	19.0624	19.0714	16.8768	17.6854	18.4859	18.9252	18.8591	18.2139	17.1871	17.5408	19.0891	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	19.4350	19.4424	19.4497	17.3761	18.0778	18.8279	19.2444	19.1791	18.5695	17.6102	18.0605	19.4639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4350	19.4424	19.4497	17.3761	18.0778	18.8279	19.2444	19.1791	18.5695	17.6102	18.0605	19.4639	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9997	0.9994	0.9986	0.9925	0.9782	0.9390	0.8517	0.8915	0.9751	0.9959	0.9993	0.9998	(94)
Useful gains	1382.9388	1724.7124	2105.6970	2525.6506	2800.1673	2692.0314	2321.9446	2177.0363	2057.0067	1690.0507	1390.1446	1285.9304	(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	22699.7378	21672.7018	19178.3971	12182.1164	9114.0675	5880.7304	3678.0989	3845.8951	6282.3361	10017.8761	15844.5701	22329.8871	(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	15859.6985	13405.0488	12702.0889	6952.6554	4697.5418	0.0000	0.0000	0.0000	0.0000	6195.9021	10407.1864	15656.7038	(98)
Space heating												85876.8256	(98)
Space heating per m2											(98) / (4) =	139.9968	(99)

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) 0.1150 (201)
Fraction of space heat from main system(s) 0.8850 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 0.8850 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 418.6615 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 100.0000 (208)
Space heating requirement 18153.3273 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	15859.6985	13405.0488	12702.0889	6952.6554	4697.5418	0.0000	0.0000	0.0000	0.0000	6195.9021	10407.1864	15656.7038	(98)
Space heating efficiency (main heating system 1)	418.6615	418.6615	418.6615	418.6615	418.6615	0.0000	0.0000	0.0000	0.0000	418.6615	418.6615	418.6615	(210)
Space heating fuel (main heating system)	3352.5494	2833.6660	2685.0687	1469.7077	993.0038	0.0000	0.0000	0.0000	0.0000	1309.7391	2199.9539	3309.6387	(211)
Space heating efficiency (main heating system 2)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating requirement	1823.8653	1541.5806	1460.7402	799.5554	540.2173	0.0000	0.0000	0.0000	0.0000	712.5287	1196.8264	1800.5209	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	257.0221	226.6279	238.2159	213.8315	209.7556	187.7228	180.5716	197.7517	197.2798	221.7169	234.0825	250.9350	(64)
Efficiency of water heater												168.7200	(216)
(217)m	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	168.7200	(217)
Fuel for water heating, kWh/month	152.3365	134.3219	141.1901	126.7375	124.3217	111.2629	107.0244	117.2070	116.9273	131.4112	138.7402	148.7287	(219)
Water heating fuel used												1550.2093	(219)
Annual totals kWh/year													
Space heating fuel - main system												18153.3273	(211)
Space heating fuel - secondary												9875.8349	(215)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												1101.4154	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 6.10 * 1029 * 0.80) =										-4017.9449		-4017.9449	(233)
Total delivered energy for all uses												26707.8420	(238)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	18153.3273	0.5190	9421.5769	(261)
Space heating - main system 2	0.0000	0.2160	0.0000	(262)
Space heating - secondary	9875.8349	0.5190	5125.5583	(263)
Water heating (other fuel)	1550.2093	0.5190	804.5586	(264)
Space and water heating			15351.6938	(265)
Pumps and fans	45.0000	0.5190	23.3550	(267)
Energy for lighting	1101.4154	0.5190	571.6346	(268)
Energy saving/generation technologies				
PV Unit	-4017.9449	0.5190	-2085.3134	(269)
Total CO2, kg/year			13861.3700	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.6000	(273)

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

DER		22.6000	ZC1
Total Floor Area	TFA	613.4200	
Assumed number of occupants	N	3.5394	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		6.5702	ZC2
CO2 emissions from cooking, equation (L16)		0.3325	ZC3
Total CO2 emissions		29.5026	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		29.5026	ZC8

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	142.4500 (1b)	x	2.4000 (2b)	=	341.8800	(1b) - (3b)
First floor	152.2600 (1c)	x	3.8500 (2c)	=	586.2010	(1c) - (3c)
Second floor	126.5000 (1d)	x	3.6500 (2d)	=	461.7250	(1d) - (3d)
Third floor	142.8100 (1e)	x	3.2500 (2e)	=	464.1325	(1e) - (3e)
Fourth floor	49.4000 (1f)	x	2.3500 (2f)	=	116.0900	(1f) - (3f)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	613.4200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1970.0285	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 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							4 * 10	=	40.0000	(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) =			40.0000 / (5) =	0.0203	(8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.2703	(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) =	0.2298	(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	0.2929	0.2872	0.2815	0.2527	0.2470	0.2183	0.2183	0.2125	0.2298	0.2470	0.2585	0.2700	(22b)
Effective ac	0.5429	0.5412	0.5396	0.5319	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5364	(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			4.5500	1.0000	4.5500			(26)
TER Semi-glazed door			2.7300	1.2000	3.2760			(26a)
TER Opening Type (Uw = 1.40)			90.2300	1.3258	119.6231			(27)
TER Room Window (Uw = 1.70)			7.9400	1.5918	12.6386			(27a)
Lower GF			132.7300	0.1300	17.2549			(28a)
Upper Ground Floor Exposed			9.7200	0.1300	1.2636			(28b)
Lower GF Retained S&C	26.7400	5.9700	20.7700	0.1800	3.7386			(29a)
Lower GF Brick Upgraded	36.2600	6.4200	29.8400	0.1800	5.3712			(29a)
Upper GF Retained S&C	67.2200	12.0900	55.1300	0.1800	9.9234			(29a)
Upper GF Brick Upgraded	59.1000	8.3600	50.7400	0.1800	9.1332			(29a)
1st Floor Retained S&C	56.8300	10.7500	46.0800	0.1800	8.2944			(29a)
1st Floor Brick Upgraded	74.6400	15.5100	59.1300	0.1800	10.6434			(29a)
Lower GF Boiler Insulation	14.2300		14.2300	0.1800	2.5614			(29a)
Lower GF Retained Brick	19.8000	6.8100	12.9900	0.1800	2.3382			(29a)
Upper GF Brick Retained	31.7600	8.5100	23.2500	0.1800	4.1850			(29a)
2nd Floor Retained S&C	50.6000	7.5600	43.0400	0.1800	7.7472			(29a)
2nd Floor Brick Upgraded	67.2800	12.1500	55.1300	0.1800	9.9234			(29a)
3rd Floor Dwarf Wall	41.6700		41.6700	0.1800	7.5006			(29a)
3rd Floor Wall around Hall	37.7000		37.7000	0.1800	6.7860			(29a)
3rd Floor DW Upgraded	3.3700	1.4000	1.9700	0.1800	0.3546			(29a)
3rd Floor DW Retained	5.8100	1.9800	3.8300	0.1800	0.6894			(29a)
FR Bay Windows Retained	9.3200		9.3200	0.1300	1.2116			(30)
Loft Insulation	64.5400		64.5400	0.1300	8.3902			(30)
Ceiling Insulation	39.7300		39.7300	0.1300	5.1649			(30)
Rafter Insulation Cinema R	4.4700		4.4700	0.1300	0.5811			(30)
Rafter Insulation Hall	17.9000	7.9400	9.9600	0.1300	1.2948			(30)
Dormer Roofs Retained	6.1800		6.1800	0.1300	0.8034			(30)
Total net area of external elements Aum(A, m2)			877.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		265.2422			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		43.8800	(36)
Total fabric heat loss	(33) + (36) =	309.1222	(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	352.9493	351.8661	350.8044	345.8175	344.8844	340.5410	340.5410	339.7366	342.2140	344.8844	346.7720	348.7453	(38)
Heat transfer coeff	662.0715	660.9883	659.9266	654.9397	654.0066	649.6632	649.6632	648.8588	651.3362	654.0066	655.8942	657.8675	(39)
Average = Sum(39)m / 12 =												654.9352	(39)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

HLP	1.0793	1.0775	1.0758	1.0677	1.0662	1.0591	1.0591	1.0578	1.0618	1.0662	1.0692	1.0725 (40)
HLP (average)												1.0677 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.5394 (42)
Average daily hot water use (litres/day)												118.2602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	130.0862	125.3558	120.6254	115.8950	111.1646	106.4342	106.4342	111.1646	115.8950	120.6254	125.3558	130.0862 (44)
Energy conte	192.9141	168.7239	174.1079	151.7915	145.6476	125.6828	116.4636	133.6437	135.2398	157.6089	172.0425	186.8270 (45)
Energy content (annual)										Total = Sum(45)m =		1860.6931 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9371	25.3086	26.1162	22.7687	21.8471	18.8524	17.4695	20.0465	20.2860	23.6413	25.8064	28.0240 (46)
Water storage loss:												
Store volume												570.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												3.1502 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.7011 (55)
Total storage loss												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (56)
If cylinder contains dedicated solar storage												
	52.7336	47.6304	52.7336	51.0325	52.7336	51.0325	52.7336	52.7336	51.0325	52.7336	51.0325	52.7336 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230 (64)
								Total per year (kWh/year) = Sum(64)m =				2755.4849 (64)
Heat gains from water heating, kWh/month												
	124.9407	111.0139	118.6877	109.3063	109.2246	100.6251	99.5209	105.2333	103.8028	113.2018	116.0397	122.9168 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688	176.9688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	63.0523	56.0025	45.5443	34.4800	25.7742	21.7596	23.5121	30.5619	41.0201	52.0844	60.7902	64.8047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	680.1248	687.1824	669.3975	631.5357	583.7419	538.8226	508.8137	501.7561	519.5409	557.4027	605.1965	650.1159 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969	40.6969 (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)												
	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750	-141.5750 (71)
Water heating gains (Table 5)												
	167.9311	165.1993	159.5265	151.8143	146.8073	139.7571	133.7647	141.4426	144.1706	152.1529	161.1663	165.2107 (72)
Total internal gains												
	990.1988	987.4748	953.5589	896.9206	835.4141	779.4300	745.1811	752.8512	783.8223	840.7307	906.2436	959.2220 (73)

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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
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489 (74)
East	2.4300	19.6403	0.6300	0.7000	0.7700	14.5856 (76)
Southeast	28.4500	36.7938	0.6300	0.7000	0.7700	319.9110 (77)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)
Southwest	16.2700	36.7938	0.6300	0.7000	0.7700	182.9508 (79)
West	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (80)
Northwest	33.0500	11.2829	0.6300	0.7000	0.7700	113.9635 (81)
Southwest	7.9400	37.0308	0.6300	0.7000	1.0000	116.6984 (82)

Solar gains	817.9869	1463.6396	2175.4806	2962.6021	3545.7260	3615.7134	3446.4604	2999.7026	2447.7447	1665.5831	992.8994	691.3418 (83)
Total gains	1808.1857	2451.1144	3129.0396	3859.5227	4381.1401	4395.1433	4191.6414	3752.5538	3231.5670	2506.3138	1899.1431	1650.5638 (84)

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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	64.3414	64.4468	64.5505	65.0420	65.1348	65.5703	65.5703	65.6516	65.4019	65.1348	64.9474	64.7526
alpha	5.2894	5.2965	5.3034	5.3361	5.3423	5.3714	5.3714	5.3768	5.3601	5.3423	5.3298	5.3168
util living area												
	0.9999	0.9997	0.9982	0.9888	0.9446	0.8187	0.6516	0.7335	0.9453	0.9969	0.9998	1.0000 (86)
MIT	19.5656	19.7291	19.9997	20.3614	20.6978	20.9129	20.9802	20.9638	20.7760	20.3310	19.8784	19.5400 (87)
Th 2	20.0178	20.0192	20.0206	20.0273	20.0286	20.0344	20.0344	20.0355	20.0321	20.0286	20.0260	20.0234 (88)
util rest of house												
	0.9999	0.9996	0.9975	0.9839	0.9183	0.7385	0.5237	0.6083	0.9075	0.9951	0.9997	1.0000 (89)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

MIT 2	18.0645	18.3050	18.7019	19.2327	19.7044	19.9695	20.0262	20.0181	19.8199	19.1923	18.5286	18.0311	(90)
Living area fraction										fLA = Living area / (4) =		0.1961	(91)
MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3590	18.5843	18.9564	19.4541	19.8992	20.1545	20.2133	20.2036	20.0075	19.4157	18.7934	18.3270	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9963	0.9798	0.9140	0.7498	0.5488	0.6323	0.9063	0.9934	0.9996	0.9999	(94)
Useful gains	1807.9349	2449.3409	3117.4602	3781.5318	4004.1746	3295.5245	2300.3915	2372.6340	2928.6708	2489.6930	1898.3035	1650.4251	(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	9308.0370	9045.1860	8220.3408	6912.3026	5362.3565	3608.5785	2347.4353	2468.0012	3847.7573	5765.5119	7669.6141	9293.7209	(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	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating												29352.8343	(98)
Space heating per m2											(98) / (4) =	47.8511	(99)

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	31393.4057	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5580.0760	4432.4079	3796.5432	2254.1550	1010.4873	0.0000	0.0000	0.0000	0.0000	2437.2092	4155.3436	5686.6121	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	5967.9957	4740.5433	4060.4740	2410.8610	1080.7351	0.0000	0.0000	0.0000	0.0000	2606.6409	4444.2178	6081.9381	(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													
Water heating requirement	268.9101	237.3654	250.1039	225.3360	221.6436	199.2273	192.4596	209.6397	208.7843	233.6049	245.5870	262.8230	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.9455	89.8874	89.7562	89.4105	88.3685	79.8000	79.8000	79.8000	79.8000	89.4509	89.8279	89.9671	(217)
Fuel for water heating, kWh/month	298.9700	264.0699	278.6482	252.0242	250.8173	249.6583	241.1774	262.7063	261.6345	261.1543	273.3973	292.1324	(219)
Water heating fuel used												3186.3900	(219)
Annual totals kWh/year													
Space heating fuel - main system												31393.4057	(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)												1113.5234	(232)
Total delivered energy for all uses												35768.3191	(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	31393.4057	0.2160	6780.9756	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	3186.3900	0.2160	688.2602	(264)
Space and water heating			7469.2359	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	1113.5234	0.5190	577.9186	(268)
Total CO2, kg/m2/year			8086.0795	(272)
Emissions per m2 for space and water heating			12.1764	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			0.9421	(272b)
Emissions per m2 for pumps and fans			0.0635	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.1764 * 1.00) + 0.9421 + 0.0635, rounded to 2 d.p.			13.1800	(273)

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