5385

12th December 2016

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Dear Sir/Madam

44 Gloucester Avenue Block E Full Planning Application – Energy and Sustainability Measures

We write to inform you of the Energy and Sustainability measures which have been adopted within the proposed Block E, 44A Gloucester Avenue development, to meet the sustainability and energy requirements set by the London Borough of Camden (LBC).

Block E 44A Gloucester Avenue, is part of the wider 44 Gloucester Avenue (Application Ref. 2015/1243/P) development which was granted full planning permission by LBC, subject to S016 Agreement, on 30th November 2015.

The Permitted wider 44 Gloucester Avenue development comprises of:

"Demolition of existing buildings identified as Number 2 at the northwest corner of the site and Number 4 at the eastern corner of the site to provide a new ground plus 5 upper storey building along the north west part of the site and a ground plus 2 storey building at the eastern corner and refurbishment of existing building on site to create 40 residential units, employment floor area (Class B1a), car parking and landscaping within the courtyard with ancillary works."

The Permitted development includes the refurbishment of the existing Block E to provide a two storey residential dwelling. However, this proposal seeks permissions for;

- Extension at the rear of the property;
- Roof extension;
- Refurbishment and;
- Amended basement design to the basement approved under Ref: 2015/1243/P

The existing building at 44A Gloucester Avenue is a two storey, over basement, detached dwelling, facing onto Gloucester Avenue. It is built of stock brick, however the front elevation appears to have later been stuccoed and painted. The aesthetic of this building is completely different to the rest of the site, and the majority of the surrounding area.

As the proposed development is part of the wider 44 Gloucester Avenue development, all energy and sustainability methods and measures incorporated within the Permitted scheme have been incorporated into the proposed Block E design and construction.

Policy Requirements

This letter confirms the sustainability and energy measures adopted by the proposed development to address the policy requirements set at national, regional and local level, which are as follows:

- The National Planning Policy Framework, March 2012
- The Building Regulations, Approved Document Part L2A and L2B, 2013 Editions
- London Borough of Camden Core Strategy, Adopted November 2010
- London Borough of Camden Development Policies, Adopted November 2010

Sustainability Measures

Sustainable development is the core principle underpinning planning, and has a key role to play in the creation of sustainable communities. In order to ensure the implementation of sustainable development 44 Gloucester Avenue development has introduced measures which satisfy the aims and objectives of LB Camden's strategic policies scheme, and the assessment criteria within the BREEAM Domestic Refurbishment scheme.

The measures have been approved by LBC, and are established within the Sustainability Statement prepared by XCO2 (October 2015) and the S106 Sustainability Plan prepared by Metropolis Green (October 2016), appended to this letter.

The table below shows the sustainability measures to be introduced into the proposed Block E development.

	Sustainability Commitments
Construction Phase Sustainability	A Construction Management Plan can be prepared to outline the management of the impacts arising from demolition and construction processes.
	A Site Waste Management Plan (SWMP) can be prepared to outline the best practice commitments and procedures for sorting, reusing, recycling and diverting waste from landfill, as required by CPG3 criteria.
	To prevent pollution, prevention measures and following best practice guidance will be adopted, as required by the Mayor's SPG.

	Sustainability Commitments
	The contractor will operate under the Considerate Constructors Scheme's Code of Considerate Practice (CCP) and will be required to achieve a score representing beyond best practice.
	Construction site impacts (energy and water consumption and the use of site timber) will be monitored and reported, to enable the site to be managed in a manner that mitigates environmental impacts.
Fabric and System Sustainability Measures	The London Plan's energy hierarchy has been applied to the development to ensure the improvement of Dwelling Emission Rate (DER) over Target Emission Rate (TER), when calculated according to Building Regulations. The design and specification is for high quality construction standards, high quality windows, energy efficient pumps, fans and ventilation equipment, high levels of insulation, individual gas fired boiler.
	To meet the requirements of Building Regulation's Part F ventilation requirement, all windows will be openable to provide a suitable level of purge ventilation.
	Internal water consumption will be reduced through specifying water efficient fixtures and fittings (WCs, taps, baths, showers, dishwashers and washing machines) throughout the development, in compliance with Policy DP22, DP23 and CPG3 and BREEAM's water standards. A water consumption rate of 105 litres or less/person/day will be targeted, in line with the Mayor's Priorities set out in his SPG.
	A water meter will be installed, as recommended in the Mayor's SPG water criteria.
	The materials used in the new building elements (roof, walls, floors, windows and floor finishes) will be specified to have a low environmental impact and high environmental performance, achieving an A+ - D rating in the BRE's Green Guide.
	At least 10% of the total value of materials used across the site will be derived from recycled and reused sources, required in Section 8 of CPG3.
	As required the Mayor's SPG, all timber and timber products will be sourced from an accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source, as set out in.
	To address surface water run-off, the risk of localised flooding caused by new development and wider issues of flood risk associated with climate change, it is noted that the site currently contains only existing buildings and hardstanding surfaces. The redevelopment proposals include green roofs on both the main building and ground floor reception extension as required by Policy DP22. As such, the development will efficiently manage its run-off, as required by Policy DP23 and the Mayor's SPG.
	The site is located in a zone with low annual probability of flooding, as noted by the Environment Agency flood risk map tool.
	All new insulation materials will be specified with a Global Warming Potential (GWP) or less than 2.5.
	Based on the layout and location of assessed rooms and the size and location of windows, it is considered that good daylighting will improve quality of life and reduce the need for energy to lighting within the dwelling.
	A home office will be provided, minimising the need to travel by car, required by Policy CS13.
	The site currently contains only existing buildings and hardstanding surfaces and is of low ecological value.
	Energy efficient internal and external lighting will be provided, to reduce the CO2 emissions associated with the development.
	To provide sustainable transport solutions, cycle storage spaces will be provided for the dwelling.
	Through the introduction of appropriate sound insulation, the performance standards set out in the Building Regulations Approved Document Part E

	Sustainability Commitments
	will be achieved. These targets will be evidenced in pre completion sound testing reports.
Management and Occupation Sustainability Measures	External waste, recycling and composting facilities will be provided for the development in dedicated bin stores at the ground floor level. Dedicated internal storage containers for recyclable waste and composting will be provided, in line with the Mayor's SPG.
	Meters will be provided that inform occupants of their energy consumption, enabling them to make decisions and manage the development in a way that reduces energy consumption, as recommended in the Mayor's SPG's energy metering requirements.
	Energy efficient white goods will be provided to the dwellings, thus reducing the CO_2 emissions from appliance use.
	A Home User Guide will be developed to provide the occupants of the dwelling with information relating to the operation and environmental performance of the building, and wider sustainability issues.

For more information on the sustainability measures adopted within Block E 44A Gloucester Avenue development please review the Sustainability Statement prepare by XCO2 and Sustainability Plan prepared by Metropolis Green for the 44 Gloucester Avenue development, appended to this letter.

Energy Measures

In line with the aims and objectives of the Council's strategic policies on energy contained within the Development Plan, the Permitted 44 Gloucester Avenue development incorporated all possible energy efficiency measures to achieve an overall 41.4% improvement in carbon emissions for the entire site against Part L 2013 Building Regulations.

The energy measures are shown in the table below and are discussed in detail within the revised Energy Strategy prepared by Metropolis Green (October 2016), appended to this letter.

	Consented 44 Gloucester Avenue Development
Energy Efficiency Measures	Air permeability - 10 m^3/hour/m^2@50Pa
	Space heating and DHW to the individual house to be provided via individual gas boiler with an efficiency of 89.5% SEDBUK 2009.
	Space heating to the residential apartments will be delivered via underfloor heating.
	Cooling to the residential units to be delivered via ceiling mounted 4 pipe fan coil units (FCUs).
	36Nos. PV panels at 0.333 kWp, facing south-southwest with total output of 11.9 kWp.
	Natural Ventilation
	100% low energy lighting to residential
	U-values: ▪ External Wall U-value -2.10(W/m².k) Retained/Upgraded (Residential) ▪ Ground floor / Exposed floor U-Value – 0.25 (W/m².k) Retained/Upgraded ▪ Roof U-value – 0.18(W/m².k) Retained/Upgraded ▪ Windows U-values – 2.0 (W/m².k) Retained/Upgraded
	Metering of the main M&E systems and renewable technologies

	A sub-metering system to allow monitoring of plant
	Achieving a 41.4% reduction

As mentioned previously, the proposed Block E will adopt the energy commitments of the permitted 44 Gloucester Avenue development, were feasible.

The energy efficiency measures specified in the following table, will be incorporated into the refurbished and new build elements of the proposed dwelling in Block E 44A Gloucester Avenue.

Specifications	Refurbished Elements	New Build Elements
FABRIC DETAILS		
External Wall U-value	2.10	0.20
Ground Floor / Exposed Floor U-value	0.25	NA
Roof U-value	NA	0.20
Windows U-values	2.00	2.00
Thermal bridging	Accredited construction details, Lintels with linear thermal conductivity (Psi) of 0.08 W/mK or lower (e.g. Keystone Hi-therm lintel or similar)	
Air Permeability	10.00	
M&E SYSTEMS		
Space Heating System (House)	Gas boiler, 89.5% SEDBUK 2009 efficiency, radiators, time and temperature zone control, weather compensator	
DHW System	Indirect cylinder 210 L, heat loss 1.9 kWh/24h	
Ventilation System	MVHR Vent Axia Kinetic Plus E	
Cooling	Individual VRF condenser unit (A+ rated)	
Water Consumption	105 litres per person per day or less	
Energy Efficient Lighting	100%	
Metering	Specified to all main M&E systems and renewable technologies	
Sub-metering	Specified to allow monitoring of plant	

Energy and carbon figures have been calculated using approved Standard Assessment Procedure (SAP) software, used to demonstrate compliance with Approved Documents Part L1B 2013 edition requirements.

Energy calculations undertaken for the proposed Block E application have shown that by incorporating the above energy efficiency measures and improvements to the existing and new build elements of building, a significant carbon reduction of 43.19% against Part L1B 2013 can be achieved. As such,

the proposed development is considered acceptable in line with the London Borough of Camden's Sustainability and Energy requirements. Please refer to the appended SAP worksheets for detailed results.

Yours sincerely
Metropolis PDG Ltd

Adam Duff
Sustainability Consultant

Rohan Shiram
Senior Energy Consultant

Miranda Pennington
Director

sAP WORKSHEETS

Project Information

Building type Semi-detached house

Reference

Date 9 December 2016

Project NW1

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	115.63	3.50	404.70	(3a)
First floor	61.66	3.00	184.98	(3b)
Second floor	61.66	3.00	184.98	(3c)
Third floor	61.66	3.69	227.53	(3d)
Total floor area	300.61			(4)
Dwelling volume (m^3)			1002.19	(5)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	0	x 10	0.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	12.00		(17)
Air permeability		0.60	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.51	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	
												52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18	
												13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.65	0.64	0.62	0.56	0.55	0.48	0.48	0.47	0.51	0.55	0.57	0.60	
												6.69 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	79.90	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

0.75	0.74	0.73	0.66	0.65	0.59	0.59	0.57	0.61	0.65	0.67	0.70	(25)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**1.620**	**1.80 (1.94)**	2.92			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**0.900**	**1.80 (1.94)**	1.62			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**1.656**	**1.80 (1.94)**	2.98			(27)
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Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**2.106**	**1.80 (1.94)**	3.79			(27)
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SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

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Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**2.106**	**1.80 (1.94)**	3.79			(27)
Pitched roofs insulated between joists 2013 Roof New, Block E - Basement			60.87	0.20	12.13	98.75	6011.05	(30)
Pitched roofs insulated between joists 2013 Roof New, Block E - SF			81.92	0.20	16.33	98.75	8089.70	(30)
Walls 2013 Block E New External Wall, Block E - SF			56.17	0.20	11.22	21.95	1232.94	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			63.20	2.07	130.77	8.75	552.98	(29)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Walls 2013 Block E New External Wall, Block E - SF			8.62	0.20	1.72	21.95	189.11	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			3.11	2.07	6.43	8.75	27.18	(29)
Walls 2013 External Wall Refurbished Resi, Block E - Basement			182.45	2.07	377.52	8.75	1596.43	(29)
Walls 2013 Block E New External Wall, Block E - SF			2.12	0.20	0.42	21.95	46.52	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			61.39	2.07	127.04	8.75	537.20	(29)
Walls 2013 Block E New External Wall, Block E - SF			20.12	0.20	4.02	21.95	441.55	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			26.97	2.07	55.80	8.75	235.98	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			4.91	2.07	10.16	8.75	42.95	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			26.97	2.07	55.80	8.75	235.98	(29)
Ground floors 2013 Exposed Floor Refurb Resi _ Comm, Block E - GF Living			6.90	0.25	1.75	85.00	586.41	(28)
Ground floors 2013 Exposed Floor New, Block E - Basement			115.63	0.10	11.62	85.00	9828.52	(28)
Internal floor 2013 Internal Ceiling/Floor, Block E - SF			61.66	0.00	0.00	95.00	5857.44	
Internal floor 2013 Internal Ceiling/Floor, Block E - GF Living			92.93	0.00	0.00	95.00	8828.60	
Internal floor 2013 Internal Ceiling/Floor, Block E - FF			123.31	0.00	0.00	95.00	11714.89	
Internal ceiling 2013 Internal Ceiling/Floor, Block E - Basement			54.76	0.00	0.00	95.00	5202.04	

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K
Internal ceiling			23.48	0.00	0.00	95.00	2230.89
2013 Internal Ceiling/Floor, Block E - GF Living							

Total area of external elements Sigma A, m²	750.60	(31)
Fabric heat loss, W/K	875.44	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	0.08	(36)
Total fabric heat loss	875.52	(37)

Ventilation heat loss calculated monthly

248.29	244.07	239.86	218.77	214.56	193.47	193.47	189.26	201.91	214.56	222.99	231.42	(38)

Heat transfer coefficient, W/K

1123.81	1119.59	1115.37	1094.29	1090.07	1068.99	1068.99	1064.77	1077.42	1090.07	1098.51	1106.94	
											1093.24	(39)

Heat loss parameter (HLP), W/m²K

3.74	3.72	3.71	3.64	3.63	3.56	3.56	3.54	3.58	3.63	3.65	3.68	
HLP (average)											3.64	(40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 3.13 (42)

Annual average hot water usage in litres per day Vd,average 114.32 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
125.75	121.18	116.60	112.03	107.46	102.89	102.89	107.46	112.03	116.60	121.18	125.75	(44)
Energy content of hot water used												
186.48	163.10	168.30	146.73	140.79	121.49	112.58	129.19	130.73	152.36	166.31	180.60	
Energy content (annual)											1798.67	(45)
Distribution loss												
27.97	24.46	25.25	22.01	21.12	18.22	16.89	19.38	19.61	22.85	24.95	27.09	(46)

Cylinder volume, l 210.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 1.94 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.05 (55)

Total storage loss												
32.48	29.33	32.48	31.43	32.48	31.43	32.48	32.48	31.43	32.48	31.43	32.48	(56)
Net storage loss												
32.48	29.33	32.48	31.43	32.48	31.43	32.48	32.48	31.43	32.48	31.43	32.48	(57)
Primary loss												
37.30	33.69	37.30	36.09	37.30	36.09	37.30	37.30	36.09	37.30	36.09	37.30	(59)
Total heat required for water heating calculated for each month												
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37	(62)
Output from water heater for each month, kWh/month												
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37	(64)
											2620.20	(64)
Heat gains from water heating, kWh/month												
117.82	104.65	111.78	102.81	102.63	94.41	93.25	98.77	97.49	106.48	109.32	115.87	(65)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
187.96	187.96	187.96	187.96	187.96	187.96	187.96	187.96	187.96	187.96	187.96	187.96	(66)
Lighting gains												
118.73	105.45	85.76	64.93	48.53	40.97	44.27	57.55	77.24	98.08	114.47	122.03	(67)
Appliances gains												
684.71	691.82	673.91	635.80	587.68	542.46	512.25	505.14	523.05	561.16	609.28	654.50	(68)
Cooking gains												
56.93	56.93	56.93	56.93	56.93	56.93	56.93	56.93	56.93	56.93	56.93	56.93	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	(71)
Water heating gains												
158.37	155.73	150.24	142.79	137.95	131.13	125.34	132.76	135.40	143.11	151.83	155.74	(72)
Total internal gains												
1084.39	1075.58	1032.50	966.09	896.74	837.15	804.44	818.03	858.27	924.94	998.16	1054.85	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106	10.63 0.64 x 0.80	0.77	7.9457
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.620	10.63 0.64 x 0.80	0.77	6.1121
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 0.900	10.63 0.64 x 0.80	0.77	3.3956
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656	10.63 0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656	10.63 0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656	10.63 0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656	10.63 0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106	10.63 0.64 x 0.80	0.77	7.9457
2013 External Window Refurb Resi _Comm, Block E - SF				

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - SF					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479	
2013 External Window Refurb Resi _Comm, Block E - SF					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - GF Living					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - GF Living					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - FF					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.620 10.63	0.64 x 0.80	0.77	6.1121	
2013 External Window Refurb Resi _Comm, Block E - FF					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - FF					
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457	
2013 External Window Refurb Resi _Comm, Block E - FF					
Total solar gains, January				110.43	(83-1)

Solar gains

110.43	211.03	358.59	575.98	775.90	830.63	775.50	615.26	431.14	251.20	136.22	92.06	(83)

Total gains

1194.82	1286.61	1391.09	1542.08	1672.65	1667.78	1579.94	1433.29	1289.41	1176.14	1134.38	1146.91	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.62	0.70	0.80 x 0.83	0.68
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 0.90	0.70	0.80 x 0.83	0.38
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.66	0.70	0.80 x 0.83	0.69
2013 External Window Refurb Resi _Comm, Block E - SF				

Lighting calculations

	Area	g	FF x Shading	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.66	0.70	0.80 x 0.83	0.69
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.66	0.70	0.80 x 0.83	0.69
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.66	0.70	0.80 x 0.83	0.69
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.66	0.70	0.80 x 0.83	0.69
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.62	0.70	0.80 x 0.83	0.68
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.11	0.70	0.80 x 0.83	0.88
2013 External Window Refurb Resi _Comm, Block E - FF				

GL = 12.24 / 300.61 = 0.041
C1 = 0.500
C2 = 1.115
EI = 839

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
18.58	18.65	18.72	19.08	19.15	19.53	19.53	19.61	19.38	19.15	19.00	18.86	
alpha												
2.24	2.24	2.25	2.27	2.28	2.30	2.30	2.31	2.29	2.28	2.27	2.26	
Utilisation factor for gains for living area												
1.00	1.00	1.00	0.99	0.99	0.97	0.94	0.96	0.99	0.99	1.00	1.00	(86)
Mean internal temperature in living area T1												
17.27	17.44	17.85	18.48	19.17	19.87	20.30	20.23	19.67	18.81	17.97	17.27	(87)
Temperature during heating periods in rest of dwelling Th2												
18.43	18.43	18.44	18.46	18.47	18.50	18.50	18.50	18.49	18.47	18.46	18.45	(88)
Utilisation factor for gains for rest of dwelling												
1.00	1.00	0.99	0.99	0.97	0.92	0.78	0.83	0.96	0.99	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
13.86	14.11	14.72	15.65	16.66	17.66	18.24	18.17	17.38	16.13	14.89	13.87	(90)

Living area fraction (61.66 / 300.61) 0.21 (91)

Mean internal temperature (for the whole dwelling)

14.56	14.80	15.36	16.23	17.17	18.11	18.67	18.59	17.85	16.68	15.52	14.57	(92)

Apply adjustment to the mean internal temperature, where appropriate

14.56	14.80	15.36	16.23	17.17	18.11	18.67	18.59	17.85	16.68	15.52	14.57	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.99	0.99	0.98	0.96	0.91	0.80	0.84	0.95	0.98	0.99	1.00	(94)
Useful gains												
1188.12	1277.52	1376.49	1512.55	1605.04	1514.21	1269.07	1209.21	1223.81	1157.20	1125.83	1141.20	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
11532.8	11080.3	9881.2	8022.9	5965.5	3756.5	2208.5	2335.5	4040.6	6629.7	9254.2	11475.6	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
7696.5	6587.5	6327.5	4687.4	3244.2	-	-	-	-	4071.6	5852.4	7688.8	

Total space heating requirement per year (kWh/year) (October to May) 46155.86 (98)

Space heating requirement per m² (kWh/m²/year) 153.54 (99)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperaturers												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	10048.5	7910.5	8092.3	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.18	0.21	0.19	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	1776.46	1668.32	1507.24	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	834.15	801.44	815.03	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	970.86	906.43	719.13	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1805.01	1707.87	1534.17	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	1094.16	116.51	50.79	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	20.56	29.42	20.03	-	-	-	-	(104)
Total											70.01	(104)
Cooled fraction											0.80	(105)
Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	4.11	5.88	4.01	-	-	-	-	
Space cooling (June to August)											14.00	(107)
Space cooling requirement per m² (kWh/m²/year)											0.05	(108)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.50%	(206)
Cooling system energy efficiency ratio	4.32%	(209)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
7696.5	6587.5	6327.5	4687.4	3244.2	-	-	-	-	4071.6	5852.4	7688.8	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
8504.4	7279.0	6991.7	5179.5	3584.7	-	-	-	-	4499.0	6466.8	8495.9	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37	(64)
Efficiency of water heater											79.80	(216)
90.11	90.10	90.06	89.97	89.77	79.80	79.80	79.80	79.80	89.88	90.04	90.12	(217)
Water heating fuel												
284.38	250.97	264.35	238.13	234.57	236.86	228.51	249.33	248.44	247.15	259.71	277.82	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	51000.96	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	3020.23	(219)
Space cooling fuel used	3.24	(221)

-	-	-	-	-	0.95	1.36	0.93	-	-	-	-	(221)

Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7420)	907.22	(230a)
central heating pump	30.00	(230c)
Total electricity for the above, kWh/year	937.22	(231)
Electricity for lighting (100.00% fixed LEL)	838.71	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	55800.36	(238)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	51000.955	3.480	1774.83	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating				
Water heating cost	3020.23	3.480	105.10	(247)
Space cooling	3.241	13.190	0.43	(248)
Mech vent fans cost	907.223	13.190	119.66	(249)
Pump/fan energy cost	30.000	13.190	3.96	(249)
Energy for lighting	838.712	13.190	110.63	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			2234.61	(255)

11a. SAP rating

Energy cost deflator	0.42	(256)
Energy cost factor (ECF)	2.72	(257)
SAP value	62.12	
SAP rating	**62**	(258)
SAP band	**D**	

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	51000.96	0.216	11016.21	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	3020.23	0.216	652.37	(264)
Space and water heating			11668.57	(265)
Space cooling	3.24	0.519	1.68	(266)
Electricity for pumps and fans	937.22	0.519	486.42	(267)
Electricity for lighting	838.71	0.519	435.29	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			12591.97	(272)

	kg/m²/year	
CO2 emissions per m²	**41.89**	(273)
EI value	51.66	(273a)
EI rating	**52**	(274)
EI band	**E**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9050) x (1 + (0.29 x 0.00)) = 3.8453, stars = 4
Main heating environmental impact	(0.2160 / 0.9050) x (1 + (0.29 x 0.00)) = 0.2387, stars = 4
Water heating energy efficiency	3.48 / 0.8660 = 4.0183, stars = 4
Water heating environmental impact	0.2160 / 0.8660 = 0.2494, stars = 4

Project Information

Building type Semi-detached house

Reference

Date 9 December 2016

Project NW1

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m^2)	**Av. Storey height (m)**	**Volume (m^3)**	
Ground floor (1)	115.63	3.50	404.70	(3a)
First floor	61.66	3.00	184.98	(3b)
Second floor	61.66	3.00	184.98	(3c)
Third floor	61.66	3.69	227.53	(3d)
Total floor area	300.61			(4)
Dwelling volume (m^3)			1002.19	(5)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	0	x 10	0.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.00	(8)
Pressure test, result q50	10.00		(17)
Air permeability		0.60	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.51	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.65	0.64	0.62	0.56	0.55	0.48	0.48	0.47	0.51	0.55	0.57	0.60

6.69 (22b)

air change rate through system	0.50	(23a)
efficiency in % allowing for in-use factor	79.90	(23c)

Ventilation : balanced whole house mechanical with heat recovery

Effective air change rate

0.75	0.74	0.73	0.66	0.65	0.59	0.59	0.57	0.61	0.65	0.67	0.70	(25)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**1.620**	**1.80 (1.94)**	2.92			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**0.900**	**1.80 (1.94)**	1.62			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**1.656**	**1.80 (1.94)**	2.98			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**2.106**	**1.80 (1.94)**	3.79			(27)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - SF			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - GF Living			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**1.620**	**1.80 (1.94)**	2.92			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**2.106**	**1.80 (1.94)**	3.79			(27)
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _ Comm, Block E - FF			**2.106**	**1.80 (1.94)**	3.79			(27)
Pitched roofs insulated between joists 2013 Roof New, Block E - Basement			60.87	0.20	12.13	98.75	6011.05	(30)
Pitched roofs insulated between joists 2013 Roof New, Block E - SF			81.92	0.20	16.33	98.75	8089.70	(30)
Walls 2013 Block E New External Wall, Block E - SF			56.17	0.20	11.22	21.95	1232.94	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			63.20	2.07	130.77	8.75	552.98	(29)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Walls 2013 Block E New External Wall, Block E - SF			8.62	0.20	1.72	21.95	189.11	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			3.11	2.07	6.43	8.75	27.18	(29)
Walls 2013 External Wall Refurbished Resi, Block E - Basement			182.45	2.07	377.52	8.75	1596.43	(29)
Walls 2013 Block E New External Wall, Block E - SF			2.12	0.20	0.42	21.95	46.52	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			61.39	2.07	127.04	8.75	537.20	(29)
Walls 2013 Block E New External Wall, Block E - SF			20.12	0.20	4.02	21.95	441.55	(29)
Walls 2013 External Wall Refurbished Resi, Block E - GF Living			26.97	2.07	55.80	8.75	235.98	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			4.91	2.07	10.16	8.75	42.95	(29)
Walls 2013 External Wall Refurbished Resi, Block E - FF			26.97	2.07	55.80	8.75	235.98	(29)
Ground floors 2013 Exposed Floor Refurb Resi _ Comm, Block E - GF Living			6.90	0.25	1.75	85.00	586.41	(28)
Ground floors 2013 Exposed Floor New, Block E - Basement			115.63	0.10	11.62	85.00	9828.52	(28)
Internal floor 2013 Internal Ceiling/Floor, Block E - SF			61.66	0.00	0.00	95.00	5857.44	
Internal floor 2013 Internal Ceiling/Floor, Block E - GF Living			92.93	0.00	0.00	95.00	8828.60	
Internal floor 2013 Internal Ceiling/Floor, Block E - FF			123.31	0.00	0.00	95.00	11714.89	
Internal ceiling 2013 Internal Ceiling/Floor, Block E - Basement			54.76	0.00	0.00	95.00	5202.04	

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K
Internal ceiling			23.48	0.00	0.00	95.00	2230.89
2013 Internal Ceiling/Floor, Block E - GF Living							

Total area of external elements Sigma A, m²	750.60	(31)
Fabric heat loss, W/K	875.44	(33)
Thermal mass parameter, kJ/m²K (user-specified TMP)	250.00	(35)
Effect of thermal bridges	0.08	(36)
Total fabric heat loss	875.52	(37)

Ventilation heat loss calculated monthly

248.29	244.07	239.86	218.77	214.56	193.47	193.47	189.26	201.91	214.56	222.99	231.42	(38)

Heat transfer coefficient, W/K

1123.81	1119.59	1115.37	1094.29	1090.07	1068.99	1068.99	1064.77	1077.42	1090.07	1098.51	1106.94	
											1093.24	(39)

Heat loss parameter (HLP), W/m²K

3.74	3.72	3.71	3.64	3.63	3.56	3.56	3.54	3.58	3.63	3.65	3.68	
HLP (average)											3.64	(40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 3.13 (42)

Annual average hot water usage in litres per day Vd,average 114.32 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month											
125.75	121.18	116.60	112.03	107.46	102.89	102.89	107.46	112.03	116.60	121.18	125.75 (44)
Energy content of hot water used											
186.48	163.10	168.30	146.73	140.79	121.49	112.58	129.19	130.73	152.36	166.31	180.60
Energy content (annual)											1798.67 (45)
Distribution loss											
27.97	24.46	25.25	22.01	21.12	18.22	16.89	19.38	19.61	22.85	24.95	27.09 (46)

Cylinder volume, l 210.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 1.94 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.05 (55)

Total storage loss											
32.48	29.33	32.48	31.43	32.48	31.43	32.48	32.48	31.43	32.48	31.43	32.48 (56)
Net storage loss											
32.48	29.33	32.48	31.43	32.48	31.43	32.48	32.48	31.43	32.48	31.43	32.48 (57)
Primary loss											
37.30	33.69	37.30	36.09	37.30	36.09	37.30	37.30	36.09	37.30	36.09	37.30 (59)
Total heat required for water heating calculated for each month											
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37 (62)
Output from water heater for each month, kWh/month											
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37 (64)
											2620.20 (64)
Heat gains from water heating, kWh/month											
117.82	104.65	111.78	102.81	102.63	94.41	93.25	98.77	97.49	106.48	109.32	115.87 (65)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
156.64	156.64	156.64	156.64	156.64	156.64	156.64	156.64	156.64	156.64	156.64	156.64	(66)
Lighting gains												
47.49	42.18	34.30	25.97	19.41	16.39	17.71	23.02	30.90	39.23	45.79	48.81	(67)
Appliances gains												
458.76	463.52	451.52	425.98	393.75	363.45	343.21	338.44	350.44	375.98	408.22	438.52	(68)
Cooking gains												
38.66	38.66	38.66	38.66	38.66	38.66	38.66	38.66	38.66	38.66	38.66	38.66	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	-125.31	(71)
Water heating gains												
158.37	155.73	150.24	142.79	137.95	131.13	125.34	132.76	135.40	143.11	151.83	155.74	(72)
Total internal gains												
737.61	734.42	709.06	667.73	624.10	583.96	559.24	567.22	589.73	631.31	678.82	716.06	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.620 10.63	0.64 x 0.80	0.77	6.1121
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 0.900 10.63	0.64 x 0.80	0.77	3.3956
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - GF Living				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - SF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - FF				
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North)	0.9 x 1.656 10.63	0.64 x 0.80	0.77	6.2479
2013 External Window Refurb Resi _Comm, Block E - SF				

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 1.620 10.63	0.64 x 0.80	0.77	6.1121
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.106 10.63	0.64 x 0.80	0.77	7.9457

Lighting calculations

	Area	g	FF x Shading	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 1.62	0.70	0.80 x 0.83	0.68
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 1.66	0.70	0.80 x 0.83	0.69
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 0.90	0.70	0.80 x 0.83	0.38
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 1.66	0.70	0.80 x 0.83	0.69
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 1.66	0.70	0.80 x 0.83	0.69
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 1.66	0.70	0.80 x 0.83	0.69

Lighting calculations

	Area	g	FF x Shading	
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 1.66	0.70	0.80 x 0.83	0.69
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - SF	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - GF Living	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 1.62	0.70	0.80 x 0.83	0.68
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.11	0.70	0.80 x 0.83	0.88
Window - Triple-glazed, air-filled, low-E, En=0.2, hard coat (North) 2013 External Window Refurb Resi _Comm, Block E - FF	0.9 x 2.11	0.70	0.80 x 0.83	0.88

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
18.58	18.65	18.72	19.08	19.15	19.53	19.53	19.61	19.38	19.15	19.00	18.86	
alpha												
2.24	2.24	2.25	2.27	2.28	2.30	2.30	2.31	2.29	2.28	2.27	2.26	
Utilisation factor for gains for living area												
1.00	1.00	1.00	1.00	0.99	0.98	0.96	0.97	0.99	1.00	1.00	1.00	(86)
Mean internal temperature in living area T1												
17.20	17.37	17.78	18.42	19.12	19.81	20.26	20.18	19.61	18.75	17.90	17.20	(87)
Temperature during heating periods in rest of dwelling Th2												
18.43	18.43	18.44	18.46	18.47	18.50	18.50	18.50	18.49	18.47	18.46	18.45	(88)
Utilisation factor for gains for rest of dwelling												
1.00	1.00	1.00	0.99	0.98	0.94	0.83	0.88	0.98	0.99	1.00	1.00	(89)
Mean internal temperature in the rest of dwelling T2												
13.76	14.01	14.62	15.56	16.58	17.60	18.20	18.12	17.30	16.04	14.79	13.76	(90)

Living area fraction (61.66 / 300.61) 0.21 (91)

Mean internal temperature (for the whole dwelling)

14.46	14.70	15.27	16.15	17.10	18.05	18.62	18.54	17.78	16.60	15.43	14.47	(92)

Apply adjustment to the mean internal temperature, where appropriate

14.46	14.70	15.27	16.15	17.10	18.05	18.62	18.54	17.78	16.60	15.43	14.47	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
1.00	1.00	0.99	0.99	0.97	0.93	0.84	0.88	0.97	0.99	1.00	1.00	(94)
Useful gains												
845.70	941.91	1061.09	1228.09	1359.03	1314.38	1123.77	1041.46	986.59	874.51	811.96	806.19	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
11420.3	10970.1	9777.4	7929.3	5883.4	3689.8	2163.9	2282.3	3961.9	6537.3	9152.1	11366.4	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
7867.5	6738.9	6484.9	4824.9	3366.2	-	-	-	-	4213.1	6004.9	7856.8	

Total space heating requirement per year (kWh/year) (October to May) 47357.27 (98)

Space heating requirement per m² (kWh/m²/year) 157.54 (99)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperaturers												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	10048.5	7910.5	8092.3	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.18	0.21	0.19	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	1776.46	1668.32	1507.24	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	834.15	801.44	815.03	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	970.86	906.43	719.13	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1805.01	1707.87	1534.17	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	1094.16	116.51	50.79	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	20.56	29.42	20.03	-	-	-	-	(104)
Total											70.01	(104)
Cooled fraction											0.80	(105)
Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	4.11	5.88	4.01	-	-	-	-	
Space cooling (June to August)											14.00	(107)
Space cooling requirement per m² (kWh/m²/year)											0.05	(108)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.50%	(206)
Cooling system energy efficiency ratio	4.32%	(209)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
7867.5	6738.9	6484.9	4824.9	3366.2	-	-	-	-	4213.1	6004.9	7856.8	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
8693.4	7446.3	7165.6	5331.4	3719.5	-	-	-	-	4655.4	6635.2	8681.6	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
256.26	226.12	238.08	214.25	210.57	189.02	182.35	198.96	198.25	222.13	233.83	250.37	(64)
Efficiency of water heater											79.80	(216)
90.12	90.11	90.07	89.99	89.79	79.80	79.80	79.80	79.80	89.90	90.05	90.13	(217)
Water heating fuel												
284.35	250.94	264.32	238.09	234.51	236.86	228.51	249.33	248.44	247.09	259.67	277.80	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	52328.48	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	3019.93	(219)
Space cooling fuel used	3.24	(221)

-	-	-	-	-	0.95	1.36	0.93	-	-	-	-	(221)

Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside (SFP=0.7420)	907.22	(230a)
central heating pump	30.00	(230c)
Total electricity for the above, kWh/year	937.22	(231)
Electricity for lighting (100.00% fixed LEL)	838.71	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	57127.59	(238)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	52328.48	0.216	11302.95	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	3019.93	0.216	652.31	(264)
Space and water heating			11955.26	(265)
Space cooling	3.24	0.519	1.68	(266)
Electricity for pumps and fans	937.22	0.519	486.42	(267)
Electricity for lighting	838.71	0.519	435.29	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			12878.65	(272)

	kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)	**42.84**	(273)

Project Information
Building type Semi-detached house

Reference
Date 9 December 2016
Project NW1

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.03b1, printed on 12/9/2016 at 4:44:00 PM

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 18.18	
Dwelling Carbon Dioxide Emission Rate	DER = 42.84	Fail
Excess emissions = 24.66kg/m² (135.7%)		

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 77.6	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 178.5	Fail

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	1.71 (max. 0.30)	2.07 (max. 0.70)	Fail
Floor	0.11 (max. 0.25)	0.25 (max. 0.70)	OK
Roof	0.20 (max. 0.20)	0.20 (max. 0.35)	OK
Openings	1.94 (max. 2.00)	1.94 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	10.00	OK
Maximum :	10.00	

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4 Heating efficiency
Main heating system:
Boiler and radiators, mains gas
Source of efficiency: from manufacturer

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:
None -

5 Cylinder insulation

Hot water storage			
	Manufacturer's declared cylinder loss factor (kWh/day)	1.94	
	Permitted by DBSCG	2.30	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

	Percentage of fixed lights with low-energy fittings: 100.0%	
	Minimum: 75.0%	OK

8 Mechanical ventilation

	Specific fan power : 0.53 Efficiency : 94.00	
	Maximum : 1.5W/(litre/sec) and efficiency not less than 70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):		OK
	Not significant	OK

Based on:

Thermal mass parameter :	250.00
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : North

Ventilation rate :	8.00
Blinds/curtains :	

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Ground floors U-value 0.10 W/m²K

Fixed cooling system

SAP 2012 Overheating Assessment for New dwelling as designed

Dwelling type	Semi-detached house
Number of storeys	4
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown (20-60 % sky blocked)
Overhangs	(as detailed below)
Thermal mass parameter	250.00 (user defined)
Night ventilation	No
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Summer ventilation heat loss coefficient	2645.78	(P1)
Transmission heat loss coefficient	875.52	(37)
Summer heat loss coefficient	3521.30	(P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None
North	-	1.00	None

Solar shading

Orientation	Z blinds	Solar access	Overhangs	Z summer		
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
North	1.00	0.90	1.000	0.900	(P8)	
Total						906

SAP 2012 Overheating Assessment for New dwelling as designed

Dwelling type	Semi-detached house
Number of storeys	4
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown (20-60 % sky blocked)
Overhangs	(as detailed below)
Thermal mass parameter	250.00 (user defined)
Night ventilation	No
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Summer ventilation heat loss coefficient	2645.78	(P1)
Transmission heat loss coefficient	875.52	(37)
Summer heat loss coefficient	3521.30	(P2)

Solar gains (calculation for July)

Orientation	Area	Flux	g & FF	Shading	Gains
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 1.62	74.68	0.64 x 0.80	0.90	50
North	0.9 x 0.90	74.68	0.64 x 0.80	0.90	28
North	0.9 x 1.66	74.68	0.64 x 0.80	0.90	51
North	0.9 x 1.66	74.68	0.64 x 0.80	0.90	51
North	0.9 x 1.66	74.68	0.64 x 0.80	0.90	51
North	0.9 x 1.66	74.68	0.64 x 0.80	0.90	51
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 1.66	74.68	0.64 x 0.80	0.90	51
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 1.62	74.68	0.64 x 0.80	0.90	50
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
North	0.9 x 2.11	74.68	0.64 x 0.80	0.90	65
Total					906

	Jun	Jul	Aug	
Solar gains	971	906	719	(P3)
Internal gains	834	801	815	
Total summer gains	1805	1708	1534	(P5)
Summer gain/loss ratio	0.51	0.49	0.44	(P6)
External temperature (Thames Valley)	15.4	17.8	17.8	
Thermal mass temperature increment (TMP=250.0)	0.25	0.25	0.25	
Threshold temperature	16.16	18.54	18.49	(P7)
Likelihood of high internal temperature	Not sig.	Not sig.	Not sig.	

Assessment of likelihood of high internal temperature **Not significant**

Predicted Energy Assessment

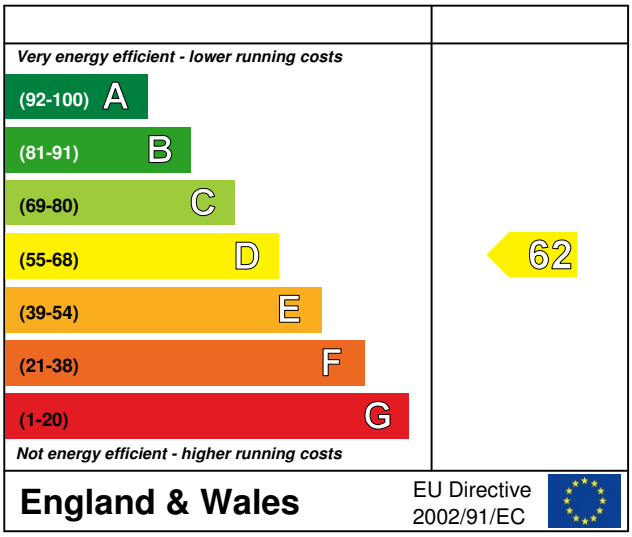
NW1

Dwelling type:	Semi-detached house
Date of assessment:	9 December 2016
Produced by	Metropolis Green (London)
Total floor area:	301 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

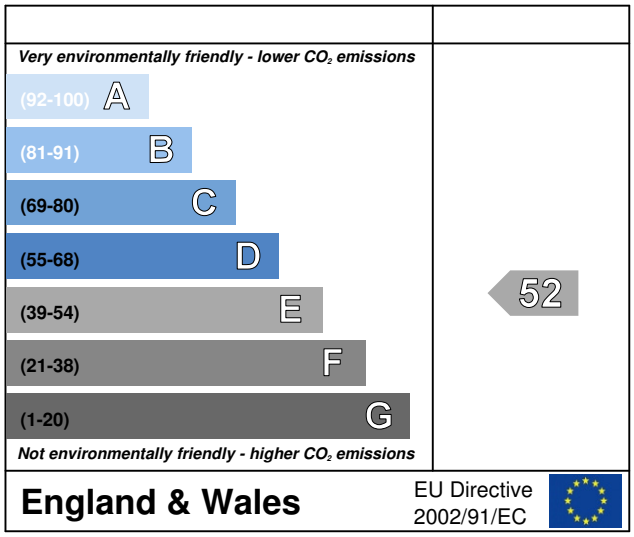
Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.