ENERGY & SUSTAINABILITY ASSESSMENT

ST JOHN'S STUDIO

PROPERTY ADDRESS

HARLEY ROAD,
LONDON,
NW3 3BY,

DATE

April 2022

PREPARED BY

EAL Consult

winner 2020 Home and Garden Awards

EAL Consult Best Energy Compliance Consultancy - London

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Contents

1. EXECUTIVE SUMMARY

This Sustainability statement has been prepared to support the planning application for the extension and alterations to St John's Studio in Harley Road , NW3 3BY. The strategy highlights how the proposed development will promote sustainability throught both design and operation and summarises the relevant regulatory and planning policies applicable and how the relevant policy targets will be addressed and achieved.

The strategy reponds to the UK Planning and regulatory framework, the National Planning Policy Framework 2021, the New London Plan 2021 and Camden Local Plan 2017.

In accordance with the Energy Hierarchy detailed within The New London Plan 2021, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of a 'Fabric First' principle, which will seek enhanced insulation standards and improved heating and lighting efficiencies in comparison to the standard requirements of Approved Document Part L1A 2013. Further carbon emission reduction can be achieved by using renewables (Air Source Heat Pumps).

Energy Effcicency & Carbon Reduction:

- Passive design principles including a high level of insulation and reduced air permeabilty to deliver Part L1A 2013 compliant Building in absence of renewable technologies. It will achieve **2.3%** reduction in carbon emissions over Part L1A baseline.

- Air Source Heat Pumps have been proposed for the specific scheme and will deliver a further **46.2%** reduction in regulated carbon emissions over Part L1A baseline when utilising the proposed carbon factor changes to building Regulations Part L.

Material and waste management:

- Minimising the use of virgin materials during construction by recycling and reusing where feasible.
- Low waste benchmark levels will be targeted during construction with requirements identifying that the diversion of waste from landfill is to be achieved by the contractor.

Recommendation and Results:

This report demonstrates that the proposed development by incorporating the measures above can achieve an average carbon emission reduction of **48.5% with the use of:**

- **Air Source Heat Pumps.**

The following tables demonstrate the carbon emissions and savings.

Table 1. Carbon Dioxide emissions after each stage of the Energy Hierarchy

	Regulated Carbon dioxide emissions (Tonnes CO2 per annum)	
	Regulated	Total
Building Regs Notional Development	6.19	7.42
After Energy demand Reduction	6.04	7.25
After Renewables	3.19	3.82

Table 2. Carbon Dioxide Savings from each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings (Tonnes CO_2)	% Reduction
Savings from energy efficiency measures	0.14	**2.3%**
Savings from Renewables	2.86	**46.2%**
Total savings	3	**48.5%**

2. INTRODUCTION

Site description

Built in the late 1990's, the house has had various additions over the years, including a rear extension, porch, balconettes, and cornicing to the windows, that in addition to the choice of brickwork laid in stretcher bond, has resulted in a discordant pastiche of the surrounding context. The existing building is in need of retrofitting to meet modern building standards and become a positive contributor to the Conservation area. In addition to re-ordering the interior, the project aims to provide a new, contemporary reading of the context retaining carbon extensive parts of the existing structure but re-forming the facade openings, adding a floor to part of the structure, extending to the rear, and refacing the house with an angled terracotta rainscreen cladding.

Methodology

This energy assessment outlines the energy demand from the development together with the associated CO_2 emissions, using the present Building Regulations Part L as a baseline. It demonstrates how the emissions from energy use in the development will be reduced through energy efficiency measures.

The proposed scheme is required to achieve carbon emission reduction principles in accordance with the UK Planning and regulatory framework,

The methodology employed to determine the potential CO_2 savings is in accordance with the three-step Energy Hierarchy.

- **Be Lean -** Improve the energy efficiency of the scheme;
- **Be Clean -** Supply as much of the remaining energy requirement with low carbon; technologies such as district heating if available or combined heat and power (CHP); and
- **Be Green -** Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.
- **Be Seen -** monitor, verify and report on post-construction energy performance

The government approved Standard Assessment Procedure (SAP) methodology software (2013) has been used to determine the CO_2 emissions and energy requirements. It compares CO_2 emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L1A 2013 (TER), a notional dwelling of the same size and shape. These calculations do not include emissions from cooking or appliances.

Opportunities for incorporating features into the development that contribute to the objectives of sustainable development were explored during the design process, to ensure that where possible, the proposals achieve best practice.

3. PLANNING POLICY CONTEXT

National Planning Policy Framework 2021 – emphasised the concept of sustainable development by encouraging local authorities to adopt proactive strategies to mitigate and adapt to climate change. It recommends the move to a low carbon future by:

- Avoiding increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Contributing to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
    - provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
    - consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
    - identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.

The London Plan 2021 provides the strategic framework for an integrated socio-economic, transportation and environmental development plan across the capital to 2050. The Plan seeks to ensure new developments are designed to enable the efficient use of energy and support the development of sustainable energy infrastructure to produce energy more efficiently. It sets out a range of policies that apply to new developments.

Policy SI 2 Minimising Greenhouse Gas Emissions:

A. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy: a) Be lean: use less energy and manage demand during operation, b) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly, c) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: 1) through a cash in lieu contribution to the borough's carbon offset fund, or 2) off-site provided that an alternative proposal is identified, and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.
F. Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

9.2.1 The Mayor is committed to London becoming a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent. London's homes and workplaces are responsible for producing approximately 78 per cent of its greenhouse gas emissions. If London is to achieve its objective of becoming a zero-carbon city by 2050, new development needs to meet the requirements of this policy. Development involving major refurbishment should also aim to meet this policy.

9.2.2 The energy hierarchy should inform the design, construction, and operation of new buildings. The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

Camden Local Plan 2017

Policy CC1 Climate change mitigation
The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.
We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

4. ENERGY STRATEGY

The Energy strategy for the proposed housing is based on the Building Regulations Part L1A; it adopts a set of principles to guide design and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. It seeks to incorporate energy efficiency through the approach detailed below.

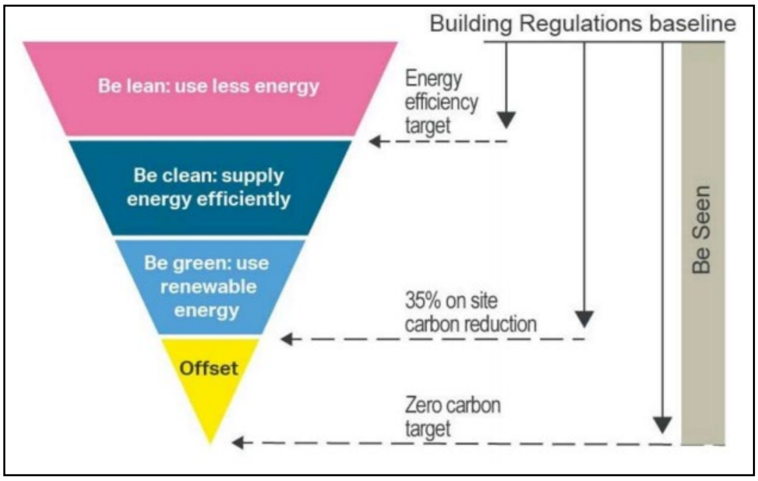

Figure 1. Energy Hierarchy

Be 'Lean' - Demand Reduction

The building fabric performance and engineering systems have been optimised in order to use less energy prior to the inclusion or consideration of Low and Zero Carbon (LZC) Technology.

Through passive design measures, efficient building fabric and engineering systems the building is estimated to achieve **2.3%** reduction in annual regulated CO_2 emissions over Part L1A benchmark, therefore demonstrating compliance with Building Regulations Through passive means alone without the utilisation of renewable technologies.

Passive Design Measures:

Fabric Performance - The fabric performance values aim to reduce unwanted heat loss and heat gains, whilst maintaining a comfortable internal environment.

Table 3. Fabric energy Efficiency Standard

Thermal element	Part L1A Minimum Standard
Wall	0.30W/m^{2}k
Roof	0.20 W/m^{2}k
Floor	0.25 W/m^{2}k
Glazing	1.2 W/m^{2}k
Doors	1.2 W/m^{2}k

The heat loss of different building elements is dependent upon their U –value. A building with low U values provides better levels of insulation and reduced heating demand.

The development will incorporate high levels of insulation and efficient glazing; thereby reduce demand for space heating. The table below shows the U values for the development and the associated improvements over Building Regulations.

Table 4. Energy Efficient design Specification

Element	Standard	Specification
Wall New **Wall Existing**	0.30 W/m²k	0.15W/m²k 0.25W/m²k
Floor	0.25W/ m²k	0.2W/m²k
Roof	0.2 W/ m²k	0.11 W/ m²k
Glazing	1.4 W/ m²k	1.1W/ m²k

Space Heating & Cooling - Space heating could be provided by underfloor heating for the dwelling;

Efficient Lighting and Controls - Throughout the development natural lighting will be optimised. The development will also incorporate low energy light fittings throughout. All light fittings will be specified as low energy lighting and will accommodate compact fluorescent (CFLs) or fluorescent luminaries only.

Ventilation - The use of natural ventilation is proposed for the dwelling;

Domestic hot water (DHW) system – domestic hot water is supplied for the dwelling; via the air source heat pump and cylinder.

Be 'Clean' – Supply Energy Efficiently

The Be Clean step of the energy hierarchy refers to the use of 'Clean energy supply'. This includes, but is not limited to, the use of Combined Heat and Power (CHP) and District Heat Networks. Policy TP1 seeks for new development to promote the use of CHP and district heating.

In light of the small scale nature of the proposed development, it is apparent that the use of CHP is also technically and financially unviable in this instance.

Be 'Green' - Renewable Energy

Once energy demand reduction measures have been applied, methods for generating low and zero carbon energy can be assessed. The following renewable technologies can be considered for the project: Biomass, Water source heat pump, air source heat pump, Wind energy and solar photovoltaic panels.

Table 5. Renewable Technologies Feasibility Table

Technology	Pros	Cons
Biomass Heating A biomass system designed for wood pellets, which have a high-energy content, would fuel this development. 	• Less volume of storage • Less maintenance and produce considerably less ash residue	• Nox Emissions which may impacts • High Costs • Not suitable for the project
Ground Source Heat Pump It circulates a mixture of water and antifreeze around a loop of pipe, called a ground loop, which is buried in the garden. Heat from the ground is absorbed into the fluid and passes through a heat exchanger into the heat pump 	• Use all through the year	• High Costs • Not suitable for this project
Air Source Heat Pump They are an efficient and environmentally-friendly way of heating using air drawn freely from the atmosphere. They operate rather like a refrigerator in reverse, absorbing heat from the air into a working fluid which is passed into a compressor where its temperature is increased before it is transferred into the heating and hot water circuits of the building	• Can generate less CO_2 than conventional heating systems. • Cheaper • Provides heating and hot water • Less maintenance • Can be used as air-conditioning in the summer	• Needs electricity • Can be noisy
Wind Turbines Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings. 	• Cheaper • Less CO_2	• Local wind speeds in the area is likely to be below the level generally required for investment in large wind turbines. • Noise and signal interference. • Detrimental aesthetic impact

Solar Photovoltaic Panels (PV) Photovoltaic panels extract the energy of the sun to generate electricity. They operate most efficiently when oriented to the south and are inclined to about 35 degrees. 	• Cheaper • Less CO_2 • No input power in order to generate electricity.	• Not enough space

Renewable Technologies Feasibility Review Conclusion

The renewable energy sources that have been reviewed for this project are Biomass Heating, Ground Source Heat Pump, Air Source Heat Pump, Domestic Wind Turbine and Solar Photovoltaic Panels (PV).

On review of the above technologies, it has been concluded that the use of an air source heat pump is to be incorporated in the design because it achieves a CO2 percentage reduction of **46.2%** contributing to an overall reduction of 48.5% in carbon emissions.

Be Seen: Post-Construction Monitoring

To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. To reduce the ‘performance gap’ the fourth stage, ‘be seen’, is a critical element in minimising greenhouse gas emissions and keeping running costs low.
Quality assurance mechanisms and commitments that will be considered as part of the energy strategy are:

- Gaining quality assurance accreditation (e.g. Heat Trust)
- Following quality standards (e.g. CIBSE Code of Practice)
- Transparent billing, including separation of the ongoing maintenance and capital replacement aspects of the standing charge
- Aftercare support (e.g. BREEAM Man 05 Aftercare)
- Heat tariffs options given to occupants
- Consumer choice for metering arrangements at no extra cost (e.g. Prepayment Meters (PPM)
- Thermal storage linked to pricing signals and renewable generation

5. SUSTAINABLE DESIGN

The proposed project incorporates sustainable design and construction measures capable of mitigating and adapting to climate change to meet future needs. This section details site-specific initiatives which demonstrate how the conversion helps to meet the sustainability objectives set out in the National Planning Framework 2021.

Energy Use and Pollution
The design of the development has taken into consideration day lighting to habitable spaces to improve the wellbeing of occupants. Good levels of daylight will offer occupants a pleasant and highly valued connection to the outdoors and plenty of natural light. It will also reduce the use of artificial lighting and therefore energy use. All light fittings will be specified as low energy lighting.
No external lighting is required. The location and orientation of windows help to create a design that avoids overheating in the summer.

Pollution: Air, Noise and Light
The layout of the development can provide good internal air quality for habitable areas but not too much so as to waste heat. The use of openable windows will create horizontal airflow. By achieving a good naturally ventilated building the energy demand for air conditioning and mechanical ventilation will thereby be eliminated within the development.

The development will not increase the air pollution of the area by reducing as a start, its energy consumption, which in turn will reduce emissions that lead to air pollution.
Other measures will include:

a. Use of eco-friendly building materials
b. Non-toxic paints
c. Installation of energy efficient appliances and devices
d. Use of renewable technologies

Light pollution can best be described as artificial light that is allowed to illuminate or intrude upon areas not intended to be lit. Light in the wrong place at the wrong time can be intrusive.
Intrusive light is over bright or poorly directed lights shining onto neighbouring property which affect the neighbours' right to enjoy their property. Therefore, the proposal will incorporate lighting measures in order to avoid causing a nuisance.

Water: Water Efficiency
In domestic and non-domestic buildings, the demand for water can be reduced as much as 50% using a variety of simple and innovative strategies that are integrated into the plumbing and mechanical systems. In order to reduce water consumption the proposed development will include efficient fixtures with low flow rates. Total internal water consumption will not exceed 105 litres/person/day.

Table 7. Water Fittings Standards

Schedule Appliance Water Consumption		
Appliance	**Flow rate or Capacity**	**Total Litres**
WC	Dual flush WC 4/2.6 litre	14.72
Basin	1.7 litres/min	5.98
Shower	8 litres/minute flow	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
W/machine	Default used	16.66
Dish Washer	Default used	3.90
		104.99

Pollution

All contractors would be required to sign up to the nationally recognised Considerate Constructors Scheme which requires, amongst other things that dust emissions, potential noise pollution, impacts on water quality and the potential for ground contamination are minimised during demolition and construction. The Contractor would also be obliged to adhere to a site specific Code of Construction Practice to reduce potential nuisance effects.

Waste

A space for reuse and recycling has been included at the ground floor unit for the residents exclusive use.

Flood Risk

The development site is located in a Low Flood Risk Area on the Environment Agency Flood Risk Map.

Biodiversity

The proposed development will incorporate measures to support and enhance the environment through consideration of the existing site, including measures to mitigate the impact of the development and enhance site biodiversity.

6. Reuse and optimising resource efficiency

The proposed development aims to optimise resource efficiency and use circular economy principles and section 9 of Energy efficiency CPG Jan 2021.

Reusing existing building

The proposed development seeks to retain existing elements of substantial embodied carbon such as the structural concrete floors, foundations and flank walls. This will minimise the need to construct new extensive structural elements of high embodied carbon. To achieve this a lightweight structure will be used in the additional floor and new front/rear facades to remain within the weight capacity of the existing structure.

The material demolished in the front and rear facades will be reused. More details are provided on table 8.

Development options

Table 8 presents the potential options explored to assess the condition of the existing building. The options were outlined in the Section 9.5 of Energy efficiency CPG Jan 2021. These are: i) Refit, ii) Refurbish, iii) Substantial refurbishment and extension, and iv) Reclaim and recycle.

Table 8. Development options

Option	Comment
Refit	The proposal looks to significantly improve the insulative capacity of the existing elements to be retained. This includes internally lining existing walls with insulation and upgrading windows. It will couple the improved insulation with a MVHR system to provide ventilation and reduce heat waste. It will also introduce an ASHP to provide a clean and efficient heat source. However, the proposal does not retain the existing structure as is and instead seeks to retain elements of high embodied carbon such as the concrete foundations, flank walls, and concrete beam and block floors.
Refurbish	The proposal looks to introduce an efficient and clean heat source whilst improving insulative qualities of the existing building. Doing so would significantly extend the life of the existing building. Adaptation measures include an adjustable solar shading sunscreen with the terracotta baguette façade and permeable paving throughout the exterior.
Substantial refurbishment and extension	The proposal seeks to demolish and reconstruct the front and rear facades to effectively accommodate an additional floor. In doing so the proposal will have the capacity to accommodate a growing extended family. However, whilst doing the above works existing elements of substantial embodied carbon will be retained such as the structural

	concrete floors, foundations, and flank walls. This minimises the need to construct new extensive structural elements of high embodied carbon. To achieve this a lightweight structure will be used in the additional floor and new front/rear facades to remain within the weight capacity of the existing structure. The material demolished in the front and rear facades will be reused in the existing building. This mainly consists of concrete blockwork and bricks. The bricks will be reused to extend the flank walls to accommodate the new front/rear façade. Concrete blockwork will be used to repair existing concrete beam and block floors.
Reclaim and recycle	The partial demolition of the building includes front/rear facades, windows, and the pitched roof timber structure and tile finish. The construction will seek to re-use the materials on site where possible. On site opportunities for re-use include the extension of flank brick walls, repairing existing beam and block floors, infill elements to the garden and permeable paving to exterior hard surfaces. When not possible to reuse on site material will be suitably recycled off site.

<u>Resource efficiency and Circular economy principles</u>

The proposed development seeks to incorporate measures to improve resource efficiency and reduce the waste through the various stages of the development process. These are summarised in the table below.

Table 9. Resource efficiency measures

Stage	Measures	Comment
Design	Energy efficiency building design	• The proposal aims to design highly energy efficient building by incorporation passive design measures and renewables (Air source heatpump) Refer to section 4 and 6 of this report
	Material efficiency	• The reuse of existing materials from the demolition of existing buildings (Brick walls, brickwork,) • Existing concrete floors repaired and retained • At least 20% of the total value of materials used should derive from recycled and reused content in the products and materials selected; • Steel will have a high recycled content;

Construction	Minimise the use of resources (energy, water, land)	• Monitor the water and energy consumption and report the equivalent carbon emissions.
	Resource efficiency	• Pre-demolition audit to be carried out and target benchmark of ≤ 11.1 tonnes of construction waste per 100m2;
	Minimise waste generation	• Reusable packing solutions with key product manufacturers will be explored at the earliest opportunity. Solutions may include flat pallets, bulk bags, steel stillages and returnable cable drums; • Pre-fabrication of materials/elements such as bathroom pods, pipework and
	Diversion of waste from landfill	• riser materials will be considered; • Construction waste – minimum 80% diversion from landfill rate; • Demolition waste – minimum 90% diversion from landfill rate;
	Sustainable sourcing	• All timber used in the development will come from a legal Source (FSC Scheme). • At least 80% of the building materials will be responsibly sourced and will use suppliers who can provide an EMS certificate or equivalent. • Materials rated with an A or B in the BRE Green Guide to Specification will be preferred.
Operation	Maintenance	• Implement a good maintenance/ repair strategy to maximise life of materials • Consider repair before replacement • When replacements required select high durability materials with low maintenance requirements
Deconstruction/end of life	Deconstruction	• Design for deconstruction and reuse of materials • Divert waste from landfill (via reuse, recycling or recovery) • Demolition and construction waste - 95% to reuse, recycling, recovery

7. CONCLUSION

The development has been designed to exceed Part L1A building regulations requirements. In line with the national and local policies, regulated CO_2 emissions from the development will be reduced by **48.5%** from the notional emissions once energy efficiency measures and lean measures are taken into account.

In order to achieve the required carbon emissions reduction, the report concludes and proposes the use of energy efficient measures outlined in the section 4 of this report.

An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives that are relevant to the area. Key sustainability initiatives in ecology, waste management, water, health and wellbeing, materials, pollution and Surface water management have been incorporated in the design of the proposed Development.

8. APPENDIX

I. SAP Calculations

Project Information

Building type Semi-detached house

Reference
Date 22 April 2022
Email: none Project The Studio
St. Johns Lodge
Harley Road
LONDON
NW3 3BY

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

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	146.83	3.31	486.01	(3a)
First floor	118.87	3.20	380.38	(3b)
Second floor	111.86	3.00	335.58	(3c)
Third floor	56.04	2.10	117.68	(3d)
	433.60			**(4)**
			1319.66	**(5)**

2. Ventilation rate

	main + seondary + other heating		m³ 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	7	x 10	70.00	(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	
		0.05	**(8)**
Pressure test, result q50	3.50		(17)
Air permeability		0.23	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.19	(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)

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

2.54 (22b)

Ventilation : natural ventilation, intermittent extract fans
Effective air change rate

0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53	(25)

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 - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR			**6.190**	**1.05 (1.10)**	6.52			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF			**17.245**	**1.05 (1.10)**	18.17			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF			**5.824**	**1.05 (1.10)**	6.14			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF			**15.584**	**1.05 (1.10)**	16.42			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF			**5.460**	**1.05 (1.10)**	5.75			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF			**14.610**	**1.05 (1.10)**	15.39			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF			**11.123**	**1.05 (1.10)**	11.72			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF			**12.620**	**1.05 (1.10)**	13.30			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF			**14.160**	**1.05 (1.10)**	14.92			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF			**12.480**	**1.05 (1.10)**	13.15			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT 3F			**14.510**	**1.10**	15.96			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE			**19.496**	**1.10**	21.45			(26)

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

Assumed occupancy, N 3.31 (42)

Annual average hot water usage in litres per day Vd,average 112.71 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month	123.98	119.47	114.96	110.45	105.95	101.44	101.44	105.95	110.45	114.96	119.47	123.98		(44)
Energy content of hot water used	183.86	160.80	165.93	144.67	138.81	119.78	111.00	127.37	128.89	150.21	163.97	178.06		
Energy content (annual)													1773.34	(45)
Distribution loss	27.58	24.12	24.89	21.70	20.82	17.97	16.65	19.11	19.33	22.53	24.59	26.71		(46)
Cylinder volume, l								300.00						(47)
Manufacturer's declared cylinder loss factor (kWh/day)								2.14						(48)
Temperature Factor								0.5400						(49)
Energy lost from hot water cylinder (kWh/day)													1.16	(55)
Total storage loss	35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82		(56)
Net storage loss	35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82		(57)
Primary loss	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Total heat required for water heating calculated for each month	242.94	214.17	225.02	201.85	197.90	176.96	170.08	186.46	186.07	209.30	221.15	237.14		(62)
Output from water heater for each month, kWh/month	242.94	214.17	225.02	201.85	197.90	176.96	170.08	186.46	186.07	209.30	221.15	237.14		(64)
													2469.03	(64)
Heat gains from water heating, kWh/month	108.40	96.16	102.44	93.85	93.42	85.57	84.17	89.62	88.60	97.21	100.26	106.47		(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	(66)
Lighting gains	124.63	110.70	90.03	68.16	50.95	43.01	46.48	60.41	81.08	102.95	120.16	128.10	(67)
Appliances gains	834.64	843.30	821.48	775.01	716.36	661.24	624.41	615.75	637.57	684.04	742.69	797.81	(68)
Cooking gains	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	(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)	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	(71)
Water heating gains	145.70	143.10	137.69	130.34	125.57	118.85	113.14	120.46	123.06	130.66	139.25	143.11	(72)
Total internal gains	1232.23	1224.35	1176.45	1100.76	1020.13	950.35	911.28	923.87	968.97	1044.91	1129.36	1196.27	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR	0.9 x 6.190 46.75	0.63 x 0.80	0.77	101.0728
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF	0.9 x 17.245 36.79	0.63 x 0.80	0.77	221.6165
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF	0.9 x 5.824 46.75	0.63 x 0.80	0.77	95.1012
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF	0.9 x 15.584 10.63	0.63 x 0.80	0.77	57.8781
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF	0.9 x 5.460 46.75	0.63 x 0.80	0.77	89.1574
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF	0.9 x 14.610 10.63	0.63 x 0.80	0.77	54.2608
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF	0.9 x 11.123 11.28	0.63 x 0.80	0.77	43.8337
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF	0.9 x 12.620 11.28	0.63 x 0.80	0.77	49.7331
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF	0.9 x 14.160 36.79	0.63 x 0.80	0.77	181.9709

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF	0.9 x 12.480 36.79	0.63 x 0.80	0.77	160.3812	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT 3F	0.9 x 14.510 36.79	0.63 x 0.80	0.77	186.4688	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE	0.9 x 19.496 10.63	0.63 x 0.80	0.77	72.4067	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR GF	0.9 x 23.766 11.28	0.63 x 0.80	0.77	93.6574	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR 3F	0.9 x 14.580 11.28	0.63 x 0.80	0.77	57.4571	
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF	0.9 x 10.130 26.00	0.63 x 0.80	1.00	119.4692	
Total solar gains, January				1584.46	(83-1)

Solar gains

1584.46	2844.4	4282.0	5965.4	7288.2	7503.5	7122.6	6093.9	4858.0	3248.5	1924.23	1338.93	(83)

Total gains

2816.7	4068.8	5458.4	7066.1	8308.4	8453.8	8033.8	7017.8	5826.9	4293.4	3053.6	2535.2	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR	0.9 x 6.19	0.80	1.00 x 0.83	3.70
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF	0.9 x 17.25	0.80	1.00 x 0.83	10.31
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF	0.9 x 5.82	0.80	1.00 x 0.83	3.48
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF	0.9 x 15.58	0.80	1.00 x 0.83	9.31
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF	0.9 x 5.46	0.80	1.00 x 0.83	3.26
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF	0.9 x 14.61	0.80	1.00 x 0.83	8.73
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF	0.9 x 11.12	0.80	1.00 x 0.83	6.65
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF	0.9 x 12.62	0.80	1.00 x 0.83	7.54

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF	0.9 x 14.16	0.80	1.00 x 0.83	8.46
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF	0.9 x 12.48	0.80	1.00 x 0.83	7.46
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF	0.9 x 10.13	0.80	0.80 x 1.00	5.83

GL = 74.74 / 433.60 = 0.172
C1 = 0.500
C2 = 0.960
El = 880

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
Heating system responsiveness 0.75

Row	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
tau	29.51	29.54	29.56	29.68	29.70	29.80	29.80	29.82	29.76	29.70	29.65	29.61	
alpha	2.97	2.97	2.97	2.98	2.98	2.99	2.99	2.99	2.98	2.98	2.98	2.97	
Utilisation factor for gains for living area	0.98	0.96	0.90	0.77	0.60	0.44	0.33	0.39	0.62	0.88	0.97	0.99	(86)
Mean internal temperature in living area T1	19.24	19.57	20.01	20.46	20.74	20.86	20.89	20.88	20.77	20.32	19.67	19.18	(87)
Temperature during heating periods in rest of dwelling Th2	19.73	19.73	19.73	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(88)
Utilisation factor for gains for rest of dwelling	0.98	0.95	0.88	0.73	0.54	0.36	0.24	0.29	0.54	0.84	0.96	0.99	(89)
Mean internal temperature in the rest of dwelling T2	17.41	17.88	18.49	19.10	19.45	19.57	19.60	19.60	19.50	18.95	18.03	17.31	(90)

Living area fraction (146.83 / 433.60) 0.34 (91)

Row	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Mean internal temperature (for the whole dwelling)	18.03	18.45	19.01	19.56	19.88	20.01	20.04	20.03	19.93	19.41	18.59	17.94	(92)
Apply adjustment to the mean internal temperature, where appropriate	18.03	18.45	19.01	19.56	19.88	20.01	20.04	20.03	19.93	19.41	18.59	17.94	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains	0.98	0.94	0.86	0.72	0.55	0.38	0.26	0.31	0.55	0.83	0.95	0.98	(94)
Useful gains	2746.5	3814.9	4710.5	5117.5	4552.3	3219.2	2100.4	2197.2	3225.7	3569.2	2909.6	2487.0	(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	8581.8	8464.2	7805.3	6628.5	5084.3	3349.9	2130.2	2248.7	3613.3	5475.3	7147.6	8564.0	(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	4341.5	3124.4	2302.6	1087.90	395.78	-	-	-	-	1418.09	3051.4	4521.3	

Total space heating requirement per year (kWh/year) (October to May) 20242.86 (98)
Space heating requirement per m² (kWh/m²/year) 46.69 (99)

8c. Space cooling requirement - not applicable

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	93.90%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
4341.5	3124.4	2302.6	1087.90	395.78	-	-	-	-	1418.09	3051.4	4521.3	(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)												
4623.5	3327.3	2452.2	1158.57	421.49	-	-	-	-	1510.21	3249.6	4815.0	(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												
242.94	214.17	225.02	201.85	197.90	176.96	170.08	186.46	186.07	209.30	221.15	237.14	(64)
Efficiency of water heater											80.20	(216)
90.26	90.13	89.83	89.04	87.03	80.20	80.20	80.20	80.20	89.37	90.09	90.30	(217)
Water heating fuel												
269.15	237.63	250.49	226.69	227.39	220.65	212.07	232.49	232.01	234.20	245.48	262.62	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	21557.89	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2850.86	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	880.44	(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	25364.18	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	21557.886	3.480	750.21	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2850.86	3.480	99.21	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	880.436	13.190	116.13	(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			1095.45	(255)

11a. SAP rating

	0.42	**(256)**
	0.96	**(257)**
SAP value	86.59	
	87	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	21557.89	0.216	4656.50	(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	2850.86	0.216	615.79	(264)
Space and water heating			5272.29	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	880.44	0.519	456.95	(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			5768.16	(272)

	kg/m²/year	
CO2 emissions per m²	**13.30**	(273)
EI value	83.85	(273a)
EI rating	**84**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9090) x (1 + (0.29 x 0.25)) = 4.1059, stars = 4
Main heating environmental impact	(0.2160 / 0.9090) x (1 + (0.29 x 0.25)) = 0.2549, stars = 4
Water heating energy efficiency	3.48 / 0.8640 = 4.0276, stars = 4
Water heating environmental impact	0.2160 / 0.8640 = 0.2500, stars = 4

Project Information

Building type	Semi-detached house		
Reference			
Date	22 April 2022		
Email:	none	Project	The Studio St. Johns Lodge Harley Road LONDON NW3 3BY

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 02/05/2022 at 10:05:19

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 = 14.27	
Dwelling Carbon Dioxide Emission Rate	DER = 13.94	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 62.9	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 55.8	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

Element	Average	Highest	
Wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Curtain Wall	0.15 (max. 2.20)	0.15 (max. 2.20)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	3.50	OK
Maximum :	10.00	

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4 Heating efficiency

Main heating system:
Boiler and underfloor heating, mains gas
Vaillant ecoFIT pure 630
Source of efficiency: from boiler database
Vaillant ecoFIT pure 630 VU 306/6-3 (H-GB)
Efficiency: 89.9% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:
None -

5 Cylinder insulation

Hot water storage			
	Manufacturer's declared cylinder loss factor (kWh/day)	2.14	
	Permitted by DBSCG	2.86	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

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):		OK
	Slight	OK
Based on:		
Thermal mass parameter :	153.18	
Overshading :	Average or unknown (20-60 % sky blocked)	
Orientation : SouthWest		
Ventilation rate :	8.00	
Blinds/curtains :		

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Ground floors U-value 0.12 W/m²K
Pitched roofs insulated between rafters U-value 0.11 W/m²K
Design air permeability 3.5 m³/h.m²

Project Information

Building type	Semi-detached house		
Reference			
Date	22 April 2022		
Email:	none	Project	The Studio St. Johns Lodge Harley Road LONDON NW3 3BY

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)	146.83	3.31	486.01	(3a)
First floor	118.87	3.20	380.38	(3b)
Second floor	111.86	3.00	335.58	(3c)
Third floor	56.04	2.10	117.68	(3d)
	433.60			**(4)**
			1319.66	**(5)**

2. Ventilation rate

	main + seondary + other heating		m³ 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	7	x 10	70.00	(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	
		0.05	**(8)**
Pressure test, result q50	3.50		(17)
Air permeability		0.23	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.19	(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)

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

2.54 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53	(25)

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 - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF			**14.610**	**1.05 (1.10)**	15.39			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF			**5.460**	**1.05 (1.10)**	5.75			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF			**15.584**	**1.05 (1.10)**	16.42			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF			**5.824**	**1.05 (1.10)**	6.14			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF			**17.245**	**1.05 (1.10)**	18.17			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR			**6.190**	**1.05 (1.10)**	6.52			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF			**12.480**	**1.05 (1.10)**	13.15			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF			**14.160**	**1.05 (1.10)**	14.92			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF			**12.620**	**1.05 (1.10)**	13.30			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF			**11.123**	**1.05 (1.10)**	11.72			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR 3F			**14.580**	**1.10**	16.04			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR GF			**23.766**	**1.10**	26.14			(26)

4. Water heating energy requirements

	kWh/year	
Assumed occupancy, N	3.31	(42)
Annual average hot water usage in litres per day Vd,average	112.71	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month	123.98	119.47	114.96	110.45	105.95	101.44	101.44	105.95	110.45	114.96	119.47	123.98		(44)
Energy content of hot water used	183.86	160.80	165.93	144.67	138.81	119.78	111.00	127.37	128.89	150.21	163.97	178.06		
Energy content (annual)													1773.34	(45)
Distribution loss	27.58	24.12	24.89	21.70	20.82	17.97	16.65	19.11	19.33	22.53	24.59	26.71		(46)
Cylinder volume, l								150.00						(47)
Manufacturer's declared cylinder loss factor (kWh/day)								2.00						(48)
Temperature Factor								0.5400						(49)
Energy lost from hot water cylinder (kWh/day)													1.08	(55)
Total storage loss	33.48	30.24	33.48	32.40	33.48	32.40	33.48	33.48	32.40	33.48	32.40	33.48		(56)
Net storage loss	33.48	30.24	33.48	32.40	33.48	32.40	33.48	33.48	32.40	33.48	32.40	33.48		(57)
Primary loss	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Total heat required for water heating calculated for each month	240.60	212.05	222.68	199.58	195.55	174.69	167.74	184.11	183.80	206.95	218.88	234.80		(62)
Output from water heater for each month, kWh/month	240.60	212.05	222.68	199.58	195.55	174.69	167.74	184.11	183.80	206.95	218.88	234.80		(64)
													2441.44	(64)
Heat gains from water heating, kWh/month	106.53	94.47	100.57	92.03	91.55	83.76	82.30	87.74	86.79	95.34	98.45	104.60		(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	198.34	(66)
Lighting gains	124.63	110.70	90.03	68.16	50.95	43.01	46.48	60.41	81.08	102.95	120.16	128.10	(67)
Appliances gains	834.64	843.30	821.48	775.01	716.36	661.24	624.41	615.75	637.57	684.04	742.69	797.81	(68)
Cooking gains	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	58.14	(69)
Pumps and fans gains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	-132.22	(71)
Water heating gains	143.18	140.58	135.17	127.82	123.05	116.33	110.62	117.94	120.54	128.14	136.73	140.59	(72)
Total internal gains	1226.71	1218.83	1170.93	1095.24	1014.61	944.83	905.76	918.35	963.45	1039.39	1123.84	1190.75	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF	0.9 x 14.610 10.63	0.63 x 0.80	0.77	54.2608
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF	0.9 x 5.460 46.75	0.63 x 0.80	0.77	89.1574
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF	0.9 x 15.584 10.63	0.63 x 0.80	0.77	57.8781
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF	0.9 x 5.824 46.75	0.63 x 0.80	0.77	95.1012
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF	0.9 x 17.245 36.79	0.63 x 0.80	0.77	221.6165
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR	0.9 x 6.190 46.75	0.63 x 0.80	0.77	101.0728
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF	0.9 x 12.480 36.79	0.63 x 0.80	0.77	160.3812
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF	0.9 x 14.160 36.79	0.63 x 0.80	0.77	181.9709
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF	0.9 x 12.620 11.28	0.63 x 0.80	0.77	49.7331

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF	0.9 x 11.123 11.28	0.63 x 0.80	0.77	43.8337	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR 3F	0.9 x 14.580 11.28	0.63 x 0.80	0.77	57.4571	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR GF	0.9 x 23.766 11.28	0.63 x 0.80	0.77	93.6574	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE	0.9 x 19.496 10.63	0.63 x 0.80	0.77	72.4067	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT 3F	0.9 x 14.510 36.79	0.63 x 0.80	0.77	186.4688	
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF	0.9 x 10.130 26.00	0.63 x 0.80	1.00	119.4692	
Total solar gains, January				1584.46	(83-1)

Solar gains

1584.46	2844.4	4282.0	5965.4	7288.2	7503.5	7122.6	6093.9	4858.0	3248.5	1924.23	1338.93	(83)

Total gains

2811.2	4063.3	5452.9	7060.6	8302.9	8448.3	8028.3	7012.3	5821.4	4287.9	3048.1	2529.7	(84)

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE SF	0.9 x 14.61	0.80	1.00 x 0.83	8.73
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE SF	0.9 x 5.46	0.80	1.00 x 0.83	3.26
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR-SIDE FF	0.9 x 15.58	0.80	1.00 x 0.83	9.31
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE FF	0.9 x 5.82	0.80	1.00 x 0.83	3.48
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT GF	0.9 x 17.25	0.80	1.00 x 0.83	10.31
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT-SIDE ENTRANCE DOOR	0.9 x 6.19	0.80	1.00 x 0.83	3.70
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT SF	0.9 x 12.48	0.80	1.00 x 0.83	7.46
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT FF	0.9 x 14.16	0.80	1.00 x 0.83	8.46

Lighting calculations

	Area	g	FF x Shading	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR FF	0.9 x 12.62	0.80	1.00 x 0.83	7.54
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) REAR SF	0.9 x 11.12	0.80	1.00 x 0.83	6.65
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF	0.9 x 10.13	0.80	0.80 x 1.00	5.83

GL = 74.74 / 433.60 = 0.172
C1 = 0.500
C2 = 0.960
El = 880

7. Mean internal temperature

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

Heating system responsiveness 0.75

Row	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
tau	29.51	29.54	29.56	29.68	29.70	29.80	29.80	29.82	29.76	29.70	29.65	29.61	
alpha	2.97	2.97	2.97	2.98	2.98	2.99	2.99	2.99	2.98	2.98	2.98	2.97	
Utilisation factor for gains for living area	0.99	0.96	0.90	0.77	0.60	0.44	0.33	0.39	0.62	0.88	0.97	0.99	(86)
Tweekday	18.99	19.37	19.87	20.38	20.70	20.84	20.88	20.87	20.74	20.22	19.48	18.92	
Tweekend	19.86	20.07	20.36	20.65	20.83	20.91	20.93	20.93	20.85	20.56	20.14	19.82	
24 instead of 16	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24 instead of 9	21.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16 instead of 9	1.00	20.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.00	
Mean internal temperature in living area T1	20.93	20.07	20.12	20.45	20.74	20.86	20.89	20.88	20.77	20.32	19.66	19.82	(87)
Temperature during heating periods in rest of dwelling Th2	19.73	19.73	19.73	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(88)
Utilisation factor for gains for rest of dwelling	0.98	0.95	0.88	0.73	0.54	0.36	0.24	0.29	0.54	0.84	0.96	0.99	(89)
Tweekday	17.41	17.88	18.49	19.10	19.45	19.57	19.60	19.60	19.50	18.95	18.03	17.31	
Tweekend	17.41	17.88	18.49	19.10	19.45	19.57	19.60	19.60	19.50	18.95	18.03	17.31	
Mean internal temperature in the rest of dwelling T2	19.58	17.88	18.49	19.10	19.45	19.57	19.60	19.60	19.50	18.95	18.03	17.31	(90)

Living area fraction (146.83 / 433.60) 0.34 (91)

Row	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ref
Mean internal temperature (for the whole dwelling)	20.04	18.62	19.04	19.56	19.88	20.01	20.04	20.03	19.93	19.41	18.58	18.16	(92)
Apply adjustment to the mean internal temperature, where appropriate	20.04	18.62	19.04	19.56	19.88	20.01	20.04	20.03	19.93	19.41	18.58	18.16	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains	0.98	0.94	0.86	0.72	0.55	0.38	0.26	0.31	0.55	0.83	0.95	0.98	(94)
Useful gains	2762.0	3817.6	4711.4	5115.1	4551.6	3218.9	2100.3	2197.1	3224.8	3566.3	2904.8	2483.8	(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	9837.4	8570.4	7828.7	6627.1	5084.3	3349.8	2130.2	2248.7	3613.1	5475.0	7144.1	8699.2	(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	5264.1	3193.9	2319.2	1088.63	396.32	-	-	-	-	1420.13	3052.3	4624.3	

Total space heating requirement per year (kWh/year) (October to May) 21358.92 (98)
Space heating requirement per m² (kWh/m²/year) 49.26 (99)

8c. Space cooling requirement - not applicable

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	504.98%		(206)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	5264.1	3193.9	2319.2	1088.63	396.32	-	-	-	-	1420.13	3052.3	4624.3	(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)	1042.43	632.48	459.27	215.58	78.48	-	-	-	-	281.23	604.44	915.74	(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)

<u>Water heating</u>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	240.60	212.05	222.68	199.58	195.55	174.69	167.74	184.11	183.80	206.95	218.88	234.80	(64)
Efficiency of water heater												313.50	(216)
	313.50	313.50	313.50	313.50	313.50	313.50	313.50	313.50	313.50	313.50	313.50	313.50	(217)
Water heating fuel	76.75	67.64	71.03	63.66	62.38	55.72	53.51	58.73	58.63	66.01	69.82	74.90	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4229.65	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	778.77	(219)
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	0.00	(231)
Electricity for lighting (100.00% fixed LEL)	880.44	(232)
Energy saving/generation technologies		
Electricity generated - µCHP/heat pump	0.00	(235)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	5888.86	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4229.654	13.190	557.89	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
High-rate percentage	100.000%			(243)
Low-rate percentage	0.000%			(244)
High-rate cost	778.77	13.190	102.72	(245)
Low-rate	0.00	13.190	0.00	(246)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	0.000	13.190	0.00	(249)
Energy for lighting	880.436	13.190	116.13	(250)
Additional standing charges			0.00	(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			776.74	(255)

11a. SAP rating

	0.42	**(256)**
	0.68	**(257)**
SAP value	90.49	
	90	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4229.65	0.519	2195.19	(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	778.77	0.519	404.18	(264)
Space and water heating			2599.37	(265)
Electricity for pumps and fans	0.00	0.519	0.00	(267)
Electricity for lighting	880.44	0.519	456.95	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.519	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			3056.32	(272)

	kg/m²/year	
CO2 emissions per m²	**7.05**	(273)
EI value	91.44	(273a)
EI rating	**91**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(13.19 / 5.0498) x (1 + (0.29 x 0.25)) = 2.8014, stars = 5
Main heating environmental impact	(0.5190 / 5.0498) x (1 + (0.29 x 0.25)) = 0.1102, stars = 5
Water heating energy efficiency	13.19 / 3.1350 = 4.2073, stars = 4
Water heating environmental impact	0.52 / + (0.00 x 0.52) = 0.1656, stars = 5

Project Information

Building type Semi-detached house

Reference
Date 22 April 2022
Email: none Project The Studio
St. Johns Lodge
Harley Road
LONDON
NW3 3BY

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assessed by program JPA Designer version 6.05.054, printed on 02/05/2022 at 10:05:19

New dwelling as designed

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1 TER and DER

Fuel for main heating system: Standard tariff (fuel factor = 1.55)

Target Carbon Dioxide Emission Rate	TER = 21.46	
Dwelling Carbon Dioxide Emission Rate	DER = 7.35	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 62.9	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 55.8	OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

Element	Average	Highest	
Wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Curtain Wall	0.15 (max. 2.20)	0.15 (max. 2.20)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	3.50	OK
Maximum :	10.00	

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4 Heating efficiency

Main heating system:
Air source heat pump, underfloor, electric
Grant AERONA3
Source of efficiency: from boiler database
Secondary heating system:
None -

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5 Cylinder insulation

Hot water storage No cylinder

6 Controls

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

Space heating controls	2207 Time and temperature zone control	OK
Hot water controls	No cylinder	
Boiler Interlock	No	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK
Slight OK

Based on:

Thermal mass parameter :	153.18
Overshading :	Average or unknown (20-60 % sky blocked)
Orientation : SouthWest	
Ventilation rate :	8.00
Blinds/curtains :	

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Ground floors U-value 0.12 W/m²K
Pitched roofs insulated between rafters U-value 0.11 W/m²K
Design air permeability 3.5 m³/h.m²