Sustainability Statement

J5652 9 John Street

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Revision: 02

Status: S2

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REVISION HISTORY

Revision	Status	Date	Author	Reviewer	Approver
00	S2	26.03.2024	AO	AE	AE
01	S2	12.04.2024	AO	AE	AE
02	S2	01.10.2024	AO	AE	AE

1. EXECUTIVE SUMMARY

This report describes the sustainability strategy for the proposed conversion of 9 John Street, London WC1N 2ES. The project consists of the refurbishment of an existing Grade II listed office building into a residential property, with an approximate existing area of 395m^2 and a proposed area of 409m^2. The proposed development will have a lower ground floor, ground floor and three storeys above.

The guidance and policies used in formulating this report are listed below and the resulting findings are compliant with the content of each:

- Camden Local Planning Documents
- Building Regulations Part L Volume 1

The energy strategy proposed aims to achieve the best outcome in terms of sustainability and energy efficiency, whilst adhering to the constraints imposed by the building's listed status. As demonstrated for the proposed energy hierarchy of the development, energy consumption and associated carbon emissions will be reduced, prioritising natural passive design measures over active measures to reduce energy.

In addition to measures reducing operational energy and associated carbon emissions, the embodied carbon content of materials used will be minimised as far as possible. It is the philosophy of the design team to design efficient, low carbon buildings.

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-3.2	-54%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**-3.2**	**-54%**

2. INTRODUCTION

This report describes the sustainability strategy for the proposed conversion of 9 John Street, London WC1N 2ES. The project consists of the refurbishment of an existing building of approximately 395m^2 GIA into a residential property of 409m^2 GIA. The proposed development will have a lower ground floor, ground floor and three storeys above. The building is Grade II listed, which brings limitations to the measures that can be applied.

This report sets out the sustainability strategy for the proposed development. In developing this strategy, local and regional planning policies have been addressed.

Due to its listed status and the development being below 500m^2, a full Energy Statement is not required. This sustainability strategy aims to achieve an improved building efficiency by making the most out of the feasible options despite the limitations brought upon by its listed status and building regulation requirements.

The proposed Sustainability Principles and Engineering Concepts incorporate the requirements and guidelines of the relevant British Standards and CIBSE Guides.

3. PLANNING POLICY BACKGROUND

The main planning documents which constitute the statutory development plan for Camden and form the basis on which decisions will be made for the proposed development are:

- Building Regulations Part L Volume 1
- Camden Planning Guidance – Energy Efficiency and Adaptation 2021, Local Plan 2017
- CIBSE Technical Manuals and Guides
- London Plan 2021

3.1. Building Regulation Compliance

Building regulations apply to this development. However, listed buildings are exempted from the energy requirements that have been set out in Approved Document Part L1B: Conservation of Fuel and Power in Existing Dwellings.

According to Part L, the property is classified as a material change of use, being converted from a commercial to residential space. Section 4.13 states that any existing thermal element being renovated should meet limiting standards of Table 4.3. If achieving the values of column (b) is not technically or functionally feasible with a payback of 15 years or less, the elements should be upgraded to as high degree as possible with a payback of 15 years (Section 4.13). Furthermore, current windows that have a U-value worse than 3.3 should be replaced by units with a performance as given in Table 4.2.

Table 4.2 Limiting U-values for new fabric elements in existing dwellings

Element type	Maximum U-value[1] W/(m²·K)
Roof[2]	0.15
Wall[2][3]	0.18
Floor[4][5]	0.18
Swimming pool basin[6]	0.25
Window[7][8][9]	1.4 or Window Energy Rating[10] Band B minimum
Rooflight[11][12]	2.2
Doors with >60% of internal face glazed[13]	1.4 or Doorset Energy Rating[10] Band C minimum
Other doors[13][14]	1.4 or Doorset Energy Rating[10] Band B minimum

Table 4.3 Limiting U-values for existing elements in existing dwellings

Element	U-value[1] W/(m²·K)	
	(a) Threshold	(b) Improved
Roof[2][3][4]	0.35	0.16
Wall – cavity insulation[2][5]	0.70	0.55
Wall – internal or external insulation[2][6]	0.70	0.30
Floor[7][8]	0.70	0.25

Section 4.10 also states that single-glazed units that cannot be replaced should also be supplemented with secondary glazing. In addition, area of openings in the dwelling should not exceed 25% of the total floor area.

Due to the building's Grade II listing, upgrades to the building fabric and glazing are not permitted and therefore making improvements would not be possible.

3.2. Camden Planning Guidance 2021

Camden Council strongly encourages refurbishment projects to be energy and resource efficient. Improving environmental sustainability of existing building stock is an important challenge to the borough. All proposed developments are required to minimise use of energy and other non-renewable resources, as well as to facilitate an increase in the use of low and zero carbon technologies to help reduce carbon dioxide (CO_2) emissions and air pollutants harmful to health.

The development is classified as a minor development and will therefore not need to meet the carbon reduction targets set out in the London Plan or the on-site renewable generation targets required for larger developments under the Camden planning guidance. However, performance against carbon reduction targets should be included in a Sustainability Statement based on SAP results. The unregulated consumption and associated emissions of the development should also be calculated.

All developments in Camden are expected to reduce carbon emissions through the application of the London Plan Energy Hierarchy:

- Use less energy (Be Lean);
- Supply energy efficiently (Be Clean)
- Use renewable energy (Be Green); and
- Monitor, verify and report on energy performance (Be Seen)

The Camden plan notes the importance of improving the existing building stock, and of reusing and repurposing existing buildings, but also the limitations on the improvements that can be made with heritage buildings. Guidelines on what improvements may be possible are included in the planning guidance and these are used as the basis of the measures set out in the ‘be lean’ improvements.

Planning guidance places importance on addressing future climate change while minimising the risk of overheating and providing comfortable environmental conditions. Measures to achieve these objectives are set out under the cooling hierarchy.

4. ENVIRONMENTAL DESIGN STRATEGY

It is proposed to use a number of energy efficiency measures to reduce the energy demand of the development in line with the energy hierarchy of Be Lean, Be Clean, Be Green and Be Seen.

4.1. Be Lean

The following design measures have been considered as part of the first step of the London Plan energy hierarchy, which is to reduce energy demand through passive design measures.

Thermal Envelope

Given the aim of maintaining the building's historical qualities, disturbances to existing fabric must be minimised. Therefore, U-value improvement for fabric to minimise heat losses has been assessed as not viable. Glazing on the front façade is proposed to have secondary glazing, whilst the remaining windows will be kept as single glazed.

Element	Building regulation Part L1 Limit U-Value [W/m^{2}K]	Proposed building U-value [W/m^{2}K]
External wall	0.3	1.5
External floor	0.25	1.1
Roof	0.16	2
Single Glazing	1.6	5.8
Secondary Glazing	1.6	3.3

Enhanced Airtightness and Good Detailing

Enhanced airtightness could reduce cold bridges and heat losses through fabric. All existing brickwork are to be surveyed, in which brickwork will undergo a careful repair and refurbishment strategy. In addition, internal walls will also be surveyed to determine their requirement for local repairs and reskimming.

The existing building was assumed to have an air tightness of 25 m^3/h/m at 50 Pa. For the proposed building, it is assumed to have an air tightness of 20 m^3/h/m^2 to account for repairs made.

Limit Overheating

Exposed thermal mass will be utilised wherever possible to create a more comfortable internal environment. Openable windows provide natural ventilation, which reduces the need for mechanical cooling. In addition, internal blinds will be used where applicable to prevent solar gains in the summer.

Daylight

The maximisation of daylight is one of the most important environmental factors for buildings. Artificial lighting contributes up to 25% of the energy costs of a typical building, despite operation largely within daylight hours. The internal layout is designed to maximise daylight while minimising summer solar gains.

Ventilation

Openable windows will allow for natural ventilation.

Heating

It is proposed for the existing gas combi boiler to be replaced by an electric boiler, to improve efficiency and reduce associated emissions. The new electric boiler has an efficiency of 100%. Existing radiators are to be replaced by cast iron radiators. Heating controls feature a programmer, TRVs and bypass, with a delayed start thermostat. For the water heating system, primary pipework is fully insulated.

Efficient Systems

Use of efficient systems and equipment with suitable time and temperature controls which have been appropriately commissioned such that the systems can be operated efficiently. Efficient components i.e. fans, pumps, refrigeration equipment have been appropriately sized to have no more capacity for demand and standby than is required for the task to operate at their optimum levels. Insulation of pipework, ductwork and hot water systems have been selected to be in line with the future highest standards.

Minimising Water Usage

The design shall incorporate water saving strategies, such as low flush toilets, and non-concussive spray taps in order to keep the maximum water usage to 105 litres/person per day (in accordance with Policy SI5 Water Infrastructure of London Plan 2021). Water consumption will be monitored. Other features shall include mains leak detection and sanitary shut-off.

Energy Efficient Lighting and Appliances

Provision of the required lighting levels whilst minimizing energy consumption by appropriate specification of light fittings and effective control of lighting systems by:

- Specifying 100% of the fixed internal light fittings as dedicated energy efficient fixtures.
- Having suitable energy consumption metering.
- Ensuring systems have been appropriately commissioned.
- Using lighting systems which are efficient and make use of daylight where possible/practical.
- Provision of low output or energy efficient external lighting.
- Avoiding the use of external lighting when communal spaces are unoccupied or during the day by means PIR, daylight sensors and time controls.

A lighting efficacy of average 95 lumens per circuit watt has been used as the design standard. This will be achieved including LED lighting sources throughout.

4.2. Be Clean

Due to the development location, it is not proposed to connect to an existing low carbon heat network.

4.3. Be Green

The viability of renewable systems such as Photovoltaic Panels, Solar Thermal, and Heat pumps has been assessed and all these systems have been considered not viable for this project due to the nature of the building, lack of space and its Grade II listing.

4.4. Be Seen

Sufficient information about the building, the fixed building services and their maintenance requirements will be provided to the user so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. The systems provided within the development will allow for monitoring to ensure they are run at optimum performance.

5. LOW AND ZERO CARBON TECHNOLOGIES

The following section provides a feasibility analysis of Low or Zero Carbon (LZC) technologies for use at 9 John Street. There are various options when it comes to LZC technology, but a combination of project constraints rules these out. The constraints are:

- Grade II Listed status
- Capital expenditure
- Return on Investment
- Carbon savings potential
- Clean energy output potential
- Spatial requirements
- Operation and maintenance requirements
- Planning requirements

Out of the technologies considered the following were discounted immediately for this site:

- Ground-source heat pumps; no space for ground-loop or boreholes
- Hydroelectric: there are no suitable water courses or hydroelectric plants near the site.
- Hydrogen: generation and storage are still in the experimental stage at this scale and no systems are currently commercially available.
- Biomass: planning energy and carbon targets rule out the use of a biomass boilers or alternatives (including CHP or biomass CHP). It is also considered not a viable solution due to issues with emissions and transport.
- CHP: as above.
- Biomass CHP: as above.
- Wind Turbines: wind turbine technology is not suitable for high density areas and those within close proximity to residential properties.

The feasibility study therefore reviewed the use of the following technologies to offset CO_2 emissions:

- Air Source Heat Pumps
- Photovoltaics
- Solar Thermal Panels

5.1. Feasibility of LZC Technologies

5.1.1. Air Source Heat Pump

An air to water heat pump uses the air as a heat sink and transfers the heat in the external space into the heating system. The temperature of the Low Temperature Hot Water (LTHW) providing the heating also affects the efficiency (coefficient of performance – COP) of the units, with the ideal flow and return temperatures being 45°C/35°C.

This limits the heating output that is possible using traditional radiator systems or underfloor heating systems. To ensure comfort levels in peak winter conditions would require significant fabric upgrades to match the heat pump output to the building heat loss. The listed nature of the building means that this will not possible.

Air-source heat pumps (ASHP) need to be located externally, away from noise sensitive receptors. There is no suitable location within the project site.

On the basis of space and technical limitations, such as the inability to upgrade building fabric, ASHPs are not considered appropriate for the project.

5.1.2. Solar Photovoltaic (PV) Panels and Detailed Information

Photovoltaic (PV) Panels are a renewable technology which will decrease the amount of electricity from the grid used in the building, particularly during the summer months when the solar irradiance is at its peak. Panels can be integrated within the building roof or stand alone; most efficient when south facing and angled at 30° from the horizontal. Such panels would reduce carbon emissions from the electrical uses within the building.

With limited roof space available, and the listing of the building, this technology is considered not appropriate for the project.

5.1.3. Solar Thermal Systems

Solar thermal panels would need to be roof-mounted or integrated into a new roof structure. Flat plate or evacuated tube type panels could be used. The solar thermal panels would be used to heat water which can be used for the domestic hot water supply to the dwelling.

With limited roof space available, and the listing of the building, this technology is considered not appropriate for the project.

6. COOLING HIERARCHY

The building will be designed in line with the cooling hierarchy outlined in Policy SI4 Managing heat risk in London Plan 2021 and referenced in the Camden planning guidance. The following measures will be followed at each stage of the hierarchy in order to reduce the demand for cooling.

6.1. Minimising Internal Heat Gains

Stage one of the Cooling Hierarchy is to minimise internal heat generation through energy efficient design.

Heat distribution infrastructure will be designed to minimise pipe lengths. This will be achieved at coordination stage, ensuring pipework is well insulated and that pipe configurations minimise heat loss. Good daylighting and high efficiency light fittings with simple controls will also help to reduce excess heat gains from artificial lighting. Low energy lighting will be specified throughout.

6.2. Reducing Heat Entering the Building

Incorporation of internal blinds will help to limit solar gains in the summer.

6.3. Passive Ventilation

Openable windows in all perimeter rooms will allow sufficient natural cross ventilation to prevent overheating.

6.4. Mechanical Ventilation

Mechanical extract ventilation can enhance the airflow through natural ventilation, however, due to the lack of grilles on the building and its listed status, mechanical ventilation is not proposed.

6.5. Active Cooling

It is not proposed to have any active cooling.

7. OVERHEATING RISK ANALYSIS

The measures described in the Cooling Hierarchy set out how overheating risk will be mitigated through passive design measures.

8. ENERGY ASSESSMENT

An energy assessment has been carried out to demonstrate how the targets for regulated CO_2 emissions reduction over and above 2021 Building Regulations will be met using the energy hierarchy outlined in Policy SI2 Minimising greenhouse gas emissions in the London Plan.

Energy consumption and associated carbon emissions have been calculated using approved SAP software and, using the GLA Carbon Emission Reporting Spreadsheet, a sitewide performance has been established. The unregulated energy demands of the development have been estimated based on CIBSE Guide F.

SAP software was used to output a Target Emissions Rate (TER) based on the notional building and a Dwelling Emissions Rate (DER) for the development.

See Appendix A for full SAP results.

8.1. SAP Model

Being a refurbishment project, the proposed development has been compared against the performance of the existing building with fabric and efficiencies as stipulated by the GLA Energy Assessment Guide Appendix 3. The SAP model for the proposed refurbishment was created with the aim to balance adherence with Building Regulations, Camden local planning guidance and preserving the building's historical significance. Therefore, most elements of the existing building were retained.

Baseline

The following fabric U-values have been assigned for the baseline, which the proposed development will be compared against. The values are based on values specified by the GLA Energy Assessment Guide Appendix 3.

Building Element	U-value (W/m^2K)
External Wall	0.3
Roof	0.16
Exposed Floor	0.25

	U-value (W/m^2K)	g-value
Glazing	1.60	0.63

The airtightness of the building is calculated via the SAP software. It is assumed to be a masonry building without a draught lobby and non-timber floors. No doors or windows are draught stripped. The building utilises an electric boiler with an efficiency of 100% as stated in Section 6 of Part L.

Proposed

Building Element	U-value (W/m^2K)
External Wall	1.5
Roof	2
Exposed Floor	1.1

	U-value (W/m^2K)	g-value
Existing Single Glazing	5.8	0.85
Secondary Glazing	3.3	0.6

As the existing building is to be retained to keep its historical qualities, the proposed values are based on it, with the assumption that it consists of uninsulated fabric. The front facade will have secondary glazed windows, whilst the remaining windows will be single-glazed. The proposed building's boiler is to be replaced by a new electric boiler with an efficiency of 100%. An air permeability of 20 m^3/hm^2 at 50Pa was assigned for the proposed building, accounting for repairs to the brickwork and internal walls.

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8.2. **Unregulated Energy**

The unregulated energy uses for the proposed development have been estimated by the methods and average values described in CIBSE Guide F and TM54: Evaluating operational energy performance of buildings at the design stage. The table below shows the electrical equipment that is used in the residential development. The number of items of equipment has been estimated based on the drawings issued by the Architect.

The power consumption of the equipment has been taken from the CIBSE Guide F 2012, paragraph 12.2. The installed capacity (nameplate rating) does not give an accurate estimate of energy use, so the 'average power consumption' as well as 'sleep mode' consumption have been used for the calculation.

The usage hours of the electrical equipment depend on the operating hours. The number of hours per day takes into account the intermittent usage and the variation of the operation from hour to hour and day to day. Instead of use a diversity factor multiplied by the power consumption, is going to be used an estimated number of hours. Overnight and weekend energy use can contribute significantly to small power energy and has been included. The equation below explains the calculation of the energy consumption.

Annual energy consumption (kWh) =

Number of equipment × {[average power consumption during operation × annual hours of operation] + [sleep mode consumption × (8760 - hours of operation)]}

EQUIPMENT	QUANTITY INSTALLED	AVERAGE POWER DEMAND	SLEEP-MODE POWER DEMAND	HOURS OF OPERATION/DAY	TOTAL HOURS/YEAR	ENERGY CONSUMPTION
		(W)	(W)	hours/day	hours/year	(kWh)
laptops	4	40	4	8	2080	359.52
screens	5	60	10	8	2080	690.80
multifunction devices	7	135	60	2	728	1,169.88
miscellaneous	5	15		8	2912	218.40
microwave	1	800		0.5	182	145.60
fridge	1	130	20	24	8760	1,138.80
cooking equipment	1	850		2	730	620.50
					TOT (kWh)	**4,343.50**
					Unregulated/m2 (kWh/m2/yr)	**11.64**
					kgCO2/yr	**603.75**
					kgCO2/m2/yr	**1.62**

8.3. Results

The proposed building, after following the implemented design measures, demonstrates an emission rate 54% greater than the Part L baseline scenario. Major improvements to the building fabric were restricted due to being a Grade II listed building, however, passive and active design measures were identified in section 4.1 to improve the building's energy performance as much as possible. These improvements would be more effectively represented through a comparison between the building's current state and the proposed design. Comparing against the GLA standard, which is based on a notional specification for existing buildings, does not accurately reflect the true build.

There is no specific degree of improvement over Part L to achieve as a minor development under Local and London Plan.

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-3.2	-54%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**-3.2**	**-54%**

9. WATER CONSUMPTION

The design shall incorporate water saving strategies, such as low flush toilets, and non-concussive spray taps to keep the water use as low as possible. Water consumption will be monitored. Other features shall include mains leak detection and sanitary shut-off.

10. MATERIALS

The development will maximise the use of recycled, responsibly sourced and low impact materials. As a refurbishment, the development will maintain the existing structure and constructions as much as possible, only making repairs or refurbishments if deemed necessary to improve air tightness. This will greatly reduce the embodied carbon of the development.

To promote resource efficiency via the effective management and reduction of construction waste. The proposed development will implement a Site Waste Management Plan (SWMP).

Demolition waste will be minimised, reused and recycled, where practicable.

These measures will aid in minimising waste to landfill, with the aim of diverting at least 85% of demolition and construction waste from landfill.

11. OPERATIONAL SUSTAINABILITY

As stated in Section 4.4 Be Seen, sufficient information about the building, the fixed building services and their maintenance requirements will be provided to the users so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. The systems provided within the development will allow for monitoring to ensure they are run at optimum performance via user-friendly controls, and metering.

High efficiency equipment and appliances will be installed throughout. Where white goods are to be provided fridges and freezers will be A+ rated under the EU Energy Efficiency Rating Scheme, washing machines and dishwashers will be A rated.

12. CONCLUSION

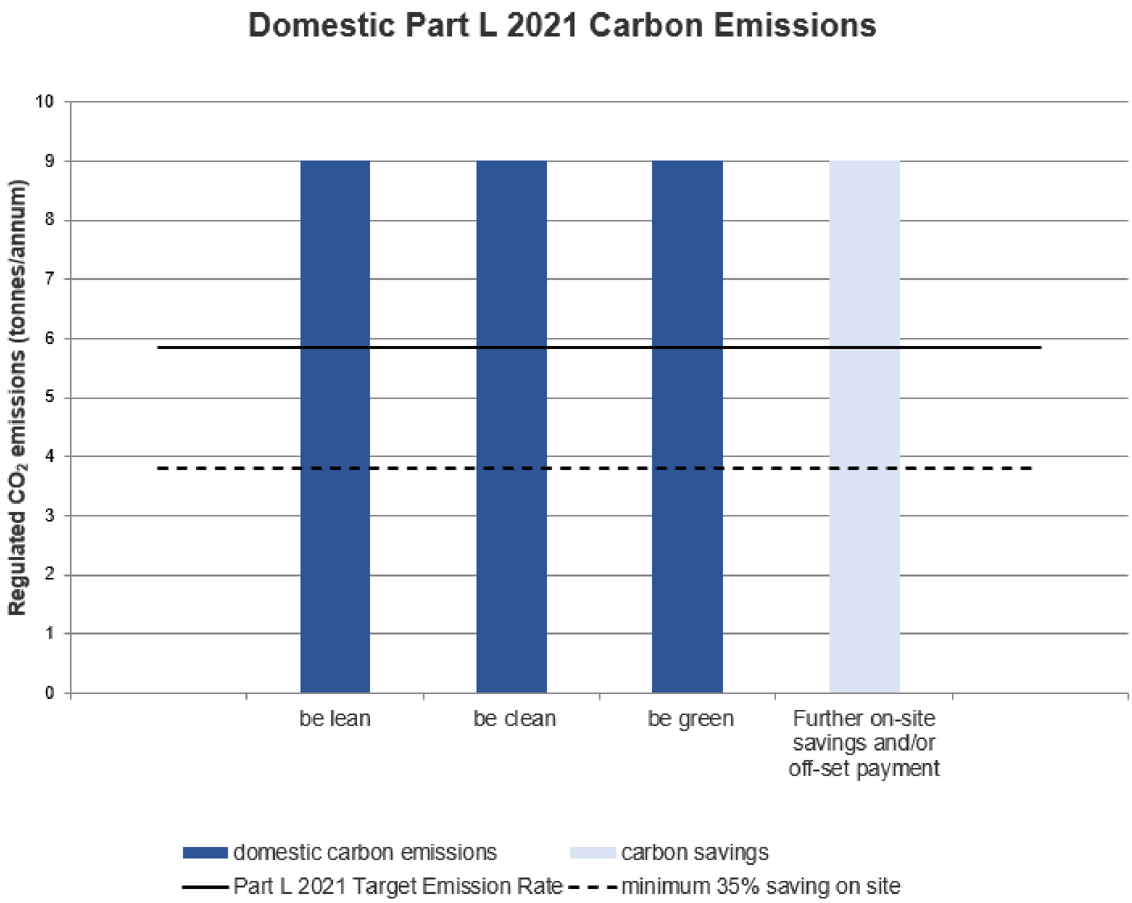
In line with the Local and London Plan, Planning Policy, and the project planning conditions, this Sustainability Statement outlines the Environmental Design Strategy for the development. Different passive measures and LZC technologies were considered for this refurbishment, and despite limitations that prevent fabric improvements and LZC technology use, other passive measures have been designated that aid with carbon reductions. The existing gas boiler is to be replaced by an electric boiler to improve operational and carbon efficiency. As the carbon factor of electricity decreases with the greening of the national grid, the environmental performance of the development will further improve.

Whilst improvements over Part L were constrained by the building's listed status, the Camden Local Plan highlights that many historic buildings have environmentally sustainable qualities which have directly contributed to their survival through the use of durable, natural and locally sourced materials, good room proportions, natural light and ventilation. Therefore, there is benefit to the reuse of this building and its existing elements. The measures for the Environmental Design Strategy were chosen to sensitively improve the energy efficiency of this existing building.

This report demonstrates how the energy and sustainability strategy of the development achieves compliance with Building Regulations, Local and London planning policy. Based on the constraints of the site, the report demonstrates how the most energy and carbon efficient design solution has been achieved. In addition to energy efficiency, the development's adaptability to climate change is demonstrated with the proposed steps of the cooling hierarchy.

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	5.8	0.6
After energy demand reduction (be lean)	9.0	0.6
After heat network connection (be clean)	9.0	0.6
After renewable energy (be green)	9.0	0.6

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-3.2	-54%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**-3.2**	**-54%**



APPENDIX A – SAP CALCULATIONS

Dwelling Reference: J5653

Dwelling Type: New Dwelling Design Stage

9 John Street
WC1N 2EB

1. Overall dwelling dimensions

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	86.5	(1a)	x	2.9	(2a)	=	250.85	(3a)
Ground Floor	75	(1b)	x	3.4	(2b)	=	255	(3b)
First Floor	74	(1c)	x	3.6	(2c)	=	266.4	(3c)
2nd Floor	73.6	(1d)	x	2.8	(2d)	=	206.08	(3d)
3rd Floor	63.4	(1e)	x	2.4	(2e)	=	152.16	(3e)
Total floor area TFA							372.5	(4)
Dwelling volume							1130.49	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80	=	0	(6a)
Open chimneys	0	x	20	=	0	(6b)
Chimneys / flues attached to closed fire	0	x	10	=	0	(6c)
Flues attached to solid fuel boiler	0	x	20	=	0	(6d)
Flues attached to other heater	0	x	35	=	0	(6e)
Number of blocked chimneys	0	x	20	=	0	(6f)
Number of intermittent extract fans	0	x	10	=	0	(7a)
Number of passive vents	0	x	10	=	0	(7b)
Number of flueless gas fires	0	x	40	=	0	(7c)

Air changes per hour

Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	5	5	(9)
Additional infiltration	0.4	0.4	(10)
Structural infiltration	0.35	0.35	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0.05	0.05	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0.25	0.25	(15)
Infiltration rate	1.05	1.05	(16)
Air permeability value, AP50, (m³/h/m²)	0	0	(17)
Air permeability value, AP4, (m³/h/m²)	0	0	(17a)
Air permeability value)	1.05	1.05	(18)
Number of sides on which dwelling is sheltered	0	0	(19)

Shelter factor													1	(20)
Infiltration rate incorporating shelter factor													1.05	(21)
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2														
	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor														
	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	1.34	1.31	1.29	1.16	1.13	1	1	0.97	1.05	1.13	1.18	1.23	13.78	(22b)
Calculate effective air change rate for the applicable case:														
													0	(23a)
													0	(23b)
													0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without heat recovery (MV)														
	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input ventilation from outside														
	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house positive input ventilation from loft														
	1.34	1.31	1.29	1.16	1.13	1	1	0.97	1.05	1.13	1.18	1.23		(24d)
Effective air change rate														
	1.34	1.31	1.29	1.16	1.13	1	1	0.97	1.05	1.13	1.18	1.23		(25)
Effective air change rate from PCDB:														
	1.34	1.31	1.29	1.16	1.13	1	1	0.97	1.05	1.13	1.18	1.23		(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	6.02		(26)
Windows	75.94		(27)
Roof window	0		(27a)
Basement floor	21.63	6487.5	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	15.96	10108	(29)
External wall	71.01	44973	(29a)

Roof	12.29	691.2	(30)
Total area of external elements ∑A, m²		508	(31)
Party Wall	0	34629	(32)
Party floor		0	(32a)
Party ceiling		0	(32b)
Internal wall **		0	(33c)
Internal floor		0	(32d)
Internal ceiling floor		0	(32e)
Fabric heat loss, W/K = ∑ (A x U)		202.84	(33)
Heat capacity Cm = ∑(A x k)		96888.7	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K		250	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K		101.6	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available		101.6	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ		304.44	(37)

Ventilation heat loss calculated monthly

499.44	489.64	479.85	430.89	421.09	372.13	372.13	362.49	391.71	421.09	440.68	460.26		(38)

Heat transfer coefficient, W/K

803.88	794.09	784.29	735.33	725.54	676.57	676.57	666.93	696.16	725.54	745.12	764.71		(39)

Heat loss parameter (HLP), W/m²K

2.16	2.13	2.11	1.97	1.95	1.82	1.82	1.79	1.87	1.95	2	2.05		(40)

Number of days in month (Table 1a)

31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Water heating energy requirement

Assumed occupancy, N	3.23	(42)

Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)

0	0	0	0	0	0	0	0	0	0	0	0		(42a)

Hot water usage in litres per day for baths, Vd,bath (from Appendix J)

90.36	89.02	87.13	83.64	81.04	78.14	76.58	78.46	80.5	83.59	87.15	90.05		(42b)

Hot water usage in litres per day for other uses, Vd,other (from Appendix J)

47.67	45.94	44.2	42.47	40.74	39	39	40.74	42.47	44.2	45.94	47.67		(42c)

Annual average hot water usage in litres per day Vd,average (from Appendix J)	127.11	(43)

Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)

138.03	134.95	131.33	126.11	121.77	117.14	115.58	119.19	122.97	127.8	133.09	137.72	1525.69	(44)

Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)

218.61	192.17	201.85	172.64	163.93	144.04	139.79	147.58	151.63	173.42	189.61	215.64	2110.91	(45)

Distribution loss (46) = 0.15 x (45)

32.79	28.83	30.28	25.9	24.59	21.61	20.97	22.14	22.74	26.01	28.44	32.35		(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	0	(47)

Water storage loss (or HIU loss)

a) If manufacturer's declared loss factor is known (kWh/day):	0	(48)
Temperature factor from Table 2b	0	(49)
Energy lost from water storage, kWh/day (48) x (49) =	300	(50)
b) If manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	0.74	(52)
Temperature factor from Table 2b	1	(53)
Energy lost from water storage, kWh/day	4.86	(54)
Enter (50) or (54) in (55)	4.86	(55)

Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

150.75	136.16	150.75	145.89	150.75	145.89	150.75	150.75	145.89	150.75	145.89	150.75	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m □ [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

150.75	136.16	150.75	145.89	150.75	145.89	150.75	150.75	145.89	150.75	145.89	150.75	(57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

369.36	328.33	352.6	318.53	314.68	289.93	290.54	298.33	297.52	324.17	335.49	366.39	3885.88	(62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0	0	0	0	0	0	0	0	0	0	0	0	(63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0	0	0	0	0	0	0	0	0	0	0	0	(63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

369.36	328.33	352.6	318.53	314.68	0	0	0	0	324.17	335.49	366.39	2709.56	(64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0	0	0	0	0	0	0	0	0	0	0	0	(64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

193.29	172.83	187.72	174.11	175.11	164.6	167.08	169.67	167.13	178.26	179.75	192.3	(65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

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

Metabolic gains (Table 5), watts

193.57	193.57	193.57	193.57	193.57	193.57	193.57	193.57	193.57	193.57	193.57	193.57	(66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5													
	60.42	53.67	43.65	33.04	24.7	20.85	22.53	29.29	39.31	49.91	58.26	62.1	(67)
Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5													
	768.11	776.08	756	713.24	659.26	608.53	574.64	566.67	586.75	629.51	683.49	734.22	(68)
Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5													
	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	(69)
Pumps and fans gains (Table 5a)													
	10	10	10	10	10	0	0	0	0	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5													
	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	(71)
Water heating gains (Table 5)													
	259.79	257.18	252.31	241.82	235.36	228.62	224.57	228.05	232.12	239.6	249.66	258.47	(72)
Total internal gains													
	1220.44	1219.04	1184.06	1120.21	1051.43	980.11	943.85	946.12	980.29	1051.14	1123.51	1186.9	(73)

6. Solar gains

Solar gains in watts, calculated for each month													
	506.82	890.15	1289.24	1716.94	2032.19	2065.48	1971.37	1728.84	1436.2	1003.03	611.95	430.57	(83)
Total gains – internal and solar (watts)													
	1727.26	2109.19	2473.3	2837.15	3083.62	3045.59	2915.22	2674.96	2416.49	2054.17	1735.46	1617.48	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)													21	(85)
Utilisation factor for gains for living area, □1,m (see Table 9a)														
	1	1	0.99	0.99	0.96	0.89	0.79	0.83	0.95	0.99	1	1		(86)
Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)														
	18.16	18.39	18.82	19.47	20.05	20.59	20.83	20.78	20.36	19.62	18.85	18.22		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
	19.23	19.25	19.26	19.35	19.37	19.46	19.46	19.48	19.42	19.37	19.33	19.3		(88)
Roof	Utilisation factor for gains for rest of dwelling, □2,m (see Table 9a)													
	1	1	0.99	0.98	0.93	0.81	0.6	0.67	0.91	0.99	1	1		(89)
Roof	Mean internal temperature in the rest of dwelling T2													
	16.73	16.98	17.41	18.12	18.69	19.25	19.41	19.41	19.04	18.28	17.49	16.84		(90)
Living area fraction													0.08	(91)
Mean internal temperature (for the whole dwelling)														
	16.84	17.09	17.52	18.22	18.8	19.35	19.52	19.51	19.14	18.38	17.6	16.95		(92)
Adjusted mean internal temperature:														
	16.59	16.84	17.27	17.97	18.55	19.1	19.27	19.26	18.89	18.13	17.35	16.7		(93)

8. Space heating requirement

Utilisation factor for gains,

1	0.99	0.99	0.97	0.91	0.78	0.57	0.64	0.88	0.98	0.99	1	(94)

Useful gains, mGm , W

1721.35	2095.21	2438.69	2741.53	2816.91	2375.62	1664.99	1702.62	2131.97	2006.39	1725.56	1613.34	(95)

Monthly average external temperature from Table U1

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature

9879.72	9478.84	8445.72	6673.07	4968.41	3044.43	1806.9	1910.21	3333.87	5463.73	7635.02	9558.62	(97)

Space heating requirement for each month

6069.83	4961.8	4469.23	2830.71	1600.72	0	0	0	0	2572.26	4254.81	5911.29	(98a)

Solar space heating calculated using Appendix H (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	(98b)

Space heating requirement for each month after solar contribution

6069.83	4961.8	4469.23	2830.71	1600.72	0	0	0	0	2572.26	4254.81	5911.29	(98c)

Space heating requirement in kWh/m²/year 87.71 (99)

8c. Space Cooling requirement

Heat loss rate,

0	0	0	0	0	0	0	0	0	0	0	0	(100)

Utilisation factor for loss

0	0	0	0	0	0	0	0	0	0	0	0	(101)

Useful loss, mLm (watts)

0	0	0	0	0	0	0	0	0	0	0	0	(102)

Gains

0	0	0	0	0	0	0	0	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) (104)

0	0	0	0	0	0	0	0	0	0	0	0	(104)

Cooled fraction 0 (105)

Intermittency factor

0	0	0	0	0	0	0	0	0	0	0	0	(106)

Space cooling requirement for month 0 0

0	0	0	0	0	0	0	0	0	0	0	0	(107)

Space cooling requirement in kWh/m²/year 0 (108)

8f. Space heating requirement

Fabric Energy Efficiency, 0 0 (109)

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

Fraction of space heat from secondary/supplementary system,													0		0	(201)
Fraction of space heat from main system(s),															1	(202)
Fraction of main heating from main system 2,															0	(203)
Fraction of total space heat from main system 1,															1	(204)
Fraction of total space heat from main system 2,															0	(205)
Efficiency of main space heating system 1 (in %),															100	(206)
Efficiency of main space heating system 2 (in %),															0	(207)
Efficiency of secondary/supplementary heating system, %,															100	(208)
Cooling System Seasonal Energy Efficiency Ratio,													0		0	(209)
Space heating requirement (calculated above),																
	0	0	0	0	0	0	0	0	0	0	0	0				(210)
Space heating fuel (main heating system 1), kWh/month													0		0	
	6069.83	4961.8	4469.23	2830.71	1600.72	0	0	0	0	2572.26	4254.81	5911.29				(211)
Space heating fuel (main heating system 2), kWh/month													0		0	
	0	0	0	0	0	0	0	0	0	0	0	0				(213)
Space heating fuel (secondary), kWh/month													0		0	
	0	0	0	0	0	0	0	0	0	0	0	0				(215)
Output from water heater),													0		100	(216)
Efficiency of water heater																
	100	100	100	100	100	100	100	100	100	100	100	100				(217)
Fuel for water heating																
	369.36	328.33	352.6	318.53	314.68	0	0	0	0	324.17	335.49	366.39			2709.56	(219)
Space Cooling																
	0	0	0	0	0	0	0	0	0	0	0	0				(221)
Annual totals													kWh/year	kWh/year		
Space heating fuel used, main system 1															32670.64	(211)
Space heating fuel used, main system 2															0	(213)
Space heating fuel used, secondary															0	(215)
Water heating fuel used															2709.56	(219)
Electricity for instantaneous electric shower(s)															0	(64a)
Space cooling fuel used															0	(221)
Electricity for pumps, fans and electric keep-hot																
Mechanical vent fans - balanced, extract or positive input from outside													0	0	0	(230a)
warm air heating system fans															0	(230b)
Heating circulation pump or water pump within warm air heating unit															214.5	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)															0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)															0	(230e)
Maintaining electric keep-hot facility for gas combi boiler															0	(230f)
Pump for solar water heating															0	(230g)
Pump for storage WWHRS															0	(230h)
Total electricity for the above															214.5	(231)
Electricity for lighting															426.84	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

	Fuel	kWh/year		
Appendix Q, <item 1 description>				
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			37197.86	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		5387.39	(240a)
Low-rate fraction	0		5387.39	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		5387.39	(241a)
Low-rate fraction	0		5387.39	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		5387.39	(242a)

Low-rate fraction	0		5387.39	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		446.81	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.51	(249)
Energy For lighting	0		80.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		6241.29	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	5.38	(257)
SAP rating	20.72	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			5038.99	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			569.01	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating			5608	(265)
Space cooling			0	(266)
Electricity for pumps, fans and electric keep			29.75	(267)
Electricity for lighting			61.61	(268)
energy saved or generated	0		0	(269b)
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(270b)
energy used			0	(271b)
Total CO2, kg/year			5836.11	(272)
Dwelling CO2 Emission Rate			15.67	(273)
EI rating			81	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			51326.39	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3061.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			54388.19	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			324.5	(281)
Electricity for lighting			654.71	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			57047.49	(286)
Dwelling PE Rate			153.15	(287)

Dwelling Reference: J5653
Dwelling Type: New Dwelling Design Stage
9 John Street
WC1N 2EB

1. Overall dwelling dimensions

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	86.5	(1a)	x	2.9	(2a)	=	250.85	(3a)
Ground Floor	75	(1b)	x	3.4	(2b)	=	255	(3b)
First Floor	74	(1c)	x	3.6	(2c)	=	266.4	(3c)
2nd Floor	73.6	(1d)	x	2.8	(2d)	=	206.08	(3d)
3rd Floor	63.4	(1e)	x	2.4	(2e)	=	152.16	(3e)
Total floor area TFA							372.5	(4)
Dwelling volume							1130.49	(5)

2. Ventilation Rate

Chimneys/Flues	0	x	80	=	0	(6a)
Open chimneys	0	x	20	=	0	(6b)
Chimneys / flues attached to closed fire	0	x	10	=	0	(6c)
Flues attached to solid fuel boiler	0	x	20	=	0	(6d)
Flues attached to other heater	0	x	35	=	0	(6e)
Number of blocked chimneys	0	x	20	=	0	(6f)
Number of intermittent extract fans	0	x	10	=	0	(7a)
Number of passive vents	0	x	10	=	0	(7b)
Number of flueless gas fires	0	x	40	=	0	(7c)

Air changes per hour

Number of storeys in the dwelling (ns)	0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc	0	0	(9)
Additional infiltration	0	0	(10)
Structural infiltration	0	0	(11)
Suspended wooden ground floor	0	0	(12)
No draught lobby	0	0	(13)
Percentage of windows and doors draught proofed	0	0	(14)
Window infiltration	0	0	(15)
Infiltration rate	0	0	(16)
Air permeability value, AP50, (m³/h/m²)	20	20	(17)
Air permeability value, AP4, (m³/h/m²)	0	0	(17a)
Air permeability value)	1	1	(18)
Number of sides on which dwelling is sheltered	0	0	(19)

Shelter factor	1	(20)
Infiltration rate incorporating shelter factor	1	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly average wind speed from Table U2	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Wind Factor	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	13.13	(22b)

Calculate effective air change rate for the applicable case:

	0	(23a)
	0	(23b)
	0	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR)	0	0	0	0	0	0	0	0	0	0	0	0	(24a)
b) If balanced mechanical ventilation without heat recovery (MV)	0	0	0	0	0	0	0	0	0	0	0	0	(24b)
c) If whole house extract ventilation or positive input ventilation from outside	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	(24d)
Effective air change rate	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	(25)
Effective air change rate from PCDB:	1.28	1.25	1.23	1.1	1.08	0.95	0.95	0.93	1	1.08	1.13	1.18	(25)

3. Heat losses and heat loss parameter

Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

ELEMENT	A X U (W/K)	A X k kJ/K	
Doors	6.02		(26)
Windows	198.66		(27)
Roof window	0		(27a)
Basement floor	95.15	6487.5	(28)
Ground floor	0	0	(28a)
Exposed floor	0	0	(28b)
Basement wall	79.8	10108	(29)
External wall	355.05	44973	(29a)

Roof							153.6						691.2	(30)
Total area of external elements ∑A, m²													508	(31)
Party Wall							0						34629	(32)
Party floor													0	(32a)
Party ceiling													0	(32b)
Internal wall **													0	(33c)
Internal floor													0	(32d)
Internal ceiling floor													0	(32e)
Fabric heat loss, W/K = ∑ (A x U)													888.28	(33)
Heat capacity Cm = ∑(A x k)													96888.7	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K													250	(35)
Linear Thermal bridges: ∑ (L x Ψ) calculated using Appendix K													0	(36)
Point Thermal bridges: ∑χ (W/K) if significant point thermal bridge present and values available													0	(36a)
Total fabric heat loss H = ∑(A × U) + ∑(L × Ψ) +∑χ													888.28	(37)
Ventilation heat loss calculated monthly														
	475.65	466.33	457	410.37	401.04	354.87	354.87	346.13	373.06	401.04	419.69	438.35		(38)
Heat transfer coefficient, W/K														
	1363.94	1354.61	1345.29	1298.65	1289.33	1243.16	1243.16	1234.42	1261.35	1289.33	1307.98	1326.63		(39)
Heat loss parameter (HLP), W/m²K														
	3.66	3.64	3.61	3.49	3.46	3.34	3.34	3.31	3.39	3.46	3.51	3.56		(40)
Number of days in month (Table 1a)														
	31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Water heating energy requirement

Assumed occupancy, N													3.23	(42)
Hot water usage in litres per day for mixer showers, Vd,shower (from Appendix J)														
	0	0	0	0	0	0	0	0	0	0	0	0		(42a)
Hot water usage in litres per day for baths, Vd,bath (from Appendix J)														
	90.36	89.02	87.13	83.64	81.04	78.14	76.58	78.46	80.5	83.59	87.15	90.05		(42b)
Hot water usage in litres per day for other uses, Vd,other (from Appendix J)														
	47.67	45.94	44.2	42.47	40.74	39	39	40.74	42.47	44.2	45.94	47.67		(42c)
Annual average hot water usage in litres per day Vd,average (from Appendix J)													127.11	(43)
Hot water usage in litres per day for each month Vd,m = (42a) + (42b) + (42c)														
	138.03	134.95	131.33	126.11	121.77	117.14	115.58	119.19	122.97	127.8	133.09	137.72	1525.69	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)														
	218.61	192.17	201.85	172.64	163.93	144.04	139.79	147.58	151.63	173.42	189.61	215.64	2110.91	(45)
Distribution loss (46) = 0.15 x (45)														
	32.79	28.83	30.28	25.9	24.59	21.61	20.97	22.14	22.74	26.01	28.44	32.35		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel													0	(47)
Water storage loss (or HIU loss)														

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)
Temperature factor from Table 2b 0 (49)
Energy lost from water storage, kWh/day (48) x (49) = 300 (50)
b) If manufacturer's declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)
Volume factor from Table 2a 0.74 (52)
Temperature factor from Table 2b 1 (53)
Energy lost from water storage, kWh/day 4.86 (54)
Enter (50) or (54) in (55) 4.86 (55)
Water storage (or HIU) loss calculated for each month (56) = (55) × (41)

150.75 136.16 150.75 145.89 150.75 145.89 150.75 150.75 145.89 150.75 145.89 150.75 (56)

If the vessel contains dedicated solar storage or dedicated WWHRS storage,
(57)m = (56)m □ [(47) – Vs] ÷ (47), else (57)m = (56)m
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).

150.75 136.16 150.75 145.89 150.75 145.89 150.75 150.75 145.89 150.75 145.89 150.75 (57)

Primary circuit loss for each month from Table 3
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks)

0 0 0 0 0 0 0 0 0 0 0 0 (59)

Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)

0 0 0 0 0 0 0 0 0 0 0 0 (61)

Total heat required for water heating calculated for each month (62) = 0.85 × (45) + (46) + (57) + (59) + (61)

369.36 328.33 352.6 318.53 314.68 289.93 290.54 298.33 297.52 324.17 335.49 366.39 3885.88 (62)

CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63a)

PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)

0 0 0 0 0 0 0 0 0 0 0 0 (63b)

Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63c)

FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)

0 0 0 0 0 0 0 0 0 0 0 0 (63d)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

369.36 328.33 352.6 318.53 314.68 0 0 0 0 324.17 335.49 366.39 2709.56 (64)

Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)

0 0 0 0 0 0 0 0 0 0 0 0 (64a)

Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59)]

193.29 172.83 187.72 174.11 175.11 164.6 167.08 169.67 167.13 178.26 179.75 192.3 (65)

include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network

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

Metabolic gains (Table 5), watts

193.57 193.57 193.57 193.57 193.57 193.57 193.57 193.57 193.57 193.57 193.57 193.57 (66)

Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

60.42	53.67	43.65	33.04	24.7	20.85	22.53	29.29	39.31	49.91	58.26	62.1	(67)

Appliances gains (calculated in Appendix L, equation L16 or L16a), also see Table 5

768.11	776.08	756	713.24	659.26	608.53	574.64	566.67	586.75	629.51	683.49	734.22	(68)

Cooking gains (calculated in Appendix L, equation L18 or L18a), also see Table 5

57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	57.58	(69)

Pumps and fans gains (Table 5a)

10	10	10	10	10	0	0	0	0	10	10	10	(70)

Losses e.g. evaporation (negative values) (Table 5

-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	-129.05	(71)

Water heating gains (Table 5)

259.79	257.18	252.31	241.82	235.36	228.62	224.57	228.05	232.12	239.6	249.66	258.47	(72)

Total internal gains

1220.44	1219.04	1184.06	1120.21	1051.43	980.11	943.85	946.12	980.29	1051.14	1123.51	1186.9	(73)

6. Solar gains

Solar gains in watts, calculated for each month

565.69	999.79	1464.16	1975.4	2359.79	2407.46	2294.1	1997.44	1639.65	1130.92	684.16	479.85	(83)

Total gains – internal and solar (watts)

1786.13	2218.84	2648.22	3095.61	3411.21	3387.56	3237.95	2943.56	2619.94	2182.06	1807.67	1666.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, ?1,m (see Table 9a)

1	1	0.99	0.98	0.96	0.92	0.86	0.89	0.96	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 and 4 in Table 9c)

16.85	17.12	17.65	18.44	19.24	20	20.45	20.37	19.73	18.72	17.7	16.88	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

18.46	18.47	18.48	18.53	18.54	18.59	18.59	18.6	18.57	18.54	18.52	18.5	(88)

Roof Utilisation factor for gains for rest of dwelling, ?2,m (see Table 9a)

1	0.99	0.99	0.97	0.93	0.82	0.61	0.68	0.91	0.98	0.99	1	(89)

Roof Mean internal temperature in the rest of dwelling T2

14.99	15.26	15.79	16.61	17.39	18.14	18.49	18.45	17.9	16.9	15.87	15.04	(90)

Living area fraction 0.08 (91)

Mean internal temperature (for the whole dwelling)

15.14	15.4	15.94	16.75	17.54	18.29	18.64	18.6	18.04	17.04	16.01	15.18	(92)

Adjusted mean internal temperature:

14.89	15.15	15.69	16.5	17.29	18.04	18.39	18.35	17.79	16.79	15.76	14.93	(93)

8. Space heating requirement

Utilisation factor for gains,														
	0.99	0.99	0.98	0.95	0.9	0.78	0.56	0.63	0.87	0.96	0.99	0.99		(94)
Useful gains, mGm , W														
	1772.33	2189.94	2585.91	2949.61	3070	2646.93	1826.73	1859.13	2276.81	2104.45	1786.07	1656.13		(95)
Monthly average external temperature from Table U1														
	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature														
	14439.86	13890.23	12356.58	9869.1	7201.52	4272.36	2219.27	2404.97	4656.77	7976.57	11330.76	14229.98		(97)
Space heating requirement for each month														
	9424.64	7862.59	7269.38	4982.03	3073.85	0	0	0	0	4368.86	6872.18	9354.94		(98a)
Solar space heating calculated using Appendix H (negative quantity)														
	0	0	0	0	0	0	0	0	0	0	0	0		(98b)
Space heating requirement for each month after solar contribution														
	9424.64	7862.59	7269.38	4982.03	3073.85	0	0	0	0	4368.86	6872.18	9354.94		(98c)
Space heating requirement in kWh/m²/year													142.84	(99)

8c. Space Cooling requirement

Heat loss rate,														
	0	0	0	0	0	0	0	0	0	0	0	0		(100)
Utilisation factor for loss														
	0	0	0	0	0	0	0	0	0	0	0	0		(101)
Useful loss, mLm (watts)														
	0	0	0	0	0	0	0	0	0	0	0	0		(102)
Gains														
	0	0	0	0	0	0	0	0	0	0	0	0		(103)
Space cooling requirement for month, whole dwelling, continuous (kWh)														(104)
	0	0	0	0	0	0	0	0	0	0	0	0		(104)
Cooled fraction													0	(105)
Intermittency factor														
	0	0	0	0	0	0	0	0	0	0	0	0		(106)
Space cooling requirement for month									0				0	
	0	0	0	0	0	0	0	0	0	0	0	0		(107)
Space cooling requirement in kWh/m²/year													0	(108)

8f. Space heating requirement

Fabric Energy Efficiency,	0		0	(109)

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

Fraction of space heat from secondary/supplementary system,													0		0	(201)
Fraction of space heat from main system(s),															1	(202)
Fraction of main heating from main system 2,															0	(203)
Fraction of total space heat from main system 1,															1	(204)
Fraction of total space heat from main system 2,															0	(205)
Efficiency of main space heating system 1 (in %),															100	(206)
Efficiency of main space heating system 2 (in %),															0	(207)
Efficiency of secondary/supplementary heating system, %,															100	(208)
Cooling System Seasonal Energy Efficiency Ratio,													0		0	(209)
Space heating requirement (calculated above),																
	0	0	0	0	0	0	0	0	0	0	0	0				(210)
Space heating fuel (main heating system 1), kWh/month													0		0	
	9424.64	7862.59	7269.38	4982.03	3073.85	0	0	0	0	4368.86	6872.18	9354.94				(211)
Space heating fuel (main heating system 2), kWh/month													0		0	
	0	0	0	0	0	0	0	0	0	0	0	0				(213)
Space heating fuel (secondary), kWh/month													0		0	
	0	0	0	0	0	0	0	0	0	0	0	0				(215)
Output from water heater),													0		100	(216)
Efficiency of water heater																
	100	100	100	100	100	100	100	100	100	100	100	100				(217)
Fuel for water heating																
	369.36	328.33	352.6	318.53	314.68	0	0	0	0	324.17	335.49	366.39			2709.56	(219)
Space Cooling																
	0	0	0	0	0	0	0	0	0	0	0	0				(221)
Annual totals													kWh/year	kWh/year		
Space heating fuel used, main system 1															53208.47	(211)
Space heating fuel used, main system 2															0	(213)
Space heating fuel used, secondary															0	(215)
Water heating fuel used															2709.56	(219)
Electricity for instantaneous electric shower(s)															0	(64a)
Space cooling fuel used															0	(221)
Electricity for pumps, fans and electric keep-hot																
Mechanical vent fans - balanced, extract or positive input from outside													0	0	0	(230a)
warm air heating system fans															0	(230b)
Heating circulation pump or water pump within warm air heating unit															214.5	(230c)
Oil boiler auxiliary (oil pump, flue fan, etc; excludes circulation pump)															0	(230d)
Gas boiler auxiliary (flue fan, etc; excludes circulation pump)															0	(230e)
Maintaining electric keep-hot facility for gas combi boiler															0	(230f)
Pump for solar water heating															0	(230g)
Pump for storage WWHRS															0	(230h)
Total electricity for the above															214.5	(231)
Electricity for lighting															426.84	(232)

Energy saving/generation technologies (Appendices M, N) - Energy used in dwelling

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)

Energy saving/generation technologies (Appendices M, N) - Energy exported

Electricity generated by PVs (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)

Electricity generated by hydro-electric generators

0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)

Electricity used or net electricity generated by micro-CHP

0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)

Appendix Q items: annual energy

	Fuel	kWh/year		
Appendix Q, <item 1 description>				
energy saved			0	(236a)
energy used			0	(237a)
Total delivered energy for all uses			57735.69	

10a. Fuel costs – Individual heating systems including micro-CHP

Fuel required	kWh/year	Fuel price	Fuel cost £/year	
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		8774.08	(240a)
Low-rate fraction	0		8774.08	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		8774.08	(241a)
Low-rate fraction	0		8774.08	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		8774.08	(242a)

Low-rate fraction	0		8774.08	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		446.81	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)				
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		40.51	(249)
Energy For lighting	0		80.61	(250)
Additional standing charges	0		92	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1 description>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		9627.98	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP

Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	8.3	(257)
SAP rating	-1.96	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissions kg CO2/year	
Space heating - main system 1			8181.34	(261)
Space heating - main system 2			0	(262)
Space heating - secondary			0	(263)
Energy for water heating			569.01	(264)
Energy for instantaneous electric shower(s)			0	(264a)

Space and water heating			8750.35	(265)
Space cooling			0	(266)
Electricity for pumps, fans and electric keep			29.75	(267)
Electricity for lighting			61.61	(268)
energy saved or generated	0		0	(269b)
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(270b)
energy used			0	(271b)
Total CO2, kg/year			8978.46	(272)
Dwelling CO2 Emission Rate			24.1	(273)
EI rating			71	(274)

13a. Primary Energy – Individual heating systems including micro-CHP

	Energy KWh/year	Emission factor kg	Emissionsr kg CO2/year	
Space heating - main system 1			83498.04	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			3061.8	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			86559.83	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			324.5	(281)
Electricity for lighting			654.71	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			89219.14	(286)
Dwelling PE Rate			239.51	(287)

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Fri 12 Apr 2024 11:52:22

Project Information			
Assessed By	Webb Yates Engineers	Building Type	House, Mid-terrace
OCDEA Registration	STRO037816	Assessment Date	2024-03-20

Dwelling Details			
Assessment Type	As designed	Total Floor Area	372 m^2
Site Reference	9 John Street - LEAN v2	Plot Reference	J5653
Address	9 John Street, WC1N 2EB		

Client Details	
Name	Not Provided
Company	Not Provided
Address	Not Provided, Not Provided, WF10 5QU

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

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*8.61 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	24.2 $kgCO_2/m^2$	**FAIL**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*45.34 kWh_{PE}/m^2*	
Dwelling primary energy	240.52 kWh_{PE}/m^2	**FAIL**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.3 kWh/m^2*	
Dwelling fabric energy efficiency	152.5 kWh/m^2	**FAIL**

2a Fabric U-values

Element	***Maximum permitted average U-Value [W/m²K]***	**Dwelling average U-Value [W/m²K]**	**Element with highest individual U-Value**	
External walls	*0.26*	1.5	Basement (1.5)	**FAIL**
Party walls	*0.2*	0	Party walls (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	1.1	Lower Ground (1.1)	**FAIL**
Roofs	*0.16*	2	Roof (2)	**FAIL**
Windows, doors, and roof windows	*1.6*	4.46	4 (5.8)	**FAIL**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))

Name	**Net area [m²]**	**U-Value [W/m²K]**
Basement wall: Basement	53.2	1.5
Exposed wall: Exposed	236.7	1.5
Party wall: Party walls	494.7	0 **(!)**
Basement floor: Lower Ground	86.5	1.1
Exposed roof: Roof	76.8	2

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	**Area [m²]**	**Orientation**	**Frame factor**	**U-Value [W/m²K]**
1, Doors	2.3	South West	N/A	1.4
2, Doors	2	South West	N/A	1.4
3, Windows (1)	18	South West	0.9	3.3
4, Windows (2)	15.6	North East	0.9	5.8
5, Windows (2)	6.6	South East	0.9	5.8
6, Windows (2)	2.8	South East	0.9	5.8
7, Windows (2)	3.7	North East	0.9	5.8
8, Windows (1)	3.8	South West	0.9	3.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part **1 - Main Dwelling**: SAP default y-value (0.2 W/m^2K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	20 m^3/hm^2, Design value	**FAIL**
Air permeability test certificate reference	Not Provided	

4 Space heating	
Main heating system 1: Boiler with radiators or underfloor heating - Electricity	
Efficiency	100.0%
Emitter type	Radiators
Flow temperature	
System type	
Manufacturer	
Model	
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	300 litres
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, TRVs, and bypass	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	95 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

APPENDIX B – GLA SPREADSHEET

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the TER/DER/BER and the TFEE/DFEE.

RESIDENTIAL CO_2 ANALYSIS (PART L1)

				Baseline		'Be Lean'	'Be Clean'	'Be Green'	Fabric Energy Efficiency (FEE)		Baseline		'Be Lean'			'Be Clean'			'Be Green'	
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m²) (Row 4)	Number of units	Total area represented by model (m²)	TER ($kgCO_2 / m^2$) (Row 273)	Energy saving/generation technologies (-) ($kgCO_2$ p.a.) (Row 269)	DER ($kgCO_2 / m^2$) (Row 273 or 384)	DER ($kgCO_2 / m^2$) (Row 273 or 384)	DER ($kgCO_2 / m^2$) (Row 273 or 384)	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Energy saving/generation technologies ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Lean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Clean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	'Be Green' savings ($kgCO_2$ p.a.)
Unit 1	372.5	1	372.5	15.67	0.00	24.20	24.20	24.20	38.30	152.50	5,837	0	9,015	9,015	-3,177	9,015	9,015	0	9,015	0
Sum		1	373	15.7	0.0	24.2	24.2	24.2	38.3	152.5	5,837	0	9,015	9,015	-3,177	9,015	9,015	0	9,015	0

NON-RESIDENTIAL CO_2 ANALYSIS (PART L2)

				Baseline		'Be Lean'	'Be Clean'	'Be Green'			Baseline		'Be Lean'			'Be Clean'			'Be Green'	
Building Use	Model Area (m²)	Number of units	Total area represented by model (m²)	BRUKL TER ($kgCO_2 / m^2$)	BRUKL Displaced electricity (-) (kWh / m^2)	BRUKL BER ($kgCO_2 / m^2$)	BRUKL BER ($kgCO_2 / m^2$)	BRUKL BER ($kgCO_2 / m^2$)			Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Energy saving/generation technologies ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Lean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions with Notional PV savings included ($kgCO_2$ p.a.)	'Be Clean' savings ($kgCO_2$ p.a.)	Part L 2021 CO_2 emissions ($kgCO_2$ p.a.)	'Be Green' savings ($kgCO_2$ p.a.)
Sum		0	0	0.0	0.0	0.0	0.0	0.0			0	0	0	0	0	0	0	0	0	0
SITE-WIDE ENERGY CONSUMPTION AND CO_2 ANALYSIS																				
Total Sum			373	-	-	-	-	-			5,837	0	9,015	9,015	-3,177	9,015	9,015	0	9,015	0

Part L 2021 Performance

Residential

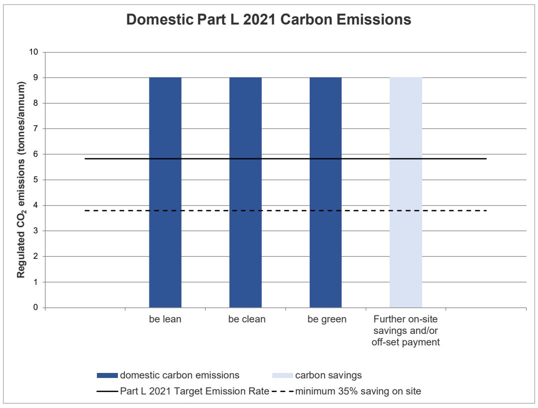
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	5.8	0.6
After energy demand reduction (be lean)	9.0	0.6
After heat network connection (be clean)	9.0	0.6
After renewable energy (be green)	9.0	0.6

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-3.2	-54%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**-3.2**	**-54%**
Annual savings from off-set payment	9.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**270**	-
Cash in-lieu contribution (£)	**25,691**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



Non-residential

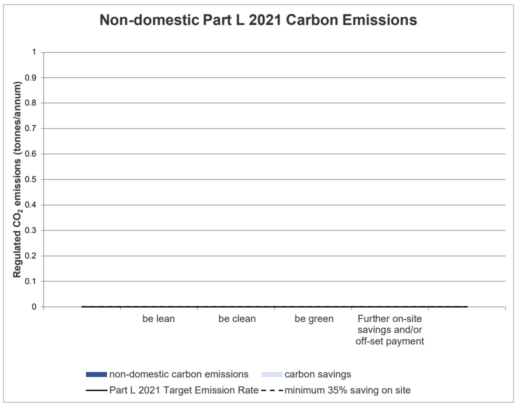
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	**0.0**	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	5.8		
Be lean	9.0	-3.2	-54%
Be clean	9.0	0.0	0%
Be green	9.0	0.0	0%
Total Savings	-	-3.2	-54%
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	-	270.4	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	38.30	152.50	-298%

	Area weighted non-residential cooling demand (MJ/m^2)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

Non-residential

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)