



EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

ENERGY & SUSTAINABILITY ASSESSMENT

63 SHELDON AVENUE

PROPERTY ADDRESS

63 Sheldon Avenue
London
N6 4NH

DATE

September 2022

PREPARED BY

EAL Consult



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Best Energy Compliance
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BUILD

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1. EXECUTIVE SUMMARY

This Sustainability statement has been prepared to support the planning application for the demolition and erection of a new build house in Highgate. The strategy highlights how the proposed development will promote sustainability through 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 responds to the UK Planning and regulatory framework, National Planning Policy Framework 2021, the London Plan 2021 and the Barnet Core Strategy 2012.

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 L1 2021. Further carbon emission reduction can be achieved by using renewables.

Energy Efficiency & Carbon Reduction:

- Passive design principles including a high level of insulation and reduced air permeability to deliver Part L1 compliant Building in absence of renewable technologies. It will achieve a **17.5%** reduction in carbon emissions over Part L1 baseline.
- Photovoltaic panels have been proposed for the specific scheme and will deliver a further **32.1%** reduction in regulated carbon emissions over Part L1 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 **49.6% with the use of:**

- **Air Source Heat Pump**

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 CO ₂ per annum)
	Regulated
Building Regs Notional Development	13.8
After Energy demand Reduction	11.4
After CHP	11.4
After Renewables	7.0

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	2.4	17.5%
Savings from CHP	0.00	0%
Savings from Renewables	4.4	32.1%
Total savings	6.9	49.6%

2. INTRODUCTION

Site description

The development concerns the demolition of an existing dwelling and erection of a new dwelling in Highgate. The site is located within Highgate Conservation Area and the development seeks to enhance the local area through its design.

Methodology

This energy assessment outlines the energy demand from the development together with the associated CO₂ 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 CO₂ 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 CO₂ emissions and energy requirements. It compares CO₂ emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L1 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.

London Borough of Haringey:

Haringey Local Plan Strategic Policies 2013-2026 adopted in March 2013 and contains the following sustainability policies and targets:

SP4: Working Towards a Low Carbon Haringey

Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:

a. From 2011 onwards, all new residential development will achieve a minimum 25% in emissions in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4** energy standards, and should aim to achieve Level 6**. All new residential development shall be zero carbon from 2016 onwards.

b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.

2. The Council will promote low- and zero-carbon energy generation through the following measures:

a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;

d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

SP5: Water Management and Flooding

The Council will require all development in Haringey to be water efficient during construction and operation and to reduce all forms of flood risk. All development shall:

- Improve the water environment, water quality and drainage systems;
- Minimise water use and illustrate how development would contribute to general and flash flooding;
- Take account of flood risk vulnerability classification as set out in paragraph 100 of the NPPF and will apply the NPPF Sequential Test and Exception Test;
- Implement measures to prevent (or mitigate as last resort) local surface water and downstream flooding;
- Implement Sustainable Drainage Systems from strategic to individual site level to improve water attenuation, quality and amenity;

SP6: Waste and Recycling

The Council supports the objectives of sustainable waste management set out by the Government in PPS10 Planning for Sustainable Waste Management and the Mayor's London Plan. To achieve these, the Council shall:

- Maximise self-sufficiency in waste management capacity;
- Seek to minimise waste creation, increase recycling rates in relation to commercial, industrial and municipal waste in order to achieve the Mayor's recycling targets;
- Address waste as a resource and look to disposal as the last option, in line with the Mayor's waste hierarchy;
- Require integrated, well-designed recycling facilities to be incorporated into all new developments;
- Monitor changes in the stock of waste management facilities, waste arisings, and the amount of waste recycled, recovered and going for disposal;

Haringey will require Site Waste Management Plans for all major applications to identify volume and types of demolition and construction waste and to demonstrate how waste will be minimised and managed during construction and occupation.

Development Management DPD, adopted July 2017**Policy DM21: Sustainable Design, Layout and Construction**

- A. All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:
- a. Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;
 - b. Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;
 - c. Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls
 - d. Wherever possible, use building materials with high environmental performance ratings; and
 - e. Seek opportunities for locally sourced labour.

- B. The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings.
- C. Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.
- D. Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

Policy DM22: Decentralised Energy

- A. Subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported. Communal energy systems
- B. All development that incorporates site-wide communal energy systems should examine opportunities for extending such systems, irrespective of whether it is connected to a DE network.

All development that incorporates site-wide communal energy systems should optimise opportunities for extending such systems beyond the site boundary to supply energy to neighbouring existing and planned future developments.

Policy DH1: Highgate Neighbourhood Plan 2017

- Proposals to demolish buildings and structures that are non-designated heritage assets should make a positive contribution to the conservation area.
- Proposals be in line with Highgate's identity as a green area

4. ENERGY STRATEGY

The Energy strategy for the proposed dwelling is based on the Building Regulations Part L; 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.

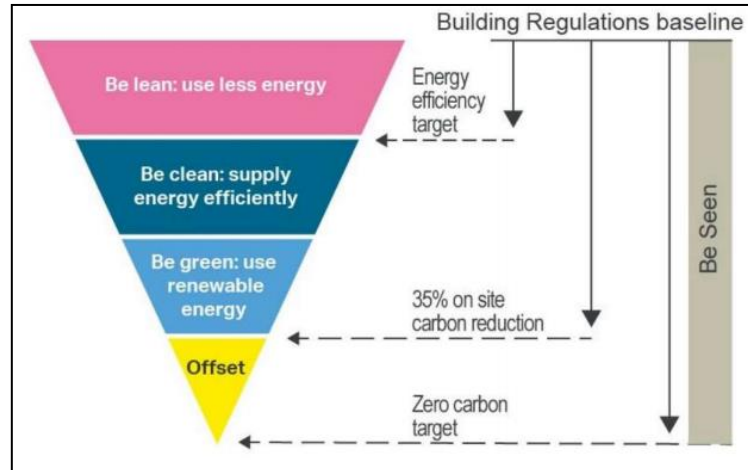


Figure 1. Energy Hierarchy

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 a **17.5%** reduction in annual regulated CO₂ emissions over Part L 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 L1 Minimum Standard
Wall	0.26W/m ² k
Roof	0.16 W/m ² k
Floor	0.18 W/m ² k
Glazing	1.6 W/m ² k
Doors	1.6 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	0.26 W/m ² k	0.14W/m ² k
Floor	0.18 W/ m ² k	0.10 W/m ² k
Roof	0.16 W/ m ² k	0.11 W/ m ² k
Glazing	1.6 W/ m ² k	1.1 W/ m ² k

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

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 LED luminaires 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 heatpump 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.

District Heating and Cooling

There is no existing or planned heat and energy network in the vicinity and the site does not fall into an opportunity area with decentralised energy potential as identified in the London Plan.

Community heating and Combined Heat and Power (CHP system)

CHP systems are usually needed where there is a large heat demand (schemes with more than 100-150 dwellings), usually resulting from the building(s) being in continuous use, or through specific heating requirements such as a swimming pool. Community (or district) heating involves using a central boiler plant (or other heat sources) to heat a number of buildings through a network of well-insulated underground pipes. This system is not considered appropriate for this development

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

Site-wide communal system/network and design for district network connection

In light of the small scale of the proposed development and its location; it is apparent that the use of a heatpump fed site-wide network is technically and financially unviable.

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 impact • 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 CO₂ 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 CO₂	• 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 CO₂ • No input power in order to generate electricity.	• Constrained to rear/side roof only due to being in a conservation area • Small rear/side roof area provides little opportunity for a significant array

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 a heatpump is to be incorporated in the design because it achieves a CO₂ percentage reduction of **32.1%** contributing to an overall reduction of **49.6%** in carbon emissions.

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 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.

Urban Greening Factor

The present scheme has an UGF of 0.51. The table below summarise the measures to be implemented within the development.

Table 8. Urban Greening Factor Calculator

Urban Greening Factor Calculator				
Surface Cover Type	Factor	Area (m ²)	Contribution	Notes
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1	320	320	
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1	0	0	
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	0.8	40	32	
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.	0.8	24	19.2	
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.	0.7	40	28	
Flower-rich perennial planting.	0.7	60	42	
Rain gardens and other vegetated sustainable drainage elements.	0.7	0	0	
Hedges (line of mature shrubs one or two shrubs wide).	0.6	32	19.2	
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6	0	0	
Green wall –modular system or climbers rooted in soil.	0.6	0	0	
Groundcover planting.	0.5	0	0	
Amenity grassland (species-poor, regularly mown lawn).	0.4	70	28	
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.	0.3	0	0	
Water features (chlorinated) or unplanted detention basins.	0.2	0	0	
Permeable paving.	0.1	70	7	
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0	47	0	
Total contribution			495.4	
Total site area (m²)			970	
Urban Greening Factor			0.51	

6. CIRCULAR ECONOMY

Materials efficiency

Materials can have a significant impact on environmental performance, both in construction but also ongoing use. Materials used for the building will have lower environmental impacts over their lifecycle. This applies to the materials used in the external walls, roof and glazing. This extends to elements of the materials category such as the basic building materials (internal walls) and the finishing elements (fascia, skirting, and furniture).

It is expected that 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.

Other measures will be implemented:

- The reuse of existing materials from the demolition of existing buildings
- 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;
- Concrete will have a Ground Granulated Blast Furnace Slag (GGBS) value of 50%.

Resource efficiency

- Pre-demolition audit to be carried out and target benchmark of ≤ 11.1 tonnes of construction waste per 100m²;

Diversion of waste from landfill

- Where possible, segregation of recyclable and non-recyclable material will be employed for all waste generated throughout the construction process. Furthermore, material will be re-used on-site where feasible;
- Pre-fabrication of materials/elements such as bathroom pods, pipework and riser materials will be considered;
- 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;
- Construction waste – minimum 80% diversion from landfill rate;
- Demolition waste – minimum 90% diversion from landfill rate;
- Operational waste – Target diversion from landfill rate to be set.

7. CONCLUSION

The development has been designed to exceed Part L1 building regulations requirements. In line with the national and local policies, regulated CO₂ emissions from the development will be reduced by **49.6%** 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 Detached house

Reference

Date 15 September 2022

Email: NONE Project 63 Sheldon Avenue
LONDON
N6 4NH**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)	322.88	2.93	946.04	(3a)
First floor	235.08	3.37	792.22	(3b)
Second floor	195.92	3.38	662.21	(3c)
Third floor	81.96	3.37	276.21	(3d)
	835.84			(4)
			2676.67	(5)

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

2. Ventilation rate

	main + secondary + 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	10	x 10	100.00	(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									
			0.04	(8)								
Pressure test, result q50	3.00			(17)								
Air permeability			0.19	(18)								
			2.00	(19)								
			0.85	(20)								
Infiltration rate incorporating shelter factor			0.16	(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)												
0.20	0.20	0.20	0.18	0.17	0.15	0.15	0.15	0.16	0.17	0.18	0.19	
											2.09	(22b)
Ventilation : natural ventilation, intermittent extract fans												
Effective air change rate												
0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.51	0.51	0.51	0.52	0.52	
												(25)

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

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) SIDE			2.380	1.05 (1.10)	2.51			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) SIDE			5.950	1.05 (1.10)	6.27			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) FRONT			47.530	1.05 (1.10)	50.08			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) REAR			16.440	1.05 (1.10)	17.32			(27)
Solid door FRONT			3.520	1.10	3.87			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) REAR			29.120	1.10	32.03			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) SIDE			1.820	1.10	2.00			(26)
Walls EXTERNAL #WINDOWS & DOORS			376.30	0.14	52.68	70.00	26341.00	(29)
Ground floors UNDERGROUND			4.17	0.10	0.42	110.00	458.70	(28)
Flat roofs FF			35.35	0.11	3.89	9.00	318.15	(30)
Flat roofs GF			39.16	0.11	4.31	9.00	352.44	(30)
Flat roofs LGF REAR #ROOFLIGHTS			87.80	0.11	9.66	9.00	790.20	(30)
Flat roofs SF			67.71	0.11	7.45	9.00	609.39	(30)
Pitched roofs with integrated insulation ROOF VOID ABOVE FF TO SF			78.61	0.10 (Ru=0.90)	7.87	9.00	707.49	(30)
Pitched roofs insulated between rafters PART OF MAIN ROOF @ SF			113.38	0.11	12.47	9.00	1020.42	(30)
Basement walls UNDERGROUND			217.29	0.14	30.42	70.00	15210.30	
Basement floors UNDERGROUND			322.88	0.10	32.29	110.00	35516.80	
Internal floor SF			81.96	0.00	0.00	18.00	1475.28	
Internal floor GF			235.08	0.00	0.00	18.00	4231.44	

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

4. Water heating energy requirements

4. Water heating energy requirements											kWh/year		
Assumed occupancy, N											3.83	(42)	
Annual average hot water usage in litres per day Vd,average											125.13	(43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month													
137.64	132.64	127.63	122.62	117.62	112.61	112.61	117.62	122.62	127.63	132.64	137.64	(44)	
Energy content of hot water used													
204.12	178.52	184.22	160.61	154.11	132.98	123.23	141.40	143.09	166.76	182.03	197.68		
Energy content (annual)											1968.74	(45)	
Distribution loss													
30.62	26.78	27.63	24.09	23.12	19.95	18.48	21.21	21.46	25.01	27.30	29.65	(46)	
Cylinder volume, l							200.00						(47)
Manufacturer's declared cylinder loss factor (kWh/day)							2.10						(48)
Temperature Factor							0.5400						(49)
Energy lost from hot water cylinder (kWh/day)											1.13	(55)	
Total storage loss													
35.15	31.75	35.15	34.02	35.15	34.02	35.15	35.15	34.02	35.15	34.02	35.15	(56)	
Net storage loss													
35.15	31.75	35.15	34.02	35.15	34.02	35.15	35.15	34.02	35.15	34.02	35.15	(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													
262.53	231.28	242.63	217.14	212.52	189.51	181.64	199.82	199.62	225.18	238.56	256.09	(62)	
Output from water heater for each month, kWh/month													
262.53	231.28	242.63	217.14	212.52	189.51	181.64	199.82	199.62	225.18	238.56	256.09	(64)	
											2656.55	(64)	
Heat gains from water heating, kWh/month													
114.60	101.57	107.99	98.63	97.97	89.44	87.71	93.75	92.80	102.18	105.75	112.46	(65)	

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

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
229.71	229.71	229.71	229.71	229.71	229.71	229.71	229.71	229.71	229.71	229.71	229.71	(66)
Lighting gains												
216.44	192.24	156.34	118.36	88.48	74.69	80.71	104.91	140.81	178.79	208.68	222.46	(67)
Appliances gains												
1218.79	1231.44	1199.57	1131.72	1046.07	965.58	911.80	899.15	931.03	998.87	1084.52	1165.02	(68)
Cooking gains												
61.80	61.80	61.80	61.80	61.80	61.80	61.80	61.80	61.80	61.80	61.80	61.80	(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)												
-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	-153.14	(71)
Water heating gains												
154.03	151.14	145.14	136.98	131.68	124.22	117.88	126.01	128.89	137.34	146.88	151.16	(72)
Total internal gains												
1727.64	1713.20	1639.42	1525.43	1404.60	1302.87	1248.77	1268.44	1339.10	1453.38	1578.44	1677.00	(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 (NorthEast) SIDE	0.9 x 2.380	11.28 0.63 x 0.70	0.77	8.2067	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) SIDE	0.9 x 5.950	36.79 0.63 x 0.70	0.77	66.9058	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) FRONT	0.9 x 47.530	36.79 0.63 x 0.70	0.77	534.4593	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) REAR	0.9 x 16.440	11.28 0.63 x 0.70	0.77	56.6886	
Solid door FRONT	0.9 x 3.520	0.00 0.00 x 0.70	0.77	0.0000	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) REAR	0.9 x 29.120	11.28 0.63 x 0.70	0.77	100.4120	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) SIDE	0.9 x 1.820	36.79 0.63 x 0.70	0.77	20.4653	
Total solar gains, January				787.14	(83-1)
Solar gains					
787.14	1395.70	2055.5	2791.3	3349.6	3423.6
3259.8	2828.3	2308.0	1581.86	952.81	667.16
Total gains					
2514.8	3108.9	3694.9	4316.8	4754.3	4726.4
4508.6	4096.7	3647.1	3035.2	2531.3	2344.2

Lighting calculations

Area g FF x Shading

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

7. Mean internal temperature

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

Heating system responsiveness 0.75

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

tau

27.75	27.77	27.79	27.88	27.90	27.98	27.98	28.00	27.95	27.90	27.86	27.83
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

alpha

2.85	2.85	2.85	2.86	2.86	2.87	2.87	2.87	2.86	2.86	2.86	2.86
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

1.00	0.99	0.98	0.96	0.91	0.82	0.71	0.76	0.91	0.98	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

 (86)

Tweekday

18.62	18.82	19.17	19.65	20.13	20.53	20.73	20.69	20.35	19.72	19.08	18.58
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Tweekend

19.65	19.76	19.96	20.24	20.51	20.73	20.85	20.82	20.63	20.28	19.91	19.63
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

24 instead of 16

9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00
------	------	------	------	------	------	------	------	------	------	------	------

24 instead of 9

22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
-------	------	------	------	------	------	------	------	------	------	------	-------

16 instead of 9

0.00	20.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
------	-------	------	------	------	------	------	------	------	------	------	------

Mean internal temperature in living area T1

21.00	19.76	19.63	19.81	20.24	20.59	20.76	20.72	20.43	19.88	19.30	20.87
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (87)

Temperature during heating periods in rest of dwelling Th2

19.97	19.97	19.97	19.97	19.97	19.98	19.98	19.98	19.98	19.97	19.97	19.97
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (88)

Utilisation factor for gains for rest of dwelling

0.99	0.99	0.98	0.95	0.89	0.77	0.60	0.67	0.87	0.97	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

 (89)

Tweekday

17.13	17.38	17.83	18.44	19.05	19.52	19.74	19.70	19.32	18.54	17.72	17.08
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Tweekend

17.13	17.38	17.83	18.44	19.05	19.52	19.74	19.70	19.32	18.54	17.72	17.08
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Mean internal temperature in the rest of dwelling T2

19.97	17.38	17.83	18.44	19.05	19.52	19.74	19.70	19.32	18.54	17.72	19.69
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (90)

Living area fraction (38.51 / 835.84)

0.05 (91)

Mean internal temperature (for the whole dwelling)

20.02	17.49	17.91	18.51	19.10	19.57	19.78	19.75	19.37	18.60	17.79	19.75
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (92)

Apply adjustment to the mean internal temperature, where appropriate

20.02	17.49	17.91	18.51	19.10	19.57	19.78	19.75	19.37	18.60	17.79	19.75
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (93)

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

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.97	0.93	0.86	0.74	0.58	0.64	0.84	0.95	0.99	1.00	(94)
Useful gains												
2501.8	3059.5	3580.6	4032.2	4106.5	3492.5	2610.9	2617.4	3076.4	2898.6	2495.1	2333.9	(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												
14974.2	11986.9	10859.4	9108.3	7016.2	4696.3	3007.8	3158.6	4984.9	7583.6	10146.5	14769.1	(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												
9279.4	5999.2	5415.5	3654.8	2164.8	-	-	-	-	3485.6	5509.0	9251.8	
Total space heating requirement per year (kWh/year) (October to May)										44760.11		(98)
Space heating requirement per m ² (kWh/m ² /year)										53.55		(99)

8c. Space cooling requirement - not applicable

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

9a. Energy requirements

												kWh/year
No secondary heating system selected												
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main heating system												415.91% (206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
9279.4	5999.2	5415.5	3654.8	2164.8	-	-	-	-	3485.6	5509.0	9251.8	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
2231.1	1442.41	1302.06	878.74	520.50	-	-	-	-	838.07	1324.54	2224.5	(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>												
Water heating requirement												
262.53	231.28	242.63	217.14	212.52	189.51	181.64	199.82	199.62	225.18	238.56	256.09	(64)
Efficiency of water heater												471.49 (216)
471.49	471.49	471.49	471.49	471.49	471.49	471.49	471.49	471.49	471.49	471.49	471.49	(217)
Water heating fuel												
55.68	49.05	51.46	46.05	45.07	40.19	38.53	42.38	42.34	47.76	50.60	54.32	(219)
Annual totals												kWh/year
Space heating fuel used, main system 1												10761.89 (211)
Space heating fuel (secondary)												0.00 (215)
Water heating fuel												563.44 (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)												1528.97 (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												12854.31 (238)

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

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	10761.895	13.190	1419.49	(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	563.44	13.190	74.32	(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	1528.969	13.190	201.67	(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			1695.48	(255)

11a. SAP rating

	0.42	(256)
	0.81	(257)
SAP value	88.72	
	89	(258)
SAP band	B	

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

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	10761.89	0.519	5585.42	(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	563.44	0.519	292.43	(264)
Space and water heating			5877.85	(265)
Electricity for pumps and fans	0.00	0.519	0.00	(267)
Electricity for lighting	1528.97	0.519	793.53	(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			6671.38	(272)

	kg/m ² /year	
CO2 emissions per m²	7.98	(273)
El value	89.85	(273a)
El rating	90	(274)
El band	B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$(13.19 / 4.1591) \times (1 + (0.29 \times 0.25)) = 3.4013$, stars = 5
Main heating environmental impact	$(0.5190 / 4.1591) \times (1 + (0.29 \times 0.25)) = 0.1338$, stars = 5
Water heating energy efficiency	$13.19 / 4.7148 = 2.7975$, stars = 5
Water heating environmental impact	$0.52 / + (0.00 \times 0.52) = 0.1101$, stars = 5

Project Information

Building type Detached house

Reference

Date 15 September 2022

Email: NONE Project 63 Sheldon Avenue
LONDON
N6 4NH**REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England**

assessed by program JPA Designer version 6.05.063, printed on 08/11/2022 at 12:44:33

New dwelling as designed**1 TER and DER**

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

Target Carbon Dioxide Emission Rate

TER = 20.66

Dwelling Carbon Dioxide Emission Rate

DER = 8.34

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

TFEE = 63.2

Dwelling Fabric Energy Efficiency (DFEE)

DFEE = 54.2

OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

<u>Element</u>	<u>Average</u>	<u>Highest</u>	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

3 Air permeability

Air permeability at 50 pascals:

3.00

OK

Maximum :

10.00

4 Heating efficiency

Main heating system:

Air source heat pump, underfloor, electric

GD Midea MHC-V16W/D2N8-B

Source of efficiency: from boiler database

Secondary heating system:

None -

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
	Not significant	OK

Based on:

Thermal mass parameter :	113.87
Overshading :	Average or unknown (20-60 % sky blocked)
Orientation : SouthEast	
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 0.10 W/m²K
Pitched roofs insulated between rafters U-value 0.11 W/m²K
Pitched roofs with integrated insulation U-value 0.10 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K
Design air permeability 3.0 m³/h.m²
