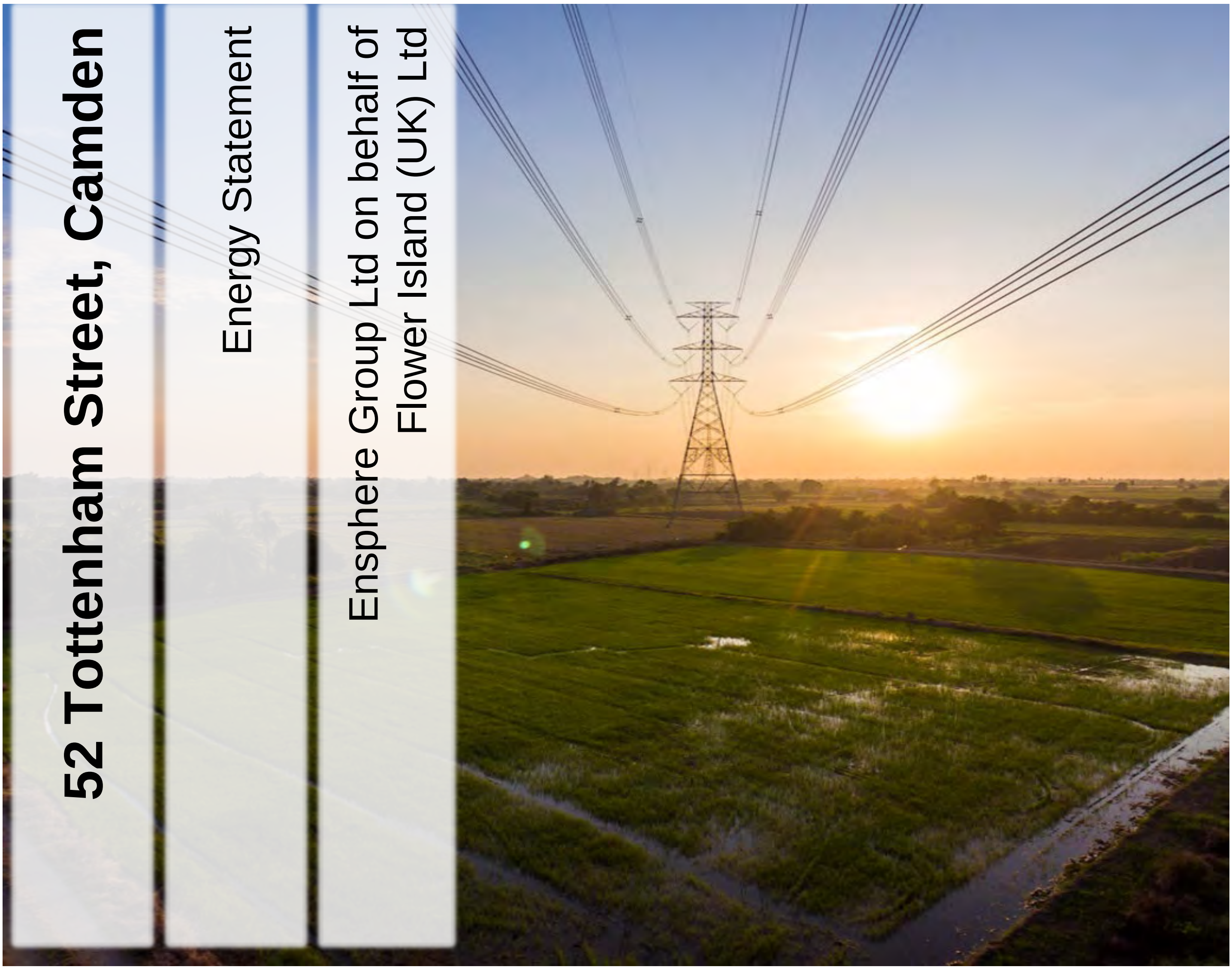

52 Tottenham Street, Camden

Energy Statement

Ensphere Group Ltd on behalf of Flower Island (UK) Ltd

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52 Tottenham Street

Energy Statement

Client Name: Flower Island (UK) Ltd)

Document Reference: 19-E007-006

Project Number: 19-E007

Quality Assurance Approval Status

This document has been prepared and checked in accordance with Ensphere Group Ltd's Quality Management System.

Issue:	Version:	Prepared by:	Reviewed by:	Date:
Final	V3	Patricia Waszkiewicz	Pete Jeavons	June 2022

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Contents

1. Executive Summary

1.1 This Energy Statement presents the energy strategy for a proposed scheme at 52 Tottenham Street, London, W1T 4RN.

1.2 Development proposals include the redevelopment of the site to 4No. residential flats above commercial. Consideration has primarily been given to the planning policy context and other requirements prior to establishing a strategy based upon the energy hierarchy; with a priority given to energy reduction and efficiency. Renewable and low carbon technologies have also been considered in the context of their technical feasibility and financial viability.

1.3 The following is therefore proposed:

- High performance building fabric and energy efficient lighting, services and controls to reduce energy demand for space heating, cooling, ventilation and lighting;
- Passive design measures to reduce energy demand.
- Air Source Heat Pumps (ASHPs) to provide space heating and hot water for the commercial space, as well as hot water to all flats;

1.4 The development will satisfy the Council target for a 20% carbon reduction relative to Part L 2013 (equivalent to the mandatory requirement under Code Level 4). A copy of the GLA Carbon Emission Reporting Spreadsheet is appended to this report outlining the savings at each stage of the Energy Hierarchy; and demonstrating a >15% saving with fabric alone and >35% saving overall.

1.5 The proposed energy strategy is considered consistent with the National Planning Policy Framework, London Plan and policies of the Council. When implemented, the scheme will provide an efficient and low carbon development.

2. Introduction

2.1 Ensphere Group Ltd was commissioned by Flower Island (UK) Ltd to produce an Energy Statement for the proposed redevelopment at 52 Tottenham Street, Camden.

Site and Surroundings

2.2 The Application Site ("the Site") is located on Tottenham Street, a connecting road between two much busier streets; Cleveland Street to the west and Charlotte Street to the east.

2.3 The Site is currently occupied by a four storey building, which was once part of a row of terrace houses.

Proposed Development

2.4 Development proposals include the redevelopment of the site, following demolition of the existing building, to provide a mixed use development comprising ground floor affordable workspace (Class B1), four residential units (Class C3) on the upper floors (3 x 1 Bed Units and 1 x 3 Bed Unit), alongside lower ground floor plant, cycle parking and refuse storage.

Report Objective

2.5 The purpose of the energy assessment is to demonstrate that the proposed climate change mitigation measures comply with energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

3. Assessment Methodology

3.1 The assessment methodology follows the Energy Hierarchy, on the basis that it is preferable to firstly minimise carbon dioxide emissions through reduced energy demand; prior to considering low carbon and renewable energy supply options.

3.2 The tiers of the Energy Hierarchy are:

- Be Lean — Demand Reduction
- Be Clean — Use Energy More Efficiently
- Be Green — Use Renewable Energy
- Be Seen — Monitor, Verify & Report

3.3 Where opportunities to improve the efficiency of the design have been maximised, consideration is then given to the second principle whereby priority is given to the efficient use of energy. This is on the basis that low carbon technologies can be cost-effective and provide significant carbon savings when compared to conventional technologies.

3.4 The third principle of the hierarchy promotes the use of renewable technologies. Whilst these technologies can be relatively expensive to install, they do offer the potential to significantly reduce carbon emissions.

3.5 Following the application of renewable technologies, the final tier of the Hierarchy requires monitoring, verification and reporting on energy performance.

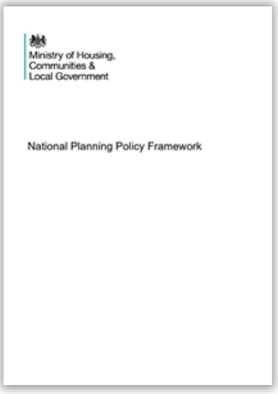
3.6 The following sections of the report review the planning policy requirements prior to establishing a baseline from which the principles of the Energy Hierarchy are applied.

4. Planning Context

4.1 Local planning policy relevant to sustainable development is considered below:

National Context

National Planning Policy Framework (2021)



4.2 The National Planning Policy Framework (NPPF) was updated in July 2021. Paragraph 7 of the revised NPPF includes reference to the following:

7. "The purpose of the planning system is to contribute to the achievement of sustainable development.

4.3 Chapter 14 of the NPPF includes consideration of climate change and the use and supply of renewable and low carbon energy. Paragraph 152 states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

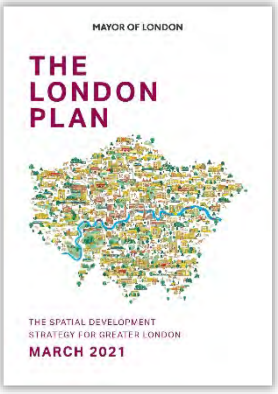
Planning Practice Guidance (2016; updated 2021)

- Climate Change - Advises how planning can identify suitable mitigation and adaption measures in plan-making and the application process to address the potential for climate change.

- Renewable and Low Carbon Energy - Guidance to help local councils in developing policies for renewable and low carbon energy and identifies the planning considerations.

London Context

London Plan (2021)



4.4 The London Plan is the overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for development of London over the next 20-25 years. The London Plan is part of the Development Plan and covers a range of planning issues. The presented policies provide a vision for how London should sustainably grow and develop in the future. Policies considered pertinent to this report are presented below:

- Policy SI 1 *(Improving air quality)* – Development proposals should not lead to further deterioration of existing poor air quality.

- Policy SI 2 *(Minimising greenhouse gas emissions)* - Major development should be net zero-carbon and minimise emissions in accordance with the following energy hierarchy: be lean, be clean, be green, be seen. A minimum on site reduction of 35% beyond Building Regulations will be required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Any short fall with the zero-carbon target should be addressed through a carbon offset payment. Development referable to the GLA should also calculate whole life-cycle carbon emissions.

- Policy SI 3 *(Energy infrastructure)* - Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system.

- Policy SI 4 *(Managing heat risk)* - Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems.

Energy Assessment Guidance (2022)

4.5 This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor as set out in London Plan Policy SI 2. It states that the purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy.

4.6 Although primarily aimed at strategic planning applications, London boroughs are encouraged to apply the same structure for energy assessments related to non-referable applications and adapt it for relevant scales of development.

Local Context

Camden Local Plan (July 2017)

4.7 The Local Plan sets out the planning policies, site allocations and land designations Borough-wide and is the central document in the Borough's Development Plan.

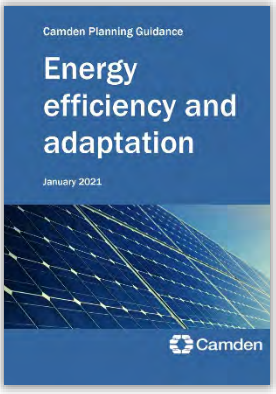
4.8 The following policies are considered relevant to this report:

- Policy CC1 (*Climate Change Mitigation*) – promotes zero carbon development, consideration of the Energy Hierarchy (encouraging connection to District Energy Networks), reduced reliance on transport by car and resource efficiency. All new residential development will be required to demonstrate a 19% CO2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). The Council will expect developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation, unless it can be demonstrated that such provision is not feasible;

- Policy CC2 (*Adapting to Climate Change*) – requires development to seek to protect existing green space, use of SUDS, incorporating biodiverse roofs, consideration of overheating risks, encourages the use of the Home Quality Mark and Passivhaus Standards along with BREEAM "excellent" for non-domestic and refurbishment developments >500sqm and/or five or more dwellings;

- Policy CC4 *(Air quality)* - Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution, with recommended measures adopted. In locations of poor air quality, developments that introduce sensitive receptors (i.e. housing, schools) will also need to be designed to mitigate the impact;

Camden Planning Guidance – Energy Efficiency & Adaptation (January 2021)



4.9 This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.

4.10 Includes requirements concerning credits under certain BREEAM categories (60% energy, 60% water and 40% materials); and reference the 20% renewables target.

4.11 Where developments are likely to be at risk of overheating applicants will be required to complete dynamic thermal modelling to demonstrate that any risk to overheating has been mitigated.

4.12 Based on the type of technology proposed, the guidance lists the Council's expectations and requirements. For example, if ASHP were considered, the Council expects carbon calculations to show that that their use for heating is more efficient than gas and that they have a COP of more than 4.

5. Baseline Emissions

5.1 This section establishes the baseline position from which carbon savings are to be achieved. For the purposes of this assessment, and in line with GLA and local authority policies and guidance, the baseline position equates to regulated carbon dioxide emissions, assuming compliance with Part L 2013 of the Building Regulations, as calculated using approved compliance software.

5.2 When determining this baseline, it has been assumed that heating would be provided by gas boilers and there will be no active cooling system.

5.3 Regulated emissions are emissions which are covered by the Building Regulations and include the energy consumed in the operation of the space heating / cooling and hot-water systems, ventilation and internal lighting.

5.4 Unregulated emissions (i.e. those associated with cooking and all electrical appliances and other small power) have been separately calculated.

5.5 All emissions have been assessed using the SAP10 carbon factors. Non-domestic unregulated emissions have been taken from the unregulated emissions values generated by the SBEM models; the domestic unregulated emissions calculated using BREDEM (BRE Domestic Energy Model).

Table 5.1 Carbon Dioxide Emissions (SAP10) – Baseline (Residential)

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013	4.4	2.8

Table 5.2 Carbon Dioxide Emissions (SAP10) – Baseline (Non-Domestic)

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013	1.6	4.2

6. Demand Reduction (Be Lean)

6.1 This section considers features of the proposed design (including indicative performance levels) relevant to passive design and energy efficiencies.

Passive Design

6.2 Passive design seeks to maximise the use of natural sources of heating, cooling and ventilation to maintain thermal comfort levels within the building.

Building Massing & Orientation

6.3 The building comprises flatted accommodation, reducing surface area and increasing the number of sheltered sides. This will help limit heat losses.

6.4 The site size and proximity of neighbouring properties limits the orientation options with glazing being located on the southern side.

Passive Heating & Cooling

6.5 Balconies and the louvres will provide a degree of solar shading; limiting solar gains.

Daylighting

6.6 Access to daylight is predominantly from the south side of the proposed development and larger windows are proposed on this elevation to improve light levels internally. Lower elevations may experience a degree of shading from properties on the southern side of Tottenham Street.

Fabric Efficiency

6.7 Fabric efficiency concerns the thermal properties associated with the building fabric and construction.

Insulation

6.8 Heat Transfer Coefficients, otherwise referred to as U-Values, are a measure of the rate of heat transfer through a building element over a given area, under standardised conditions (i.e. the rate at which heat is lost or gained through a fabric).

6.9 It is intended that the performance of the building fabric will incorporate relatively low U-Values to reduce the rate at which the buildings lose heat, preserving the heat within the space and reducing the requirement for mechanical heating.

Table 6.1 Proposed Building Fabric U-Values

Fabric Element	Part L1A (W/m^2K)	Proposed (W/m^2K)
External Wall	0.30	0.18
Roof	0.20	0.13
Ground Floor	0.25	0.13
Windows	2.00 (including frame)	1.4 (double glazed)

Air Tightness

6.10 A high level of air tightness is proposed and a level below $4m^3/h/m^2$ is targeted, meaning that air infiltration between the internal and the external environment will be largely controlled and space heating demand further reduced.

Thermal Bridging

6.11 Thermal bridging is the penetration of the insulation layer by a highly conductive non-insulating material allowing rapid heat transfer from an interior to exterior environment (and vice versa). In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges.

6.12 The building fabric shall be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements. A "Y" value of 0.04 has been assumed for the purposes of the indicative SAPs and it is expected that there will be a betterment on Accredited Construction Details (ACDs) values.

System Efficiencies

Heating Systems

6.13 It is proposed to incorporate conventional gas-fired boilers where low carbon and renewable technologies are not deemed feasible or viable (see sections below).

6.14 Where employed, boiler efficiencies in excess of 89.5% will be targeted. It is expected that boilers will be gas-fired condensing combi with automatic ignition with heat distributed via radiator or underfloor heating.

Cooling Systems

6.15 It is proposed to incorporate mechanical cooling as contingency against hotter summers and to ensure comfort.

Ventilation

6.16 It is expected that ventilation will be based on the whole house approach as defined in Approved Document Part L2 with Mechanical Ventilation Heat Recovery (MVHR) units to be installed in all apartments.

Extract Fans

6.17 It is anticipated that extract fans will be employed in WC and kitchen areas. The specific fan power (SFP) for these systems will be efficient and target a power consumption rate of 0.3W/l/s.

Metering

6.18 The major energy uses shall be monitored via separate “smart” energy meters with time and temperature zone control.

Lighting Efficiency

6.19 At this stage, detailed lighting design calculations have not yet been undertaken, but lighting design is intended to be highly efficient and in excess of Building Standards requirements. In the domestic components it is intended that lighting efficacy shall be in excess of 100lumens/circuit Watt (likely predominantly LED).

6.20 Lighting controls (e.g. PIR occupancy sensors) shall be employed throughout the common areas to further reduce the energy consumption for artificial lighting.

Domestic Appliances

6.21 Within the residential apartments, domestic appliances such as fridges, freezers and domestic dishwashers shall be specified in consideration of their energy performance; the EU energy label of these appliances shall be A+ or greater.

Overheating Mitigation

6.22 The issue of overheating will need detailed and considered assessment at a later stage of design on the basis that, as buildings become progressively better sealed and insulated, the potential for overheating increases. However, given that the buildings will have large openable windows as well as the potential for mechanical cooling, it is considered probably that the risk will be mitigated.

6.23 The following is, nevertheless, relevant:

Limiting Summer External Gains

6.24 The following shall be considered in conjunction and interrelationship with the ventilation strategy, to ensure thermal comfort for occupants and energy savings.

- Solar control glazing shall be installed to the elevations most affected; the precise specification of glazing types for windows and glazed curtain walling is to be based upon further analysis at later stages so that the appropriate balance is found between limiting summer heat gains without compromising daylight harvesting and winter solar gains.

- Thermal mass (discussed above) and internal occupant-controlled shading elements will be considered at the more detailed design stage along with heat reflective finishes of the external building surfaces.

Limiting Internal Heat Gains

6.25 Heat losses from the Hot Water and Low Temperature Hot Water (LTHW) distribution network are considered to be a significant source of potential overheating in well insulated buildings. This issue can be a significant factor affecting comfort and will therefore need full consideration during the detailed design of the mechanical systems.

6.26 However, it is expected that attention will be given to:

- The positioning of the distribution network and its potential impact on surrounding spaces;
- The (mechanical) ventilation of spaces where heating pipework is distributed (e.g. corridors);
- The implementation of combined passive/active ventilation systems for air exhaust of spaces into corridors and to the outside;
- Maximising the natural ventilation potential of spaces;
- The performance of the insulation, with calculations undertaken assessing heat losses from the pipework relative to the heat losses from the spaces.

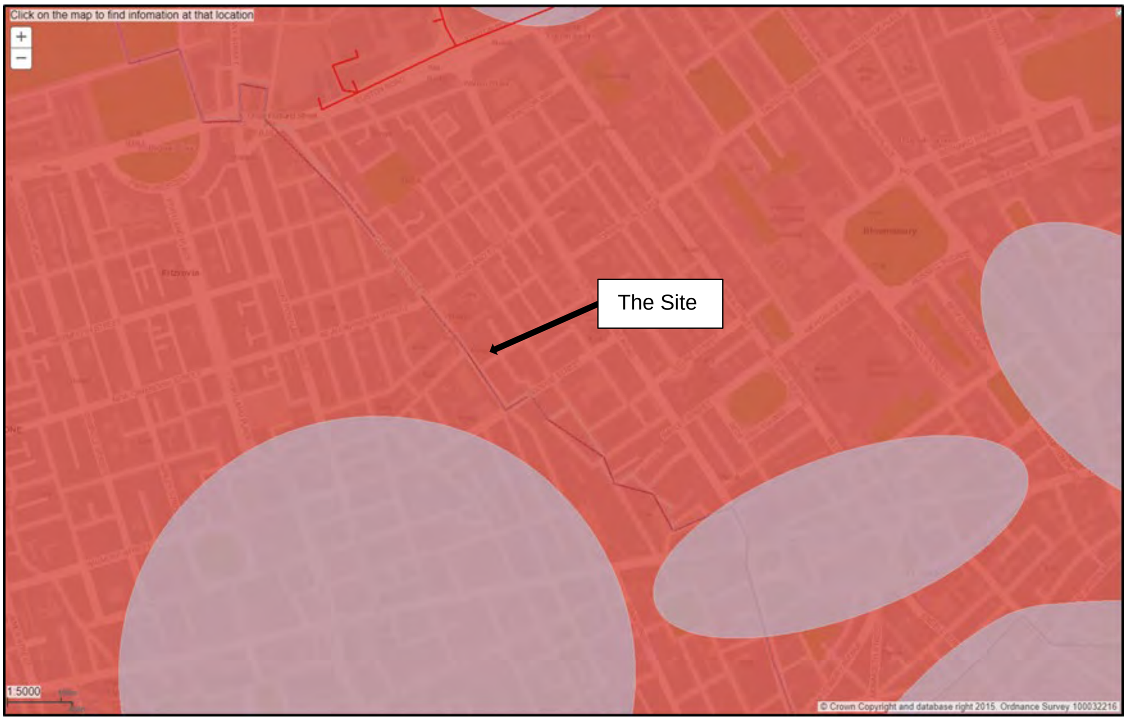
7. Heating Infrastructure (Be Clean)

District Energy Networks (DEN)

7.1 The term “district energy” applies to the energy distribution network, rather than the origins of the energy and the extent of any carbon savings will be largely determined by the energy source and heat losses on the network.

7.2 The London Heat Map is a tool provided by the Mayor of London to identify opportunities for decentralised energy projects in London and it builds on the 2005 London Community Heating Development Study.

Figure 7.1 Extract from the London Heat Map



7.3 The above extract from The London Heat Map shows the site located in an area of high heat density. The wider area, as with much of central London, is defined as being a Heat Network Priority Area. However, the Site is not within a zone defined as Heat Mapping Decentralised Energy Potential (purple shading).

7.4 No existing District Energy Networks (DEN) have been identified in close proximity to the site. The nearest potential network runs along Euston Road (red lines on the above image), circa 650m to the north.

District Energy Appraisal

7.5 In the absence of a DEN in close proximity to the Site and small heating demand, it is not proposed to accommodate DEN as part of the energy strategy.

Combined Heat & Power (CHP)

7.6 Combined Heat & Power (CHP) systems generate electrical energy and provide the waste heat from the process to be used on site. They are typically gas-fired but can be run off alternative fuel sources. CHP is a highly efficient means to supply heat in developments, providing significant carbon savings and wider environmental benefits (the power generation is much less resource intensive and carbon emitting compared to grid electricity from the average UK power station).

CHP Appraisal

7.7 Whilst the site has a heating demand, it is modest and likely subject to daily / weekly / yearly fluctuation due to occupancy patterns. At this scale, it is generally not economic to install CHP as smaller CHPs tend to have lower electrical efficiencies and therefore higher carbon emissions. CHP also tends to emit higher levels of NO_x than other heating systems; potentially adversely impacting local air quality.

7.8 A centralised CHP plant would create complex managerial arrangements and the administrative burden of managing CHP electricity sales to grid when the power is not required on site; combined with the relatively low unit price for small volumes of exported CHP electricity can create incentives for the CHP to be installed but not operated. CHP is therefore not proposed.

8. Renewable Energy (Be Green)

8.1 Renewable technologies are those which take their energy from sources which are considered to be inexhaustible (e.g. sunlight, wind etc.). Emissions associated with renewables are generally considered to be negligible and the technologies are frequently referred to as "zero carbon".

Biomass Systems

8.2 Biomass systems are heating systems that use agricultural, forest, urban and industrial residues and waste to produce heat and (depending on the system) electricity. At the building scale, biomass boilers using wood pellets or woodchips are the norm. Biomass should be sourced locally to limit "embodied carbon" associated with transport and ideally be derived from waste wood products to limit the take-up of agricultural land for fuel crops.

Biomass Appraisal

8.3 Whilst technically feasible, the site is in an urban setting and the absence of a readily available and diverse local fuel source creates risk associated with security of fuel supply. This has implications for operational viability.

8.4 Carbon emissions associated with cultivation, processing and transport of biomass are not normally considered in the context of planning or Building Regulations meaning that total carbon emissions are likely to be significantly higher than estimated. Biomass is also likely to cause other air quality impacts (e.g. particulates), which have implications for local air quality.

8.5 Biomass is therefore not a preferred technology for the scheme.

Heat Pumps

8.6 Heat pumps draw thermal energy from the air, water or ground ("source") and upgrade it to be used as useful heat at another location ("sink"). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the "sink".

8.7 Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun.

8.8 Reversible systems can provide air conditioning comfort cooling; however, when in cooling mode, the system is not considered renewable as it is not taking advantage of a renewable source of energy.

Heat Pump Appraisal

8.9 ASHPs are therefore proposed on hot water to limit carbon emissions associated with the residential development in operation.

Micro Hydro Power

8.10 Micro hydro power systems harness energy from flowing water by using height differences (called “head”); the minimum allowable head is 1.5m and ideally not lower than 10m.

Micro Hydro Appraisal

8.11 There is no surface water course immediately accessible to the site. Micro hydro is therefore not considered an option for the site, for technical feasibility reasons.

Micro Wind Power

8.12 Wind turbines are used to generate electricity; with power production determined by the rotation of the blades and being proportionate to the speed of their rotation. The technology is most efficient for constant, low turbulence wind profiles.

Micro Wind Appraisal

8.13 Whilst wind turbines are considered technically feasible in a limited capacity, wind speeds are relatively low and subject to turbulence. The technology is therefore likely to underperform;

8.14 Given the uncertainty over performance, the fact that any contribution will likely be quite minor, micro wind turbines are not proposed for the development.

Solar Systems

8.15 Both solar thermal and photovoltaic (PV) systems convert energy from the sun into a form which can be applied within the building. Solar thermal generates energy for heating (usually for hot water) and PV generates electricity. Hybrid photovoltaic / solar thermal collectors are also available and co-generate heat and power.

Solar System Appraisal

8.16 The absence of suitable roof space prohibits the application of these technologies.

9. Summary

9.1 This Energy Statement provides an overview of the energy strategy in consideration of the site context, anticipated energy requirements and local priorities and initiatives.

9.2 A review of Camden Council's planning policies has identified a number of requirements relating to energy. Of these, Local Plan policy CC1 (*Climate Change Mitigation*) is considered most pertinent along with Camden Planning Guidance – *Sustainability* (CPG3). Consideration has also been given to the NPPF and GLA's London Plan and the targets contained therein.

9.3 The approach follows the Energy Hierarchy and the buildings' fabric shall be constructed to a high-performance standard, achieving high levels of thermal insulation and low air permeability. Energy efficient lighting and appropriate controls shall be employed throughout the development.

9.4 The opportunity for the incorporation of renewables has been maximised and use of ASHP on hot water is proposed to limit carbon emissions associated with the residential development in operation.

Carbon Savings – Residential

9.5 Energy modelling has been undertaken using SAP and SBEM and the carbon savings delivered by each of the three steps of the Energy Hierarchy have been estimated (indicative outputs are included in the appendices).

Table 9.1 CO_2 Emissions after Each Stage of the Energy Hierarchy (SAP10) (Residential)

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013	4.4	2.8
After energy demand reduction	3.7	2.8
After CHP	3.7	2.8
After renewable energy	2.1	2.8

Table 9.2 Regulated CO_2 Savings from Each Stage of the Energy Hierarchy (Residential)

	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	%
Savings from energy demand reduction	0.8	17%
Savings from CHP	0.0	0%
Savings from renewable energy	1.6	36%
Total Cumulative Savings	2.4	53%

Carbon Savings – Non-Domestic

Table 9.3 CO_2 Emissions after Each Stage of the Energy Hierarchy (SAP10) (Non-Domestic)

Step	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013	1.6	4.2
After energy demand reduction	1.4	4.2
After CHP	1.4	4.2
After renewable energy	0.8	4.2

Table 9.4 Regulated CO_2 Savings from Each Stage of the Energy Hierarchy (Non-Domestic)

	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	%
Savings from energy demand reduction	0.2	10%
Savings from CHP	0.0	0%
Savings from renewable energy	0.6	37%
Total Cumulative Savings	0.8	48%

9.6 The development will satisfy the Council target for a 20% carbon reduction relative to Part L 2013 (equivalent to the mandatory requirement under Code Level 4). A copy of the GLA Carbon Emission Reporting Spreadsheet is appended to this report outlining the savings at each stage of the Energy Hierarchy; and demonstrating a >15% saving with fabric alone and >35% saving overall.

9.7 Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework, London Plan and policies of the Council. When implemented, the scheme will provide an efficient and low carbon development.

Appendices

A. Site Plans


Basement Plan
1 : 50
Ground Floor Plan
1 : 50
30 Cleveland Street
Arthur Stanley House
Tottenham Street
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1m
5m
N
PLANNING
rev
date
author / check
comments
DSDHA
357 Kennington Lane London SE11 5QY
F 020 7703 3800
W www.dsdha.co.uk
project
52 Tottenham Street
London, W1T 4RN
drawing title
GA Plan - Level B1 & 00
drawn
size
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drawing number
revision
297 _P20.100
A

B. Key Local Planning Policy Requirements

London Planning Policy Framework

Camden Local Plan (July 2017)

The Local Plan was adopted by Council on 3 July 2017 and has replaced the Core Strategy and Camden Development Policies documents as the basis for planning decisions and future development in the borough. Policies relevant to this report are presented below:

Policy G1 Delivery and Location of Growth [extract]

The Council will create the conditions for growth to deliver the homes, jobs, infrastructure and facilities to meet Camden's identified needs and harness the benefits for those who live and work in the borough.

Delivery of Growth

The Council will deliver growth by securing high quality development and promoting the most efficient use of land and buildings in Camden by:

a) Supporting development that makes best use of its site, taking into account quality of design, its surroundings, sustainability, amenity, heritage, transport accessibility and any other considerations relevant to the site;

[…]

Policy D1 Design [extract]

The Council will seek to secure high quality design in development. The Council will require that development:

[…]

c) Is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation;

d) is of sustainable and durable construction and adaptable to different activities and land uses;

[…]

Policy D2 Heritage [extract]

The Council will preserve and, where appropriate, enhance Camden's rich and diverse heritage assets and their settings, including conservation areas, listed buildings, archaeological remains, scheduled ancient monuments and historic parks and gardens and locally listed heritage assets.

[…]

Listed Buildings

Listed buildings are designated heritage assets and this section should be read in conjunction with the section above headed 'designated heritage assets'. To preserve or enhance the borough's listed buildings, the Council will:

i) resist the total or substantial demolition of a listed building;

j) resist proposals for a change of use or alterations and extensions to a listed building where this would cause harm to the special architectural and historic interest of the building; and

k) resist development that would cause harm to significance of a listed building through an effect on its setting.

Policy CC1 Climate Change Mitigation

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

We will:

a) Promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b) Require all major development to demonstrate how London Plan targets for carbon dioxide have been met;

c) Ensure that the location of the development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d) Support and encourage sensitive energy efficiency improvements to existing buildings;

e) Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f) Expect all developments to optimise resource efficiency.

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

g) Working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h) Protecting existing decentralised energy networks (e.g. at Gower Street Bloomsbury, Kings Cross, Gospel Oak, and Somers Town) and safeguarding potential network routes; and

i) Requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

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

Policy CC2 Adapting to Climate Change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a) The protection of existing green spaces and promoting new appropriate green infrastructure;

b) Not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems;

c) Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d) Measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units of 500sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

<u>Sustainable Design and Construction Measures</u>

The Council will promote and measure sustainable design and construction by:

e) Ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f) Encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g) Encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve “excellent” in BREEAM domestic refurbishment; and

h) Expecting non-domestic developments of 500sqm of floorspace or above to achieve “excellent” in BREEAM assessments and encouraging zero carbon in new developments from 2019.

Policy CC3 Water and flooding

The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.

We will require development to:

a) incorporate water efficiency measures;

b) avoid harm to the water environment and improve water quality;

c) consider the impact of development in areas at risk of flooding (including drainage);

d) incorporate flood resilient measures in areas prone to flooding;

e) utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and

f) not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore

Policy CC4 Air quality

The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

Policy CC5 Waste

The Council will seek to make Camden a low waste borough.

We will:

a) aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;

b) deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;

c) safeguard Camden's existing waste site at Regis Road unless a suitable compensatory waste site is provided that replaces the maximum throughput achievable at the existing site; and

d) make sure that developments include facilities for the storage and collection of waste and recycling.

Policy DM1 Delivery and Monitoring [extract]

The Council will deliver the vision, objectives and policies of the Local Plan by:

[…]

d) Using planning contributions where appropriate to:

i. Support sustainable development;

C. GLA Carbon Emissions Reporting Spreadsheet

ensphere

SAP 2012 Performance	SAP 10.0 Performance

Domestic

SAP 2012 Performance

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

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	5.1	6.2
After energy demand reduction (be lean)	4.7	6.2
After heat network connection (be clean)	4.7	6.2
After renewable energy (be green)	4.6	6.2

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

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.3	6%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.1	3%
Cumulative on site savings	**0.5**	**9%**
Annual savings from off-set payment	4.6	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**138**	-
Cash in-lieu contribution (£)	**13,149**	

*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

SAP 10.0 Performance

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

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	4.4	2.8
After energy demand reduction (be lean)	3.7	2.8
After heat network connection (be clean)	3.7	2.8
After renewable energy (be green)	2.1	2.8

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

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	0.8	17%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	1.6	36%
Cumulative on site savings	**2.4**	**53%**
Annual savings from off-set payment	2.1	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**62**	-
Cash in-lieu contribution (£)	**5,903**	

*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-domestic

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

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	2.2	9.4
After energy demand reduction (be lean)	2.1	9.4
After heat network connection (be clean)	2.1	9.4
After renewable energy (be green)	1.8	9.4

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

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.1	4%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.3	14%
Total Cumulative Savings	**0.4**	**18%**
Annual savings from off-set payment	1.8	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**55**	-
Cash in-lieu contribution (£)	**5,232**	

*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

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

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	1.6	4.2
After energy demand reduction (be lean)	1.4	4.2
After heat network connection (be clean)	1.4	4.2
After renewable energy (be green)	0.8	4.2

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

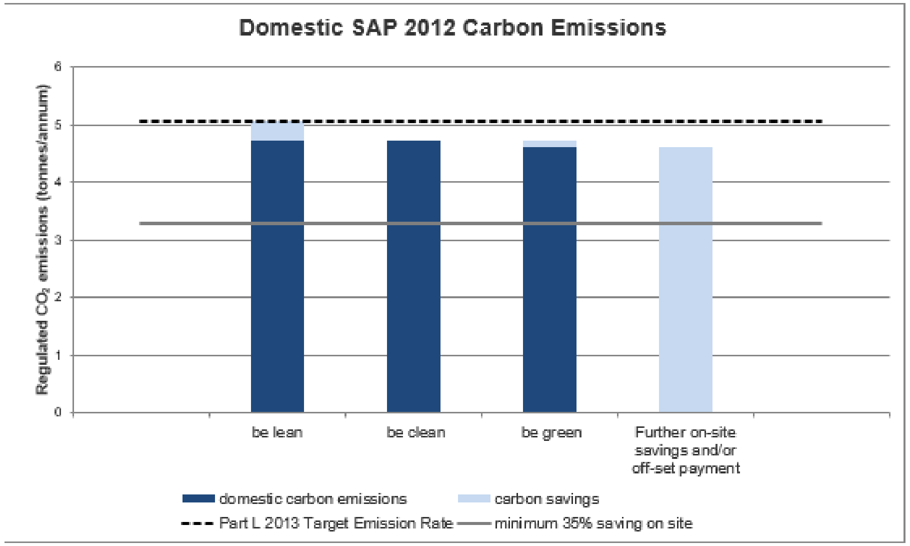
	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.2	10%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	37%
Total Cumulative Savings	**0.8**	**48%**
Annual savings from off-set payment	0.8	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**25**	-
Cash in-lieu contribution (£)*	**2,349**	

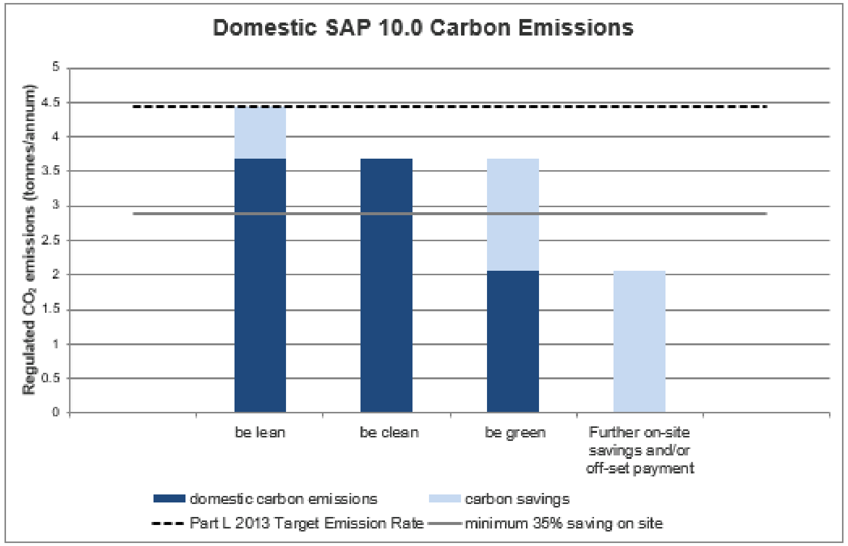
*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

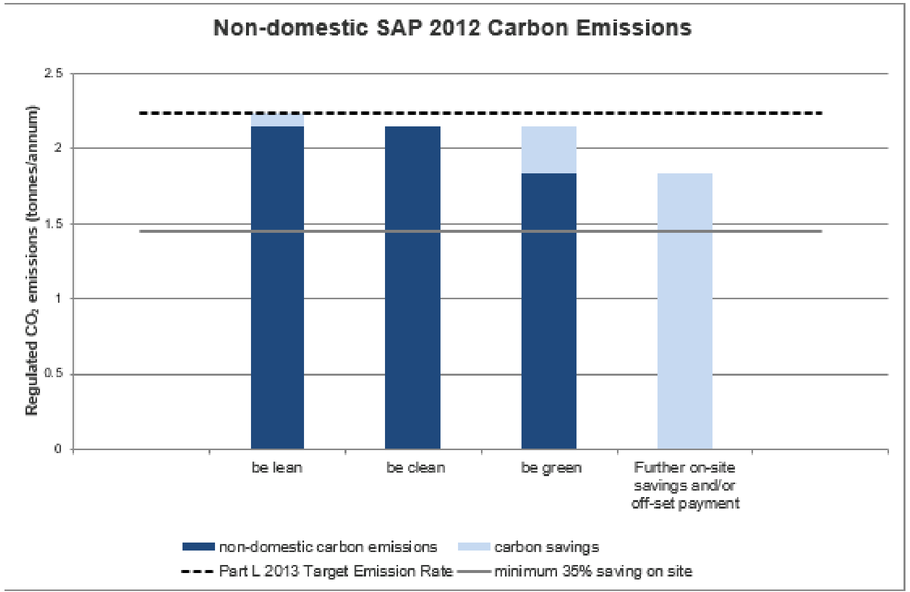
SITE-WIDE

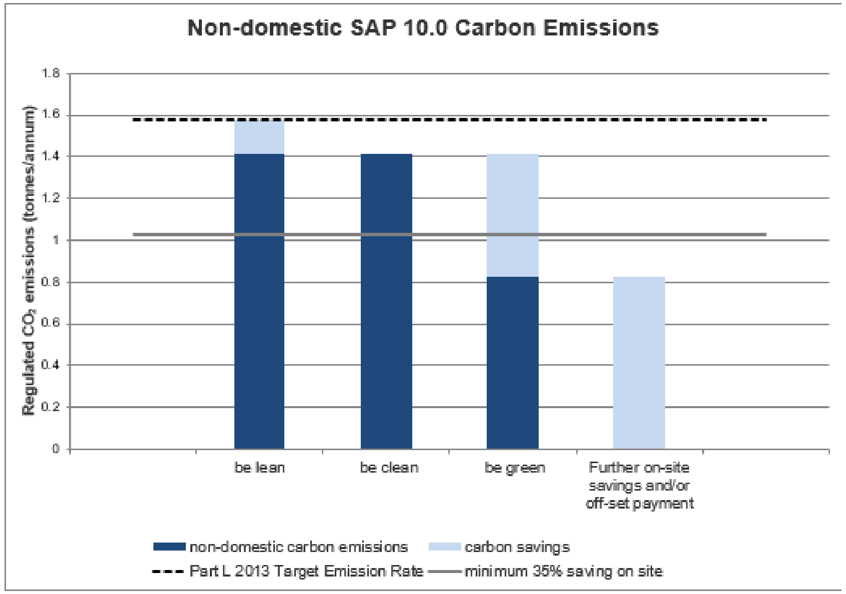
	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	7.3		
Be lean	6.9	0.4	6%
Be clean	6.9	0.0	0%
Be green	6.4	0.4	6%
Total Savings	-	0.9	12%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**193.5**	-

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	6.0		
Be lean	5.1	0.9	15%
Be clean	5.1	0.0	0%
Be green	2.9	2.2	37%
Total Savings	-	3.1	52%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**86.9**	-


Domestic SAP 2012 Carbon Emissions
Regulated CO_2 emissions (tonnes/annum)
0
1
2
3
4
5
6
be lean
be clean
be green
Further on-site savings and/or off-set payment
domestic carbon emissions
carbon savings
Part L 2013 Target Emission Rate
minimum 35% saving on site


Domestic SAP 10.0 Carbon Emissions
Regulated CO_2 emissions (tonnes/annum)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
be lean
be clean
be green
Further on-site savings and/or off-set payment
domestic carbon emissions
carbon savings
Part L 2013 Target Emission Rate
minimum 35% saving on site


Non-domestic SAP 2012 Carbon Emissions
Regulated CO_2 emissions (tonnes/annum)
0
0.5
1
1.5
2
2.5
be lean
be clean
be green
Further on-site savings and/or off-set payment
non-domestic carbon emissions
carbon savings
Part L 2013 Target Emission Rate
minimum 35% saving on site


Non-domestic SAP 10.0 Carbon Emissions
Regulated CO_2 emissions (tonnes/annum)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
be lean
be clean
be green
Further on-site savings and/or off-set payment
non-domestic carbon emissions
carbon savings
Part L 2013 Target Emission Rate
minimum 35% saving on site

D. Indicative Energy Model Outputs (Be Lean)

ensphere

DER WorkSheet: New dwelling design stage

User Details

Assessor Name:		**Stroma Number:**	
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.51

Property Address: WLC Proposed MF

Address : 52 Tottenham Street, LONDON, W1T 4RN

1. Overall dwelling dimensions:

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Ground floor	38	(1a) x	2.6	(2a) =	98.8	(3a)
First floor	31	(1b) x	2.6	(2b) =	80.6	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	179.4	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m^3 per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent 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)

DRAFT

				Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		1.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.08	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.07	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

DER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.07	0.07	0.08	0.08

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	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
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	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
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(25)

3. Heat losses and heat loss parameter:

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ELEMENT	Gross area (m^2)	Openings m^2	Net Area A ,m^2	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			14.28	x1/[1/(1.4)+ 0.04]	=	18.93			(27)
Windows Type 2			14.28	x1/[1/(1.4)+ 0.04]	=	18.93			(27)
Walls Type1	14.28	14.28	0	x 0.18	=	0			(29)
Walls Type2	14.28	14.28	0	x 0.18	=	0			(29)
Total area of elements, m^2			28.56						(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)...(30) + (32) =	37.86	(33)
Heat capacity Cm = S(A x k)	((28)...(30) + (32) + (32a)...(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		1.15	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	39.01	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	12.19	12.09	11.99	11.47	11.37	10.86	10.86	10.76	11.06	11.37	11.58	11.78	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	51.21	51.1	51	50.49	50.39	49.87	49.87	49.77	50.08	50.39	50.59	50.8	

Average = Sum(39)1...12 /12= 50.46 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	0.74	0.74	0.74	0.73	0.73	0.72	0.72	0.72	0.73	0.73	0.73	0.74	

Average = Sum(40)1…12 /12= 0.73 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.22 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 91.54 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	100.69	97.03	93.37	89.71	86.05	82.39	82.39	86.05	89.71	93.37	97.03	100.69	

Total = Sum(44)1…12 = 1098.48 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	149.33	130.6	134.77	117.5	112.74	97.29	90.15	103.45	104.68	122	133.17	144.61	

Total = Sum(45)1…12 = 1440.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	22.4	19.59	20.22	17.62	16.91	14.59	13.52	15.52	15.7	18.3	19.98	21.69	(46)

Water storage loss:

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

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage 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/year — (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(61)m=	50.96	44.66	47.58	44.24	43.85	40.63	41.98	43.85	44.24	47.58	47.85	50.96	(61)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(62)m=	200.29	175.26	182.35	161.74	156.59	137.91	132.13	147.3	148.92	169.58	181.02	195.57	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(64)m=	200.29	175.26	182.35	161.74	156.59	137.91	132.13	147.3	148.92	169.58	181.02	195.57	

Output from water heater (annual)1…12 — 1988.66 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(65)m=	62.39	54.59	56.71	50.13	48.45	42.5	40.47	45.36	45.87	52.46	56.24	60.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	17.38	15.44	12.55	9.5	7.1	6	6.48	8.42	11.31	14.36	16.76	17.86	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	194.95	196.97	191.88	181.02	167.32	154.45	145.85	143.82	148.92	159.77	173.47	186.35	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	(71)
Water heating gains (Table 5)													
(72)m=	83.86	81.24	76.22	69.62	65.12	59.03	54.4	60.97	63.7	70.51	78.11	81.75	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	362.51	359.97	346.97	326.47	305.87	285.81	273.05	279.54	290.26	310.97	334.67	352.29	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.3	x	14.28	x	36.79	x	0.76	x	0.8	=	86.25	(77)
Southeast	0.9x	0.3	x	14.28	x	36.79	x	0.76	x	0.8	=	86.25	(77)
Southeast	0.9x	0.3	x	14.28	x	62.67	x	0.76	x	0.8	=	146.92	(77)
Southeast	0.9x	0.3	x	14.28	x	62.67	x	0.76	x	0.8	=	146.92	(77)
Southeast	0.9x	0.3	x	14.28	x	85.75	x	0.76	x	0.8	=	201.02	(77)

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Southeast	0.9x	0.3	x	14.28	x	85.75	x	0.76	x	0.8	=	201.02	(77)
Southeast	0.9x	0.3	x	14.28	x	106.25	x	0.76	x	0.8	=	249.08	(77)
Southeast	0.9x	0.3	x	14.28	x	106.25	x	0.76	x	0.8	=	249.08	(77)
Southeast	0.9x	0.3	x	14.28	x	119.01	x	0.76	x	0.8	=	278.99	(77)
Southeast	0.9x	0.3	x	14.28	x	119.01	x	0.76	x	0.8	=	278.99	(77)
Southeast	0.9x	0.3	x	14.28	x	118.15	x	0.76	x	0.8	=	276.97	(77)
Southeast	0.9x	0.3	x	14.28	x	118.15	x	0.76	x	0.8	=	276.97	(77)
Southeast	0.9x	0.3	x	14.28	x	113.91	x	0.76	x	0.8	=	267.03	(77)
Southeast	0.9x	0.3	x	14.28	x	113.91	x	0.76	x	0.8	=	267.03	(77)
Southeast	0.9x	0.3	x	14.28	x	104.39	x	0.76	x	0.8	=	244.71	(77)
Southeast	0.9x	0.3	x	14.28	x	104.39	x	0.76	x	0.8	=	244.71	(77)
Southeast	0.9x	0.3	x	14.28	x	92.85	x	0.76	x	0.8	=	217.66	(77)
Southeast	0.9x	0.3	x	14.28	x	92.85	x	0.76	x	0.8	=	217.66	(77)
Southeast	0.9x	0.3	x	14.28	x	69.27	x	0.76	x	0.8	=	162.38	(77)
Southeast	0.9x	0.3	x	14.28	x	69.27	x	0.76	x	0.8	=	162.38	(77)
Southeast	0.9x	0.3	x	14.28	x	44.07	x	0.76	x	0.8	=	103.31	(77)
Southeast	0.9x	0.3	x	14.28	x	44.07	x	0.76	x	0.8	=	103.31	(77)
Southeast	0.9x	0.3	x	14.28	x	31.49	x	0.76	x	0.8	=	73.81	(77)
Southeast	0.9x	0.3	x	14.28	x	31.49	x	0.76	x	0.8	=	73.81	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	172.5	293.84	402.04	498.15	557.97	553.94	534.05	489.43	435.33	324.75	206.62	147.63	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	535.02	653.81	749.02	824.62	863.84	839.74	807.1	768.96	725.59	635.72	541.29	499.92	(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, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.95	0.87	0.72	0.54	0.38	0.27	0.3	0.48	0.78	0.96	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	20.52	20.71	20.87	20.97	21	21	21	21	21	20.96	20.73	20.47	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.3	20.31	20.31	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.31	20.31	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.98	0.94	0.85	0.68	0.5	0.34	0.23	0.25	0.43	0.74	0.95	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	19.67	19.94	20.16	20.28	20.31	20.32	20.32	20.32	20.32	20.27	19.98	19.61	(90)

fLA = Living area ÷ (4) = 0.36 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	19.98	20.22	20.42	20.53	20.56	20.57	20.57	20.57	20.56	20.52	20.25	19.92	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.83	20.07	20.27	20.38	20.41	20.42	20.42	20.42	20.41	20.37	20.1	19.77	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.94	0.85	0.69	0.51	0.35	0.24	0.26	0.44	0.74	0.95	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	524.68	614.33	635.79	566.01	437.33	290.02	190.35	199.95	315.81	473.06	512.57	493.29	(95)
Monthly average external temperature from Table 8													
(96)m=	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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	795.19	775.1	702.27	579.77	438.83	290.09	190.35	199.96	316.2	492.37	657.78	791.06	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	201.26	108.04	49.46	9.91	1.12	0	0	0	0	14.37	104.55	221.55	

Total per year (kWh/year) = Sum(98)1…5,10…12 = 710.24 (98)

Space heating requirement in kWh/m²/year 10.29 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	201.26	108.04	49.46	9.91	1.12	0	0	0	0	14.37	104.55	221.55		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	222.88	119.64	54.77	10.97	1.24	0	0	0	0	15.91	115.78	245.35		
Total (kWh/year) =Sum(211)1…5,10…12=													786.54	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)1…5,10…12=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)														
	200.29	175.26	182.35	161.74	156.59	137.91	132.13	147.3	148.92	169.58	181.02	195.57		
Efficiency of water heater													81	(216)
(217)m=	85.41	84.31	82.82	81.48	81.06	81	81	81	81	81.66	84.17	85.69		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	234.5	207.88	220.18	198.49	193.18	170.26	163.13	181.85	183.86	207.67	215.06	228.24		
Total = Sum(219a)1…12 =													2404.29	(219)

Annual totals	kWh/year	kWh/year
Space heating fuel used, main system 1		786.54

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Water heating fuel used			2404.29	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		294.16		(230a)
central heating pump:		120		(230c)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =		414.16	(231)
Electricity for lighting			306.94	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3911.92	(338)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	169.89	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	519.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =			689.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	214.95	(267)
Electricity for lighting	(232) x	0.519	=	159.3	(268)
Total CO2, kg/year		sum of (265)...(271) =		1063.47	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		15.41	(273)
EI rating (section 14)					(274)

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User Details:

Assessor Name:		**Stroma Number:**	
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.51

Property Address: WLC Proposed TF

Address : 52 Tottenham Street, LONDON, W1T 4RN

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53	(1a) x	2.6	(2a) =	137.8	(3a)
First floor	42	(1b) x	2.6	(2b) =	109.2	(3b)
Second floor	34	(1c) x	2.6	(2c) =	88.4	(3c)
Third floor	20	(1d) x	2.6	(2d) =	52	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	149	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	387.4	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent 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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		1.5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.08	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.07	(21)

Infiltration rate modified for monthly wind speed

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m													
	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.07	0.07	0.08	0.08	

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]													
(24a)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)													
(24b)m=	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 if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)													
(24c)m=	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 if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]													
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)													
(25)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			13.26	x1/[1/(1.4)+ 0.04]		=	17.58			(27)
Windows Type 2			13.26	x1/[1/(1.4)+ 0.04]		=	17.58			(27)
Windows Type 3			13.26	x1/[1/(1.4)+ 0.04]		=	17.58			(27)
Windows Type 4			13.26	x1/[1/(1.4)+ 0.04]		=	17.58			(27)
Walls Type1	13.26	13.26	0	x	0.18	=	0			(29)
Walls Type2	13.26	13.26	0	x	0.18	=	0			(29)
Walls Type3	13.26	13.26	0	x	0.18	=	0			(29)
Walls Type4	13.26	13.26	0	x	0.18	=	0			(29)
Roof	30	0	30	x	0.13	=	3.9			(30)
Total area of elements, m²			83.04							(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)...(30) + (32) =	74.22	(33)
Heat capacity Cm = S(A x k)	((28)...(30) + (32) + (32a)...(32e) =	270	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 3.33 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 77.55 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.33	26.11	25.89	24.78	24.56	23.45	23.45	23.23	23.89	24.56	25	25.44	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	103.88	103.66	103.43	102.33	102.1	101	101	100.77	101.44	102.1	102.55	102.99	

Average = Sum(39)1..12 /12= 102.27 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.7	0.7	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.69	0.69	0.69

Average = Sum(40)1..12 /12= 0.69 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.93 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 109.32 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	120.25	115.87	111.5	107.13	102.76	98.38	98.38	102.76	107.13	111.5	115.87	120.25	

Total = Sum(44)1..12 = 1311.78 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	178.32	155.96	160.94	140.31	134.63	116.18	107.65	123.54	125.01	145.69	159.03	172.7

Total = Sum(45)1..12 = 1719.96 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	26.75	23.39	24.14	21.05	20.19	17.43	16.15	18.53	18.75	21.85	23.85	25.9	(46)

Water storage loss:

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

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage 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/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

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Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0 (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	49.32	50.96	48.52	50.14	50.96	49.32	50.96	49.32	50.96	(61)

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

(62)m=	229.28	201.99	211.9	189.63	185.59	164.69	157.79	174.49	174.33	196.65	208.34	223.65	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	229.28	201.99	211.9	189.63	185.59	164.69	157.79	174.49	174.33	196.65	208.34	223.65

Output from water heater (annual)1..12 2318.34 (64)

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

(65)m=	72.03	63.36	66.25	58.98	57.5	50.76	48.33	53.82	53.89	61.18	65.21	70.16	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	28.48	25.29	20.57	15.57	11.64	9.83	10.62	13.8	18.53	23.52	27.46	29.27	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	319.43	322.75	314.39	296.61	274.16	253.07	238.97	235.66	244.01	261.79	284.24	305.34	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	(71)
Water heating gains (Table 5)													
(72)m=	96.82	94.29	89.05	81.92	77.29	70.5	64.96	72.33	74.85	82.23	90.56	94.3	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	521.72	519.32	501	471.09	440.09	410.38	391.54	398.78	414.38	444.54	479.25	505.9	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

ensphere

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.3	x	13.26	x	36.79	x	0.76	x	0.8	=	80.09	(77)
Southeast 0.9x	0.3	x	13.26	x	36.79	x	0.76	x	0.8	=	80.09	(77)
Southeast 0.9x	0.54	x	13.26	x	36.79	x	0.72	x	0.8	=	136.58	(77)
Southeast 0.9x	0.77	x	13.26	x	36.79	x	0.72	x	0.8	=	194.75	(77)
Southeast 0.9x	0.3	x	13.26	x	62.67	x	0.76	x	0.8	=	136.43	(77)
Southeast 0.9x	0.3	x	13.26	x	62.67	x	0.76	x	0.8	=	136.43	(77)
Southeast 0.9x	0.54	x	13.26	x	62.67	x	0.72	x	0.8	=	232.64	(77)
Southeast 0.9x	0.77	x	13.26	x	62.67	x	0.72	x	0.8	=	331.73	(77)
Southeast 0.9x	0.3	x	13.26	x	85.75	x	0.76	x	0.8	=	186.66	(77)
Southeast 0.9x	0.3	x	13.26	x	85.75	x	0.76	x	0.8	=	186.66	(77)
Southeast 0.9x	0.54	x	13.26	x	85.75	x	0.72	x	0.8	=	318.31	(77)
Southeast 0.9x	0.77	x	13.26	x	85.75	x	0.72	x	0.8	=	453.89	(77)
Southeast 0.9x	0.3	x	13.26	x	106.25	x	0.76	x	0.8	=	231.28	(77)
Southeast 0.9x	0.3	x	13.26	x	106.25	x	0.76	x	0.8	=	231.28	(77)
Southeast 0.9x	0.54	x	13.26	x	106.25	x	0.72	x	0.8	=	394.4	(77)
Southeast 0.9x	0.77	x	13.26	x	106.25	x	0.72	x	0.8	=	562.39	(77)
Southeast 0.9x	0.3	x	13.26	x	119.01	x	0.76	x	0.8	=	259.05	(77)
Southeast 0.9x	0.3	x	13.26	x	119.01	x	0.76	x	0.8	=	259.05	(77)
Southeast 0.9x	0.54	x	13.26	x	119.01	x	0.72	x	0.8	=	441.78	(77)
Southeast 0.9x	0.77	x	13.26	x	119.01	x	0.72	x	0.8	=	629.92	(77)
Southeast 0.9x	0.3	x	13.26	x	118.15	x	0.76	x	0.8	=	257.18	(77)
Southeast 0.9x	0.3	x	13.26	x	118.15	x	0.76	x	0.8	=	257.18	(77)
Southeast 0.9x	0.54	x	13.26	x	118.15	x	0.72	x	0.8	=	438.57	(77)
Southeast 0.9x	0.77	x	13.26	x	118.15	x	0.72	x	0.8	=	625.38	(77)
Southeast 0.9x	0.3	x	13.26	x	113.91	x	0.76	x	0.8	=	247.95	(77)
Southeast 0.9x	0.3	x	13.26	x	113.91	x	0.76	x	0.8	=	247.95	(77)
Southeast 0.9x	0.54	x	13.26	x	113.91	x	0.72	x	0.8	=	422.83	(77)
Southeast 0.9x	0.77	x	13.26	x	113.91	x	0.72	x	0.8	=	602.92	(77)
Southeast 0.9x	0.3	x	13.26	x	104.39	x	0.76	x	0.8	=	227.23	(77)
Southeast 0.9x	0.3	x	13.26	x	104.39	x	0.76	x	0.8	=	227.23	(77)
Southeast 0.9x	0.54	x	13.26	x	104.39	x	0.72	x	0.8	=	387.49	(77)
Southeast 0.9x	0.77	x	13.26	x	104.39	x	0.72	x	0.8	=	552.54	(77)
Southeast 0.9x	0.3	x	13.26	x	92.85	x	0.76	x	0.8	=	202.12	(77)
Southeast 0.9x	0.3	x	13.26	x	92.85	x	0.76	x	0.8	=	202.12	(77)
Southeast 0.9x	0.54	x	13.26	x	92.85	x	0.72	x	0.8	=	344.66	(77)
Southeast 0.9x	0.77	x	13.26	x	92.85	x	0.72	x	0.8	=	491.46	(77)
Southeast 0.9x	0.3	x	13.26	x	69.27	x	0.76	x	0.8	=	150.78	(77)
Southeast 0.9x	0.3	x	13.26	x	69.27	x	0.76	x	0.8	=	150.78	(77)
Southeast 0.9x	0.54	x	13.26	x	69.27	x	0.72	x	0.8	=	257.12	(77)

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DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	13.26	x	69.27	x	0.72	x	0.8	=	366.63	(77)
Southeast 0.9x	0.3	x	13.26	x	44.07	x	0.76	x	0.8	=	95.93	(77)
Southeast 0.9x	0.3	x	13.26	x	44.07	x	0.76	x	0.8	=	95.93	(77)
Southeast 0.9x	0.54	x	13.26	x	44.07	x	0.72	x	0.8	=	163.59	(77)
Southeast 0.9x	0.77	x	13.26	x	44.07	x	0.72	x	0.8	=	233.26	(77)
Southeast 0.9x	0.3	x	13.26	x	31.49	x	0.76	x	0.8	=	68.54	(77)
Southeast 0.9x	0.3	x	13.26	x	31.49	x	0.76	x	0.8	=	68.54	(77)
Southeast 0.9x	0.54	x	13.26	x	31.49	x	0.72	x	0.8	=	116.88	(77)
Southeast 0.9x	0.77	x	13.26	x	31.49	x	0.72	x	0.8	=	166.66	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	491.51	837.22	1145.52	1419.36	1589.8	1578.3	1521.65	1394.49	1240.36	925.31	588.71	420.63	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	1013.23	1356.54	1646.52	1890.45	2029.88	1988.68	1913.19	1793.28	1654.74	1369.85	1067.96	926.53	(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, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.95	0.84	0.66	0.47	0.32	0.23	0.26	0.42	0.75	0.97	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.5	20.74	20.92	20.99	21	21	21	21	21	20.97	20.73	20.44	(87)

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

(88)m=	20.34	20.34	20.35	20.35	20.35	20.36	20.36	20.36	20.36	20.35	20.35	20.35	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.94	0.81	0.61	0.43	0.29	0.2	0.22	0.38	0.71	0.96	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.68	20.02	20.25	20.34	20.35	20.36	20.36	20.36	20.36	20.33	20.02	19.6	(90)

fLA = Living area ÷ (4) = 0.2 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.84	20.17	20.39	20.47	20.48	20.49	20.49	20.49	20.49	20.46	20.16	19.77	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.69	20.02	20.24	20.32	20.33	20.34	20.34	20.34	20.34	20.31	20.01	19.62	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.94	0.81	0.61	0.43	0.29	0.2	0.22	0.38	0.71	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	1001.63	1271.81	1333.78	1157.78	880.7	579.61	377.64	397.07	632.44	967.64	1021.61	920.38	(95)
Monthly average external temperature from Table 8													
(96)m=	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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1598.94	1566.95	1420.98	1168.72	881.48	579.63	377.64	397.08	632.66	991.34	1324.01	1588.29	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	444.4	198.33	64.88	7.88	0.58	0	0	0	0	17.63	217.73	496.92

Total per year (kWh/year) = Sum(98)$_{1...5,10...12}$ = 1448.35 (98)

Space heating requirement in kWh/m²/year 9.72 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) x [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		89.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	444.4	198.33	64.88	7.88	0.58	0	0	0	0	17.63	217.73	496.92		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	496.54	221.6	72.49	8.81	0.64	0	0	0	0	19.7	243.27	555.22		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1618.27	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)
Water heating Output from water heater (calculated above)	229.28	201.99	211.9	189.63	185.59	164.69	157.79	174.49	174.33	196.65	208.34	223.65		
Efficiency of water heater													89.5	(216)
(217)m=	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	256.18	225.69	236.76	211.87	207.36	184.02	176.3	194.97	194.78	219.72	232.79	249.89		
Total = Sum(219a)$_{1...12}$ =													2590.32	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1618.27	
Water heating fuel used			2590.32	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		635.21		(230a)
central heating pump:		120		(230c)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =		755.21	(231)
Electricity for lighting			502.92	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5466.72	(338)

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

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	349.55	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	559.51	(264)
Space and water heating	(261) + (262) + (263) + (264) =				909.06	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	391.96	(267)
Electricity for lighting	(232)	x	0.519	=	261.02	(268)
Total CO2, kg/year			sum of (265)...(271) =		1562.03	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		10.48	(273)
EI rating (section 14)					89	(274)

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BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Tottenham Street_Be Lean

As designed

Date: Tue May 31 13:10:56 2022

Administrative information

Building Details

Address: 52 Tottenham St, London, W1T 4RN

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.14

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Pete Jeavons

Telephone number: Phone

Address: 52 Grosvenor Gardens, London, SW1W 0AU

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	13.6
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	13.6
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	13
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	"RM000000_W1"
Floor	0.25	0.22	0.22	"RM000000_F"
Roof	0.25	0.13	0.13	"RM000001_C"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"PL000000_W-1_O0"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	4

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Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- DWH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Resi cycle storage -1F	-	80	-	32
Plant room -1F	80	-	-	185
Store -1F	80	-	-	14
Refuse holding -1F	80	-	-	13
Circulation area -1F	-	80	-	94
Circulation area GF	-	80	-	119
Toilet GF	-	80	-	51
Commercial GF	80	-	-	381

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Commercial GF	YES (+149.3%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

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Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	164.6	164.6
External area [m²]	358.1	358.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	5
Average conductance [W/K]	97.65	136.34
Average U-value [W/m²K]	0.27	0.38
Alpha value* [%]	24.87	16.5

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	23.79	30.62
Cooling	0	0
Auxiliary	1.45	0.72
Lighting	13.92	12.8
Hot water	0.5	0.46
Equipment*	57.23	57.23
TOTAL**	39.66	44.6

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	127.24	153.78
Primary energy* [kWh/m²]	75.64	78.39
Total emissions [kg/m²]	13	13.6

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	67.6	59.7	23.8	0	1.4	0.79	0	0.84	0
	Notional	90.3	63.5	30.6	0	0.7	0.82	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U_{i-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.2	"RM000000_W1"
Floor	0.2	0.22	"RM000000_F"
Roof	0.15	0.13	"RM000001_C"
Windows, roof windows, and rooflights	1.5	1.4	"PL000000_W-1_O0"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

U_{i-Typ} = Typical individual element U-values [W/(m²K)] U_{i-Min} = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	4

E. Indicative Energy Model Outputs (Be Green)

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:		**Stroma Number:**	
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.51

Property Address: WLC Proposed MF

Address : 52 Tottenham Street, LONDON, W1T 4RN

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	38	(1a) x	2.6	(2a) =	98.8	(3a)
First floor	31	(1b) x	2.6	(2b) =	80.6	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	179.4	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent 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	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		1.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.08	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.07	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

DER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.07	0.07	0.08	0.08

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(24a)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(24a)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)
(25)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			14.28	x1/[1/(1.4)+ 0.04]		=	18.93			(27)
Windows Type 2			14.28	x1/[1/(1.4)+ 0.04]		=	18.93			(27)
Walls Type1	14.28	14.28	0	x	0.18	=	0			(29)
Walls Type2	14.28	14.28	0	x	0.18	=	0			(29)
Total area of elements, m²			28.56							(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)...(30) + (32) =	37.86	(33)
Heat capacity Cm = S(A x k)	((28)...(30) + (32) + (32a)...(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		1.15	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	39.01	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	12.19	12.09	11.99	11.47	11.37	10.86	10.86	10.76	11.06	11.37	11.58	11.78	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	51.21	51.1	51	50.49	50.39	49.87	49.87	49.77	50.08	50.39	50.59	50.8	

Average = Sum(39)1...12 /12= 50.46 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.74	0.74	0.74	0.73	0.73	0.72	0.72	0.72	0.73	0.73	0.73	0.74	

Average = Sum(40)$_{1...12}$ /12= 0.73 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.22 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.54 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	100.69	97.03	93.37	89.71	86.05	82.39	82.39	86.05	89.71	93.37	97.03	100.69	
										Total = Sum(44)$_{1...12}$ =		1098.48	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)													
(45)m=	149.33	130.6	134.77	117.5	112.74	97.29	90.15	103.45	104.68	122	133.17	144.61	
										Total = Sum(45)$_{1...12}$ =		1440.28	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	22.4	19.59	20.22	17.62	16.91	14.59	13.52	15.52	15.7	18.3	19.98	21.69	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 201 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.8694 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.87 (55)

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

(56)m=	26.95	24.34	26.95	26.08	26.95	26.08	26.95	26.95	26.08	26.95	26.08	26.95	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m=	26.95	24.34	26.95	26.08	26.95	26.08	26.95	26.95	26.08	26.95	26.08	26.95	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m													
(62)m=	176.28	154.95	161.72	143.58	139.69	123.37	117.1	130.4	130.77	148.95	159.25	171.57	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
Output from water heater													
(64)m=	176.28	154.95	161.72	143.58	139.69	123.37	117.1	130.4	130.77	148.95	159.25	171.57	
									Output from water heater (annual)$_{1...12}$			1757.61	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]													
(65)m=	49.65	43.43	44.81	39.07	37.49	32.35	29.97	34.4	34.81	40.56	44.28	48.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	111.08	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	17.38	15.44	12.55	9.5	7.1	6	6.48	8.42	11.31	14.36	16.76	17.86	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	194.95	196.97	191.88	181.02	167.32	154.45	145.85	143.82	148.92	159.77	173.47	186.35	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	34.11	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	-88.86	(71)
Water heating gains (Table 5)													
(72)m=	66.74	64.62	60.23	54.26	50.38	44.93	40.29	46.23	48.34	54.52	61.5	64.63	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	345.39	343.36	330.98	311.11	291.14	271.7	258.94	264.8	274.9	294.98	318.05	335.17	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.3	x	14.28	x	36.79	x	0.76	x	0.8	=	86.25	(77)
Southeast	0.9x	0.3	x	14.28	x	36.79	x	0.76	x	0.8	=	86.25	(77)
Southeast	0.9x	0.3	x	14.28	x	62.67	x	0.76	x	0.8	=	146.92	(77)
Southeast	0.9x	0.3	x	14.28	x	62.67	x	0.76	x	0.8	=	146.92	(77)
Southeast	0.9x	0.3	x	14.28	x	85.75	x	0.76	x	0.8	=	201.02	(77)

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Southeast 0.9x	0.3	x	14.28	x	85.75	x	0.76	x	0.8	=	201.02	(77)
Southeast 0.9x	0.3	x	14.28	x	106.25	x	0.76	x	0.8	=	249.08	(77)
Southeast 0.9x	0.3	x	14.28	x	106.25	x	0.76	x	0.8	=	249.08	(77)
Southeast 0.9x	0.3	x	14.28	x	119.01	x	0.76	x	0.8	=	278.99	(77)
Southeast 0.9x	0.3	x	14.28	x	119.01	x	0.76	x	0.8	=	278.99	(77)
Southeast 0.9x	0.3	x	14.28	x	118.15	x	0.76	x	0.8	=	276.97	(77)
Southeast 0.9x	0.3	x	14.28	x	118.15	x	0.76	x	0.8	=	276.97	(77)
Southeast 0.9x	0.3	x	14.28	x	113.91	x	0.76	x	0.8	=	267.03	(77)
Southeast 0.9x	0.3	x	14.28	x	113.91	x	0.76	x	0.8	=	267.03	(77)
Southeast 0.9x	0.3	x	14.28	x	104.39	x	0.76	x	0.8	=	244.71	(77)
Southeast 0.9x	0.3	x	14.28	x	104.39	x	0.76	x	0.8	=	244.71	(77)
Southeast 0.9x	0.3	x	14.28	x	92.85	x	0.76	x	0.8	=	217.66	(77)
Southeast 0.9x	0.3	x	14.28	x	92.85	x	0.76	x	0.8	=	217.66	(77)
Southeast 0.9x	0.3	x	14.28	x	69.27	x	0.76	x	0.8	=	162.38	(77)
Southeast 0.9x	0.3	x	14.28	x	69.27	x	0.76	x	0.8	=	162.38	(77)
Southeast 0.9x	0.3	x	14.28	x	44.07	x	0.76	x	0.8	=	103.31	(77)
Southeast 0.9x	0.3	x	14.28	x	44.07	x	0.76	x	0.8	=	103.31	(77)
Southeast 0.9x	0.3	x	14.28	x	31.49	x	0.76	x	0.8	=	73.81	(77)
Southeast 0.9x	0.3	x	14.28	x	31.49	x	0.76	x	0.8	=	73.81	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	172.5	293.84	402.04	498.15	557.97	553.94	534.05	489.43	435.33	324.75	206.62	147.63	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	517.9	637.2	733.03	809.26	849.11	825.63	792.99	754.23	710.22	619.73	524.67	482.79	(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, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.96	0.88	0.73	0.55	0.39	0.28	0.3	0.49	0.79	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.5	20.69	20.86	20.97	21	21	21	21	21	20.95	20.71	20.45	(87)

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

(88)m=	20.63	20.63	20.63	20.63	20.63	20.64	20.64	20.64	20.64	20.63	20.63	20.63	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.95	0.87	0.71	0.53	0.36	0.25	0.28	0.46	0.77	0.96	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.64	19.91	20.15	20.28	20.31	20.32	20.32	20.32	20.32	20.27	19.95	19.58	(90)

fLA = Living area ÷ (4) = | 0.36 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.95	20.2	20.41	20.53	20.56	20.57	20.57	20.57	20.56	20.52	20.23	19.89	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

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(93)m=	19.95	20.2	20.41	20.53	20.56	20.57	20.57	20.57	20.56	20.52	20.23	19.89	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.95	0.86	0.71	0.52	0.36	0.25	0.28	0.46	0.77	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	509.91	604.34	633.38	570.7	444.48	297.47	197.83	207.42	323.18	475.78	501.81	477.79	(95)
Monthly average external temperature from Table 8													
(96)m=	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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	801.41	781.64	709.33	587.2	446.37	297.57	197.84	207.43	323.71	499.67	664.2	797.18	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	216.88	119.14	56.51	11.88	1.41	0	0	0	0	17.78	116.92	237.62	

Total per year (kWh/year) = Sum(98)1...5,9...12 = | 778.14 | (98)

Space heating requirement in kWh/m²/year | 11.28 | (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of main heating from main system 2		0	(203)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		100	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	216.88	119.14	56.51	11.88	1.41	0	0	0	0	17.78	116.92	237.62		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	216.66	119.02	56.45	11.87	1.41	0	0	0	0	17.76	116.8	237.39		
Total (kWh/year) =Sum(211)1...5,10...12=													777.36	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)1...5,10...12=													0	(215)

Water heating

Output from water heater (calculated above)														
	176.28	154.95	161.72	143.58	139.69	123.37	117.1	130.4	130.77	148.95	159.25	171.57		
Efficiency of water heater													349.41	(216)
(217)m=	349.41	349.41	349.41	349.41	349.41	349.41	349.41	349.41	349.41	349.41	349.41	349.41		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	50.45	44.34	46.28	41.09	39.98	35.31	33.51	37.32	37.42	42.63	45.58	49.1		
Total = Sum(219a)1...12 =													503.02	(219)

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Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			777.36	
Water heating fuel used			503.02	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		294.16		(230a)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =		294.16	(231)
Electricity for lighting			306.94	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			1881.48	(338)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	403.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	261.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			664.52	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	152.67	(267)
Electricity for lighting	(232) x	0.519	=	159.3	(268)
Total CO2, kg/year		sum of (265)...(271) =		976.49	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		14.15	(273)
EI rating (section 14)				89	(274)

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User Details:

Assessor Name: **Stroma Number:**
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.51

Property Address: WLC Proposed TF

Address : 52 Tottenham Street, LONDON, W1T 4RN

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	53	(1a)	x	2.6	(2a)	=	137.8	(3a)
First floor	42	(1b)	x	2.6	(2b)	=	109.2	(3b)
Second floor	34	(1c)	x	2.6	(2c)	=	88.4	(3c)
Third floor	20	(1d)	x	2.6	(2d)	=	52	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	149	(4)						
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		387.4	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent 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	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction *if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35*		0	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		1.5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.08	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.07	(21)

Infiltration rate modified for monthly wind speed

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

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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.07	0.07	0.08	0.08

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	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
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	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
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.21	0.2	0.2	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.2	0.2	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			13.26	x1/[1/(1.4)+ 0.04]	=	17.58			(27)
Windows Type 2			13.26	x1/[1/(1.4)+ 0.04]	=	17.58			(27)
Windows Type 3			13.26	x1/[1/(1.4)+ 0.04]	=	17.58			(27)
Windows Type 4			13.26	x1/[1/(1.4)+ 0.04]	=	17.58			(27)
Walls Type1	13.26	13.26	0	x 0.18	=	0			(29)
Walls Type2	13.26	13.26	0	x 0.18	=	0			(29)
Walls Type3	13.26	13.26	0	x 0.18	=	0			(29)
Walls Type4	13.26	13.26	0	x 0.18	=	0			(29)
Roof	30	0	30	x 0.13	=	3.9			(30)
Total area of elements, m²			83.04						(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 74.22 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 270 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.33 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 77.55 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.33	26.11	25.89	24.78	24.56	23.45	23.45	23.23	23.89	24.56	25	25.44	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	103.88	103.66	103.43	102.33	102.1	101	101	100.77	101.44	102.1	102.55	102.99	

Average = Sum(39)1…12 /12= 102.27 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.7	0.7	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.69	0.69	0.69	

Average = Sum(40)1…12 /12= 0.69 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.83 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 109.32 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	120.25	115.87	111.5	107.13	102.76	98.38	98.38	102.76	107.13	111.5	115.87	120.25	

Total = Sum(44)1…12 = 1311.78 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	178.32	155.96	160.94	140.31	134.63	116.18	107.65	123.54	125.01	145.69	159.03	172.7	

Total = Sum(45)1…12 = 1719.96 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	26.75	23.39	24.14	21.05	20.19	17.43	16.15	18.53	18.75	21.85	23.85	25.9	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 201 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.8694 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

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Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.87	(55)

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

(56)m=	26.95	24.34	26.95	26.08	26.95	26.08	26.95	26.95	26.08	26.95	26.08	26.95	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	26.95	24.34	26.95	26.08	26.95	26.08	26.95	26.95	26.08	26.95	26.08	26.95	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

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

(62)m=	205.27	180.31	187.89	166.39	161.58	142.26	134.61	150.49	151.09	172.64	185.11	199.65	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	205.27	180.31	187.89	166.39	161.58	142.26	134.61	150.49	151.09	172.64	185.11	199.65	

Output from water heater (annual)$_{1...12}$ — 2037.29 (64)

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

(65)m=	59.29	51.86	53.51	46.65	44.78	38.63	35.8	41.08	41.57	48.44	52.88	57.42	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	146.63	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	28.48	25.29	20.57	15.57	11.64	9.83	10.62	13.8	18.53	23.52	27.46	29.27	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	319.43	322.75	314.39	296.61	274.16	253.07	238.97	235.66	244.01	261.79	284.24	305.34	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	37.66	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	-117.3	(71)
Water heating gains (Table 5)													
(72)m=	79.69	77.17	71.93	64.8	60.17	53.65	48.11	55.21	57.73	65.11	73.44	77.18	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	504.59	502.2	483.88	453.97	422.96	393.54	374.69	381.66	397.26	427.42	462.13	488.78	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.3	x	13.26	x	36.79	x	0.76	x	0.8	=	80.09	(77)
Southeast 0.9x	0.3	x	13.26	x	36.79	x	0.76	x	0.8	=	80.09	(77)
Southeast 0.9x	0.54	x	13.26	x	36.79	x	0.72	x	0.8	=	136.58	(77)
Southeast 0.9x	0.77	x	13.26	x	36.79	x	0.72	x	0.8	=	194.75	(77)
Southeast 0.9x	0.3	x	13.26	x	62.67	x	0.76	x	0.8	=	136.43	(77)
Southeast 0.9x	0.3	x	13.26	x	62.67	x	0.76	x	0.8	=	136.43	(77)
Southeast 0.9x	0.54	x	13.26	x	62.67	x	0.72	x	0.8	=	232.64	(77)
Southeast 0.9x	0.77	x	13.26	x	62.67	x	0.72	x	0.8	=	331.73	(77)
Southeast 0.9x	0.3	x	13.26	x	85.75	x	0.76	x	0.8	=	186.66	(77)
Southeast 0.9x	0.3	x	13.26	x	85.75	x	0.76	x	0.8	=	186.66	(77)
Southeast 0.9x	0.54	x	13.26	x	85.75	x	0.72	x	0.8	=	318.31	(77)
Southeast 0.9x	0.77	x	13.26	x	85.75	x	0.72	x	0.8	=	453.89	(77)
Southeast 0.9x	0.3	x	13.26	x	106.25	x	0.76	x	0.8	=	231.28	(77)
Southeast 0.9x	0.3	x	13.26	x	106.25	x	0.76	x	0.8	=	231.28	(77)
Southeast 0.9x	0.54	x	13.26	x	106.25	x	0.72	x	0.8	=	394.4	(77)
Southeast 0.9x	0.77	x	13.26	x	106.25	x	0.72	x	0.8	=	562.39	(77)
Southeast 0.9x	0.3	x	13.26	x	119.01	x	0.76	x	0.8	=	259.06	(77)
Southeast 0.9x	0.3	x	13.26	x	119.01	x	0.76	x	0.8	=	259.06	(77)
Southeast 0.9x	0.54	x	13.26	x	119.01	x	0.72	x	0.8	=	441.76	(77)
Southeast 0.9x	0.77	x	13.26	x	119.01	x	0.72	x	0.8	=	629.92	(77)
Southeast 0.9x	0.3	x	13.26	x	118.15	x	0.76	x	0.8	=	257.18	(77)
Southeast 0.9x	0.3	x	13.26	x	118.15	x	0.76	x	0.8	=	257.18	(77)
Southeast 0.9x	0.54	x	13.26	x	118.15	x	0.72	x	0.8	=	438.57	(77)
Southeast 0.9x	0.77	x	13.26	x	118.15	x	0.72	x	0.8	=	625.36	(77)
Southeast 0.9x	0.3	x	13.26	x	113.91	x	0.76	x	0.8	=	247.95	(77)
Southeast 0.9x	0.3	x	13.26	x	113.91	x	0.76	x	0.8	=	247.95	(77)
Southeast 0.9x	0.54	x	13.26	x	113.91	x	0.72	x	0.8	=	422.83	(77)
Southeast 0.9x	0.77	x	13.26	x	113.91	x	0.72	x	0.8	=	602.92	(77)
Southeast 0.9x	0.3	x	13.26	x	104.39	x	0.76	x	0.8	=	227.23	(77)
Southeast 0.9x	0.3	x	13.26	x	104.39	x	0.76	x	0.8	=	227.23	(77)
Southeast 0.9x	0.54	x	13.26	x	104.39	x	0.72	x	0.8	=	387.49	(77)
Southeast 0.9x	0.77	x	13.26	x	104.39	x	0.72	x	0.8	=	552.54	(77)
Southeast 0.9x	0.3	x	13.26	x	92.85	x	0.76	x	0.8	=	202.12	(77)
Southeast 0.9x	0.3	x	13.26	x	92.85	x	0.76	x	0.8	=	202.12	(77)
Southeast 0.9x	0.54	x	13.26	x	92.85	x	0.72	x	0.8	=	344.66	(77)
Southeast 0.9x	0.77	x	13.26	x	92.85	x	0.72	x	0.8	=	491.46	(77)
Southeast 0.9x	0.3	x	13.26	x	69.27	x	0.76	x	0.8	=	150.78	(77)
Southeast 0.9x	0.3	x	13.26	x	69.27	x	0.76	x	0.8	=	150.78	(77)
Southeast 0.9x	0.54	x	13.26	x	69.27	x	0.72	x	0.8	=	257.12	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	13.26	x	69.27	x	0.72	x	0.8	=	366.63	(77)
Southeast	0.9x	0.3	x	13.26	x	44.07	x	0.76	x	0.8	=	95.93	(77)
Southeast	0.9x	0.3	x	13.26	x	44.07	x	0.76	x	0.8	=	95.93	(77)
Southeast	0.9x	0.54	x	13.26	x	44.07	x	0.72	x	0.8	=	163.59	(77)
Southeast	0.9x	0.77	x	13.26	x	44.07	x	0.72	x	0.8	=	233.26	(77)
Southeast	0.9x	0.3	x	13.26	x	31.49	x	0.76	x	0.8	=	68.54	(77)
Southeast	0.9x	0.3	x	13.26	x	31.49	x	0.76	x	0.8	=	68.54	(77)
Southeast	0.9x	0.54	x	13.26	x	31.49	x	0.72	x	0.8	=	116.88	(77)
Southeast	0.9x	0.77	x	13.26	x	31.49	x	0.72	x	0.8	=	166.66	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	491.51	837.22	1145.52	1419.36	1589.8	1578.3	1521.65	1394.49	1240.36	925.31	588.71	420.63	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	996.1	1339.42	1629.4	1873.33	2012.76	1971.84	1896.34	1776.15	1637.62	1352.72	1050.84	909.41	(84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, h1,m (see Table 9a)													
(86)m=	0.99	0.96	0.84	0.65	0.47	0.33	0.23	0.26	0.43	0.76	0.97	1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													
(87)m=	20.49	20.73	20.92	20.99	21	21	21	21	21	20.97	20.72	20.43	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)													
(88)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)													
(89)m=	0.99	0.95	0.83	0.63	0.45	0.31	0.22	0.24	0.41	0.74	0.97	1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m=	19.66	20.01	20.25	20.34	20.35	20.36	20.36	20.36	20.36	20.33	20	19.59	(90)

fLA = Living area ÷ (4) = 0.2 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2													
(92)m=	19.83	20.16	20.38	20.47	20.48	20.49	20.49	20.49	20.49	20.46	20.15	19.76	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m=	19.83	20.16	20.38	20.47	20.48	20.49	20.49	20.49	20.49	20.46	20.15	19.76	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.94	0.82	0.63	0.45	0.3	0.21	0.23	0.4	0.72	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	986.37	1264.03	1338.87	1171.3	895.86	594.76	392.8	412.2	647.6	978.37	1011.17	904.34	(95)
Monthly average external temperature from Table 8													
(96)m=	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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1613.05	1581.4	1436.07	1184.02	896.8	594.79	392.8	412.2	647.89	1006.49	1338.16	1602.24	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	466.25	213.28	72.32	9.16	0.7	0	0	0	0	20.92	235.43	519.23

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1537.29 (98)

Space heating requirement in kWh/m²/year — 10.32 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of main heating from main system 2		0	(203)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		100	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	466.25	213.28	72.32	9.16	0.7	0	0	0	0	20.92	235.43	519.23		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	465.78	213.06	72.24	9.15	0.7	0	0	0	0	20.9	235.2	518.71		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1535.75	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)
Water heating														
Output from water heater (calculated above)														
	205.27	180.31	187.89	166.39	161.58	142.26	134.61	150.49	151.09	172.64	185.11	199.65		
Efficiency of water heater													346.52	(216)
(217)m=	346.52	346.52	346.52	346.52	346.52	346.52	346.52	346.52	346.52	346.52	346.52	346.52		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	59.24	52.03	54.22	48.02	46.63	41.05	38.84	43.43	43.6	49.82	53.42	57.61		
Total = Sum(219a)$_{1...12}$ =													587.92	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1535.75	
Water heating fuel used			587.92	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		635.21		(230a)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =		635.21	(231)
Electricity for lighting			502.92	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			**3261.81**	(338)

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

DER WorkSheet: New dwelling design stage

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	797.06	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	305.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1102.19	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	329.68	(267)
Electricity for lighting	(232) x	0.519	=	261.02	(268)
Total CO2, kg/year		sum of (265)...(271) =		1692.88	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		11.36	(273)
EI rating (section 14)				88	(274)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Tottenham Street_Be Green

As designed

Date: Tue May 31 13:14:11 2022

Administrative information

Building Details

Address: 52 Tottenham St, London, W1T 4RN

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.14

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Pete Jeavons

Telephone number: Phone

Address: 52 Grosvenor Gardens, London, SW1W 0AU

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	12.1
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	12.1
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	11.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	"RM000000_W1"
Floor	0.25	0.22	0.22	"RM000000_F"
Roof	0.25	0.13	0.13	"RM000001_C"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"PL000000_W-1_O0"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	4

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.06	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- DWH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.06	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- SYST0004-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Resi cycle storage -1F	-	80	-	32
Plant room -1F	80	-	-	185
Store -1F	80	-	-	14
Refuse holding -1F	80	-	-	13
Circulation area -1F	-	80	-	94
Circulation area GF	-	80	-	119
Toilet GF	-	80	-	51
Commercial GF	80	-	-	381

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Commercial GF	YES (+149.3%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

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Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	164.6	164.6
External area [m²]	358.1	358.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	5
Average conductance [W/K]	97.65	136.34
Average U-value [W/m²K]	0.27	0.38
Alpha value* [%]	24.87	16.5

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.53	10.32
Cooling	0	0
Auxiliary	1.45	0.72
Lighting	13.92	12.8
Hot water	0.14	0.16
Equipment*	57.23	57.23
TOTAL**	**22.04**	**24**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	127.24	153.78
Primary energy* [kWh/m²]	65.96	71.83
Total emissions [kg/m²]	11.2	12.1

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	67.6	59.7	6.5	0	1.4	2.87	0	3.06	0
Notional	90.3	63.5	10.3	0	0.7	2.43	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

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Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U_{i-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.2	"RM000000_W1"
Floor	0.2	0.22	"RM000000_F"
Roof	0.15	0.13	"RM000001_C"
Windows, roof windows, and rooflights	1.5	1.4	"PL000000_W-1_O0"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

U_{i-Typ} = Typical individual element U-values [W/(m²K)] U_{i-Min} = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	4

F. General Notes

The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Ensphere Group Ltd for inaccuracies in the data supplied by any other party.

The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

No site visits have been carried out, unless otherwise specified.

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