62 Mansfield Road, Camden, London. NW3 2HU

Energy & Sustainability Statement

May 2014

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This report has been prepared by Adrian Holmes of Peter Deer Associates who is a Chartered Building Services Engineer with CIBSE Low Carbon Consultant Certification No. LCEA 031106.

The information contained within this report is for the purpose of demonstrating planning compliance and is not intended as a design stage tender document. Cost information quoted in this document is for comparison purposes and based on industry standard benchmarks. The costs quoted cannot be relied on for the purposes of pricing the project.

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Executive Summary

The site is located in the Mansfield Conservation Area between the rear of 62 Mansfield Road and an electricity sub-station that fronts Courthope Road. The site was formerly used as off street car parking and is currently empty.

The scheme proposes a small 1 bedroom house with a total floor area of 56.4m² across ground floor and basement. The dwelling includes an entrance hall, WC, kitchen and living room, a double bedroom and a study with en-suite bathroom. An internal patio allows light to penetrate habitable spaces throughout, and direct sunlight is available through sky lights.

This report has modelled the proposed domestic dwelling design with the Government's standard energy compliance models SAP 2009 and SAP 2012.

SAP2009

This model is used to demonstrate the 25% emission reduction target and how the proposed building complies with London Borough of Camden requirement for new dwelling to achieve Code for Sustainable Homes Level 4.

SAP 2012

This model is used to demonstrate that the proposed design complies with the current 2014 Building Regulations, energy efficiency compliance (Part L1a)

Two option Have been considered

Option A Code for Sustainable Homes level 4 thermal improvements only. (Proposed)

This Option considers how to achieve Code for Sustainable Homes level 4 rating without renewables. The emission reduction obtained through thermal improvements and waste water heat recovery.

Option B Code for Sustainable Homes level 4 with renewables. (stand by solution)

This option takes thermal improvements to point where the building compliances with Part L (just exceeds the TER) The rest of the emission is reduced through the installation of PV.

The proposal is to design the dwelling to option A as this option will not require Photo Voltaic array on the roof which may cause issue with the neighbours. The advantages of option A is:

- Extremely low U values and permeability rate result in lower energy bills.
- There is no PV roof array which may cause issues with neighbours and or planners.

An Air tightness rates of less than $2m^3/m^2@50pa$ is extremely difficult to achieve and presents considerable risk to the builder. To avoid going back to planning in the event that this high level of air tightness is untrainable, it opposed to have stand by option with PV.

Option B is fall back option should Photo Voltaic be acceptable with neighbours and planners. Option B provides greater design flexibility with wider choice construction methods. This option may be adopt because option A is either too costly to build or there failure to meet the very low air tightness of option A, requiring a small PV array in compensation.

SAP	Mayor Hierarchy option A	Emission	Percentage Improvement
2009	Building Regulation Compliance	24.07 kgCO2/m²/year	
2009	Thermal Improvements (Be Lean)	20.80 kgCO2/m²/year	14%
2009	Energy Efficient Plant (Be Clean)	20.03 kgCO2/m²/year	4%
2009	Renewable Energy Generation (Be Green)	18.03 kgCO2/m²/year	10%

Table 1 Option A Mayor Emission Hierarchy

SAP	Model	Emission	Percentage Improvement
2012	Target Emission Rate	23.93 kgCO2/m²/year	
2012	Dwelling emission Rate	20.11 kgCO2/m²/year	16.0%
2012	Target Fabric Energy Efficiency	69.60	
2012	Dwelling Fabric Energy Efficiency	61.00	12.4%

Table 2 option A 2014 Building regulation Compliance

SAP	Mayor Hierarchy	Emission	Percentage Improvement
2009	Building Regulation Compliance	24.07 kgCO2/m²/year	
2009	Thermal Improvements (Be Lean)	23.84 kgCO2/m²/year	1.0%
2009	Energy Efficient Plant (Be Clean)	23.62 kgCO2/m²/year	0.9%
2009	Renewable Energy Generation (Be Green)	17.19 kgCO2/m²/year	27.2%

Table 3 Option B Mayor Emission Hierarchy

SAP	Model	Emission	Percentage Improvement
2012	Target Emission Rate	23.93 kgCO2/m²/year	
2012	Dwelling emission Rate	17.59 kgCO2/m²/year	26.5%
2012	Target Fabric Energy Efficiency	70.00	
2012	Dwelling Fabric Energy Efficiency	67.20	4.0%

Table 4 Option B 2014 Building Regulation compliance

London Borough of Camden Planning policies relevant to the proposed development

DP22 – Promoting sustainable design and construction

The proposed new dwelling has reduced the energy consumption through sustainable design by reducing the building thermal loss (improved U values), day light, solar gains, thermal mass (concrete floor structure) and natural ventilation (large window openings) with mechanical heat recovery background ventilation (fresh air to living room and bedroom and extract ventilation from bathroom and kitchen)..

DP24 – Securing high quality design

The proposed design is in keeping with surrounding buildings. See Design and Access statement for details.

DP26 – Managing the impact of development on occupiers and neighbours

The contractor will supply a detailed construction plan and is required to use the Considerate Contractor Scheme. This is to reduce the impact on neighbours and ensure correct workforce welfare is provided. The contractors will be required to provide an offsite storage facility from which deliveries are made using suitable sized vehicles at appropriate times.

CS14 – Promoting high quality places and conserving our heritage

The new development is design within the context of the existing buildings. See Design and Access statement)

CS13 – Tackling climate change through promoting higher environmental standards

The proposed design promotes higher environmental standards in the following ways:-

- Improved thermal performance through sustainable design
- Reduce water consumption through water efficient outlets
- Avoids over heating through large window openings, roof lights, and the use thermal mass in the floor and wall structures,
- Protects the local ecology through preserving the existing trees adjacent to the roadways.
- Reduce the urban heat island effect by proposing a green living roof design.
- Reduces the site Carbon Footprint through the selection of thermal efficient building materials and very low air permeability rate.

Code for Sustainable Homes

A Code for Sustainable Homes pre-assessment has been undertaken for 62 Mansfield Road. A copy of assessment is in the Appendix of this document. The predicted score of 68% which is a conservative score. The compact nature of site presents a number of difficulties which has limited the number of credits sought In particular management, ecology, transport and surface water run-off. Additional credits may be achieved through selection of building materials and water efficiency. The expectation is that Code for Sustainable Homes level 4 is achievable, and there are opportunities to add additional credits should proposed credits be lost through design development.

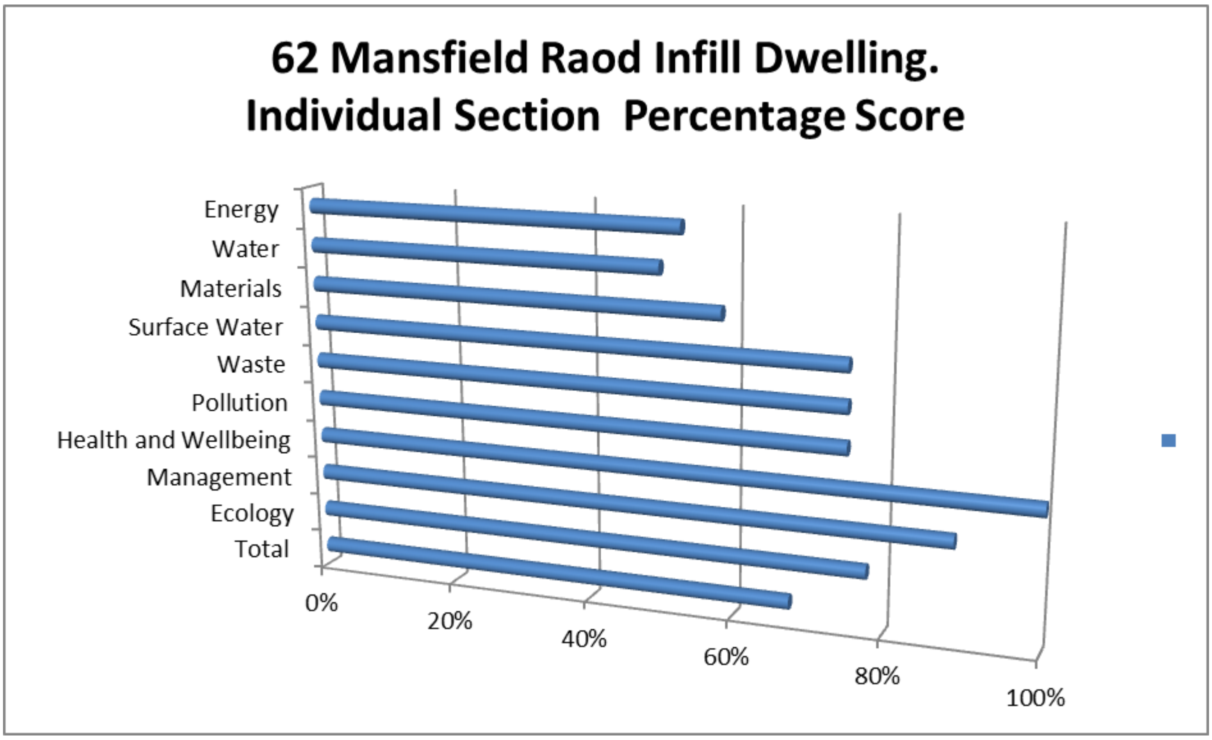

Figure 1 Graphic summary of the Code for Sustainable Homes Credits.

2 Introduction

The site is located in the Mansfield Conservation Area between the rear of 62 Mansfield Road and an electricity sub-station that fronts Courthope Road. The site was formerly used as off street car parking and is currently empty.

The scheme proposes a small 1 bedroom house with a total floor area of 56.4m^2 across ground floor and basement. The dwelling includes an entrance hall, WC, kitchen and living room, a double bedroom and a study with en-suite bathroom. An internal patio allows light to penetrate habitable spaces throughout, and direct sunlight is available through sky lights.

Materials (predominantly brick and render) are sympathetic to the immediate context. The chosen brick, a TBS Tilbury Stockyard Mystique, will give the new building its own subtle identity, whilst harmonizing well with the surrounding London stock brick buildings.

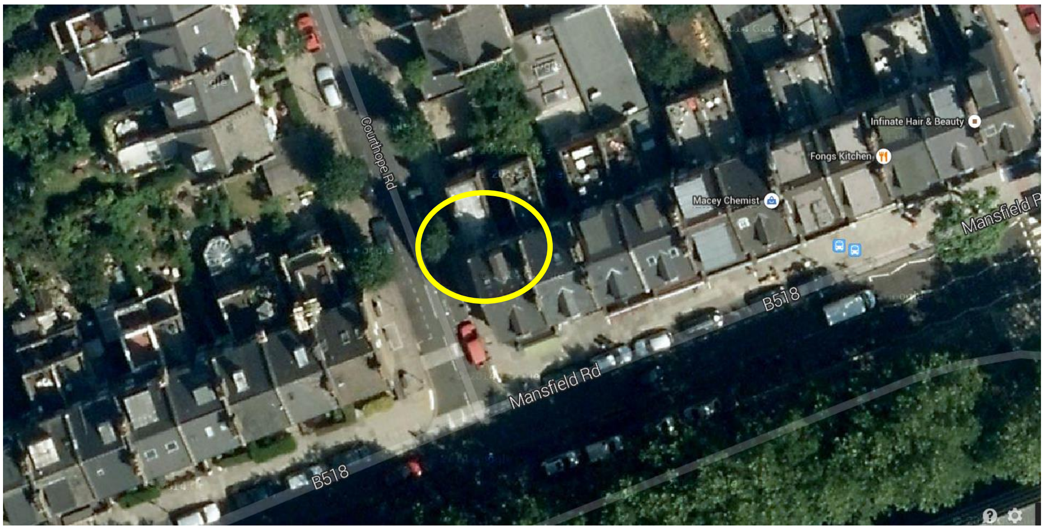

Figure 2 Location of 62 Mansfield infill development. Map Courtesy of Google Maps.

Address: Land to rear of 62 Mansfield Road, London. NW3 2HU

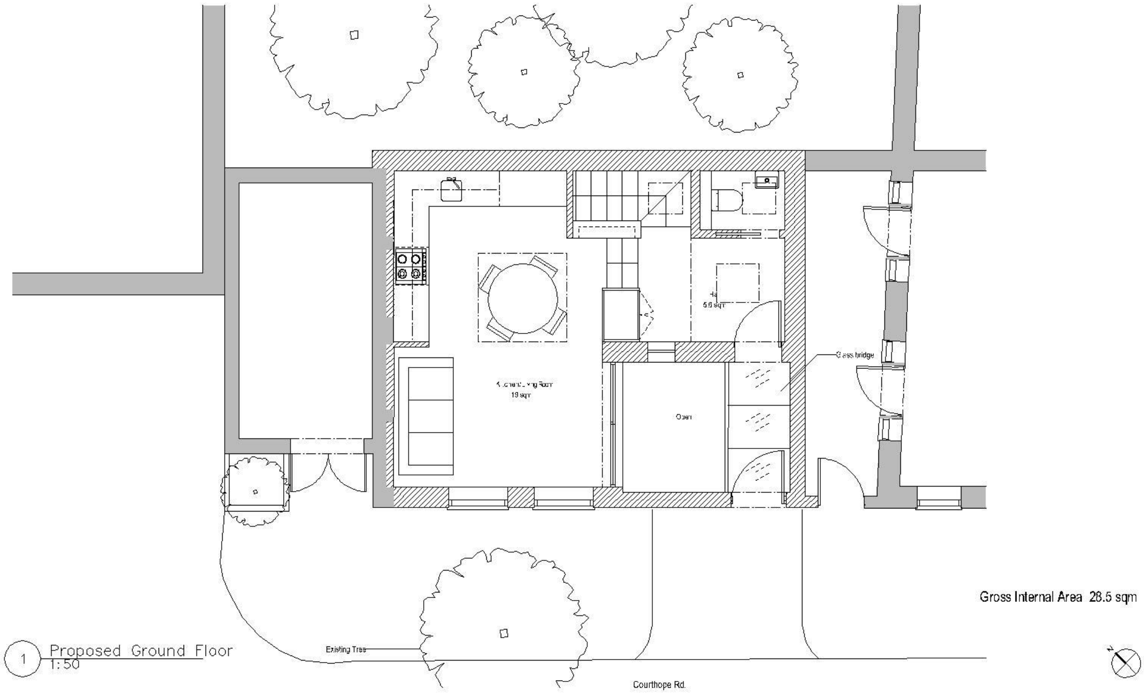

Figure 3 Ground Floor

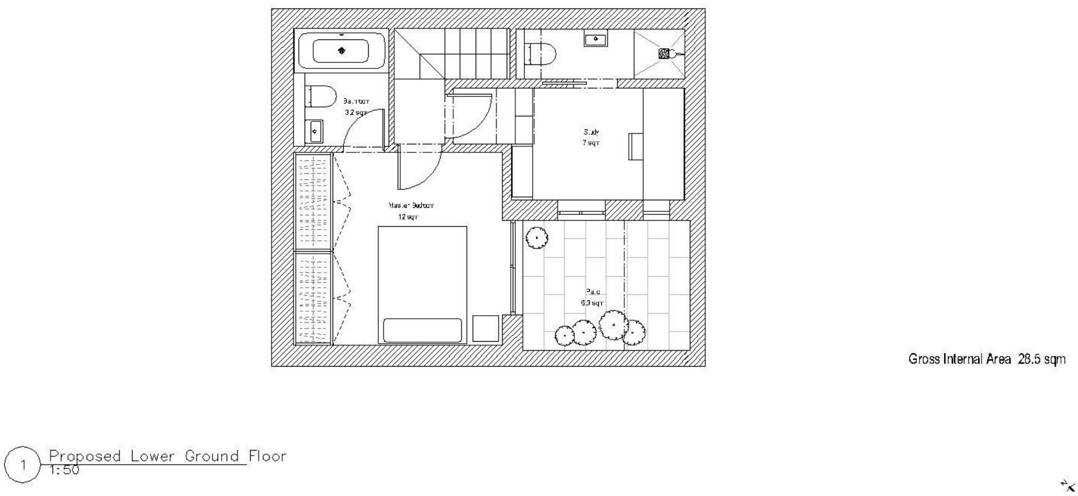

Figure 4 Lower Ground Floor

Aim of this report

This reports sets out to demonstrate how the design of the purposed building at 62 Mansfield Road meets with the London Borough of Camden planning requirements with regard to Energy and Sustainability. The report outlines the basic planning requirements and gives a short description of how the design complies. The appendix to the this report contains SAP reports showing design Building regulation compliance and Code for Sustainable Home pre-assessment (Level 4)

This report should be read in conjunction with following reports

- Design and Access Statement (Barbara Weiss Architects)
- Sunlight and daylight report (BLDA Consultancy)
- Arboriculture Report (Bartlett Consulting)
- Basement Impact Assessment (Ashton Bennett Consultancy)

3 Planning Policies

The implications of our actions on the environment are increasingly clear and action is required at global, national and local levels. Climate change means that in the future, London will experience hotter summers and wetter winters. Weather events which are considered as extreme today are likely to become far more frequent. The biggest impact on individuals and communities will be the increasing risk of flood, droughts and heat waves. This will have implications for people's health, safety and comfort, food production, biodiversity and infra-structure. Risks in London are set out in the Mayor's Adaptation Strategy.

GLA London Plan Policies (Chapter 5)

POLICY 5.1 CLIMATE CHANGE MITIGATION

To mitigate against climate change the mayor requires the London boroughs to reduce Carbon Dioxide emission from new development and supporting development of low carbon energy infrastructure to produce energy more efficiently and exploit the opportunities to utilise energy from waste.

Policy 5.2 Minimising Carbon Dioxide Emissions

London Boroughs are asked to ensure that all new residential developments achieve a minimum environmental standards as shown by achieving a Code for Sustainable Homes Level 4 with 40% emission reduction from 2006 (30% from 2009)

Policy 5.3 Sustainable Design and Construction Strategy

This policy is intended to ensure that buildings minimise carbon dioxide emissions; are efficient in resource use; protect the environment; recognise the uniqueness of locations; are healthy and adaptable; and make the most of natural systems including, for example, the use of passive solar design or local ecosystems.

Policy 5.6 Decentralised energy in development proposals, planning decisions

The Mayor supports the greater use of renewable and low carbon generation technologies, and has set a target for London to generate 25%t of its heat and power requirements through the use of local, decentralised energy (DE) systems by 2025.

Policy 5.7 Renewable Energy Strategy

There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation wherever feasible

London Borough of Camden Planning Policies

Camden Council Local Development Framework policy (November 2010) applies the Mayor of London planning polices and the London Borough of Camden planning polices to the specific local requirements of the Borough wards.

For this section it is intended to show how the proposed design meets with Camden's development policies, specific to energy and sustainability, in the context of the refurbishment of an existing listed building.

DP22 – Promoting sustainable design and construction
DP24 – Securing high quality design
DP26 – Managing the impact of development on occupiers and neighbours
CS14 – Promoting high quality places and conserving our heritage
CS13 – Tackling climate change through promoting higher environmental standards

The application the policies above is outlined in Camden's Planning Guidance on Sustainability and Energy efficiency in existing buildings (CPG3 2011)

Camden's key messages for New Developments are:

- To Demonstrate the environmental improvements demonstrating that the proposed building design will achieve a Code for Sustainable Homes Level 4 Certificate at the end of the project
- The reducing energy consumption through sustainable design, and design energy efficient heating systems with lower Carbon dioxide Emissions. This is demonstrated by achieving Code for Sustainable Homes Level 4 (minimum emission reduction of 25% form 2010 Building Regulation).
- Water efficient design to reduce the Borough water consumption and minimise the potential for surface water flooding.

In order to identify the most appropriate measures, the Council recommends taking the approach below, which takes into account measures best suited to individual buildings and households (i.e. taking human behaviour into consideration as well as the building envelope and services):

- Assess the condition of the building fabric and building services.
- Assess the effectiveness and value for money of measures to improve energy performance.

Generating Renewable Energy On-Site

Buildings can also generate energy, for example, by using photovoltaic panels to produce electricity, or solar thermal panels, which produce hot water. Once a building and its services have been designed to make sure energy consumption will be as low as possible and the use of energy efficient sources has been considered, the Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation (which can include demonstrated that such provision is not feasible. Details on ways to generate renewable energy can be found in our Camden Planning Guidance supplementary document).

4 Energy Modelling

The development has been modelled using the BRE SAP 2009 Energy Assessment Model for domestic dwellings and additional energy from equipment and occupational use has been estimated using the BRE Domestic Energy Model Formula 12.

Regulated energy is the energy used by building engineering services systems, used to calculate the building emissions rate (BER). Unregulated energy is the energy associated through the occupation, and use of the building, and is not used to calculate the BER. The energy used by washing machines and computers for example will be considered to be unregulated.

Regulated Energy

Regulated energy is the energy used for the SAP calculation to demonstrate Building Control Compliance:

- Heating
- Hot water
- Fans and Pumps
- Lighting

Unregulated Energy

Unregulated energy is the energy used by the occupants for cooking and appliances. This energy is not regulated as it depends on the occupants and their lifestyles and cannot easily be calculated.

The BRE developed the BRE Domestic Energy Model Formula 12. This statistical formula was developed in the 1970's and is a comparison between the energy used and the dwelling floor areas. It is a good representation of typical buildings but it is less accurate when used for wheelchair accessible dwellings and large luxury apartments.

Notional Building

A notional dwelling is a dwelling of the same size and shape as the proposed building and which is constructed to the minimum allowable standards set out in the in the 2006 Building Regulations.

Target Emission Rate

The Part L of the Building regulations sets Target Emissions Rate (TER) based on CO_2 emissions for all types of buildings. The target uses a "notional" building design and sets "improvement factors" for the developer to demonstrate that their designs are within the targets. The latest 2010 edition uses the 2006 level with an improvement factor of around 25%.

Dwelling Emission Rate

The Dwelling CO_2 Emission Rate (DER) is a similar indicator to the Environmental Impact rating. The DER is used for the purposes of compliance with Building Regulations. It is equal to the annual CO_2

emissions per unit floor area for space heating, water heating, ventilation and lighting, less the emissions saved by energy generation technologies, expressed in $kg/m^2/year$.

Emissions Reduction

Code Level 4 Requires the DER to be 25% less than the TER which is approximately equivalent to a 30% Emission reduction from the benchmark emission standard defined in the 2006 Building Regulations. Unregulated emissions are not included in the DER or TER calculations

Emission Reduction from Low and Zero Carbon Technologies

The 20% emission reduction from Low and Zero Carbon technologies is the reduction in combined site emission including both regulated and unregulated emission. This is demonstrated by additional calculation using the standard energy model and shown in the Code for Sustainable Home compliance report (See Appendix)

Energy Modelling Procedure

To demonstrate compliance with the Mayor's Energy Hierarchy, three separate energy models have been developed.

Base Energy Model

This model is design to demonstrate the improvements made to the building fabric (Be Lean). This model uses standard gas fired condensing boiler and radiators. This model shows the improvements made to the building fabric and air permeability rate for the building to pass the 2010 Building Regulation (approximately 15% better than the 2006 Building Regulations).

BE Clean Energy Model

This Model uses the improved U Values but also considers the improvement such as modern high efficiency Boilers and controls.

Be Green Energy Model

This model shows the improvements made by adding Low or Zero Carbon energy generation to meet the 20% emission reduction set out in the London Plan. .

It should be noted that since this is a single dwelling development the only requirement is for the building to achieve the minimum requirements required to demonstrate Code for Sustainable Homes Level 4 (25% improvement from the TER)

Option A Code for Sustainable Homes level 4 thermal improvements only.

This Option considers how to achieve Code for Sustainable Homes level 4 rating without renewables. The emission reduction obtained through thermal improvements only

Option B Code for Sustainable Homes level 4 with renewables this option takes thermal improvements to point where the building compliances with Part L (just exceeds the TER) The rest of the emission is reduced through the installation of PV.

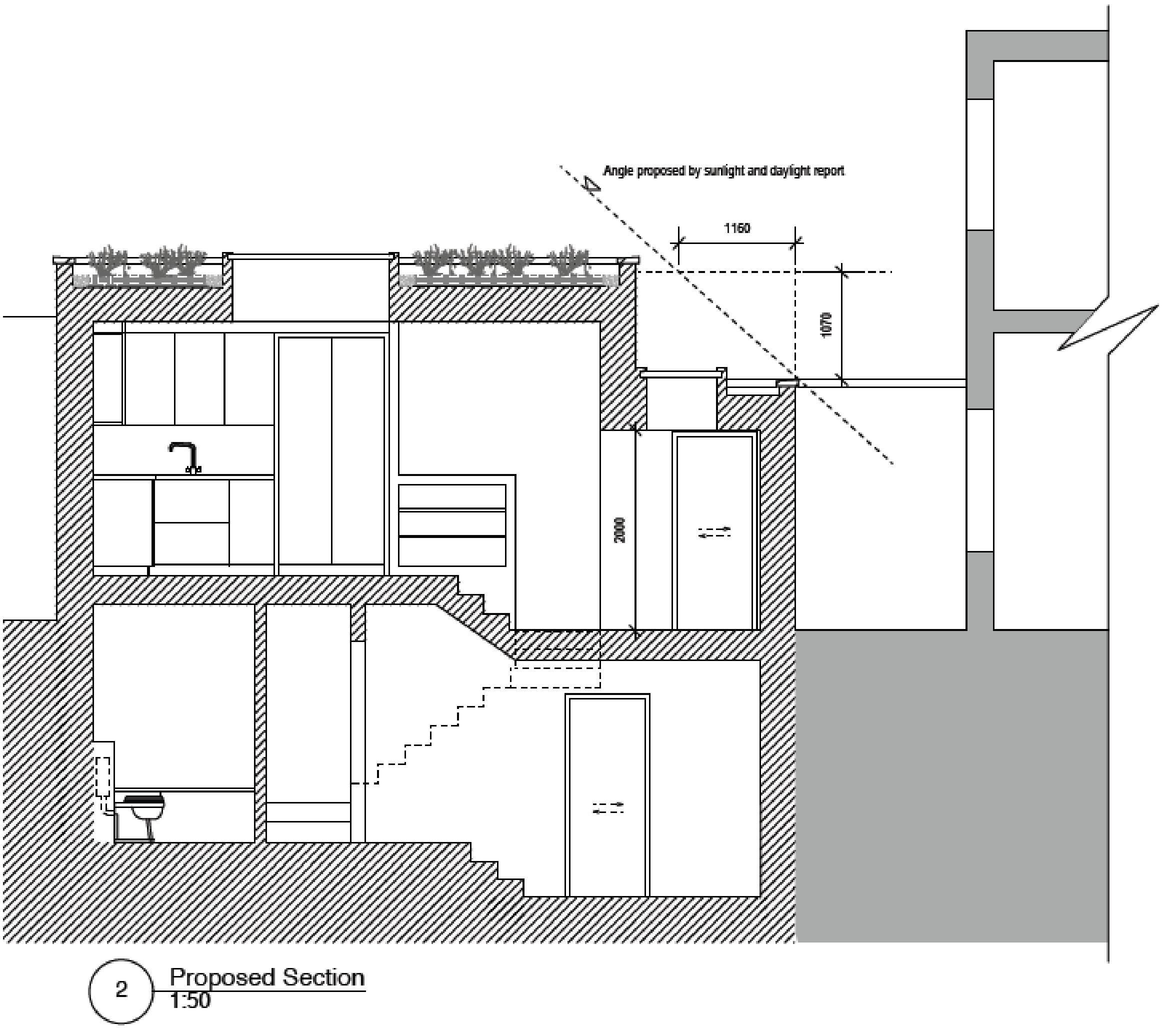

Figure 5 Cross Section(

5 Passive Design and Energy Demand Reduction (Be Lean)

The proposed development of 62 Mansfield Road will reduce the energy consumed during the life of the building by using thermal improvements and adopting sustainable design practises, as set out in the London Borough of Camden Sustainability Planning Guide Document 3

Sustainable design reduces the energy used during both construction and operation of the building. There are two types of lean energy reduction:

Passive Energy Savings

Passive savings are built into the building structure and tend to last the lifetime of the building and include the following:

- Reduce building fabric U Values
- Low air permeability rates
- Optimisation of window sizing and shading
- Dual façade opening for controllable natural ventilation
- Selection of green building materials with improved thermal mass

Active Measures

Active lean energy measures reducing energy consumption through recycling the heat in a mechanical ventilation system, or through efficient operation, such as low energy lighting and low water use fittings These measures comply with London policies 5.2 minimising carbon dioxide emissions and policy 5.3 Sustainable Design and Construction Strategy.

Fabric, Floor and Roofs

The construction of these elements will be designed to reduce thermal bridging losses at the intersections, junctions of walls and roofs. These elements will be detailed so that the builder can achieve the required air permeability.

	Building Regulation	Complaint	Option A Code 4 Thermal Improvements Only	Option B Code 4 With PV
Walls	0.35W/m²K	0.12W/m²K	0.10W/m²K	0.12W/m²K
Floors	0.25W/m²K	0.12W/m²K	0.10W/m²K	0.12W/m²K
Roof	0.25W/m²K	0.12W/m²K	0.10W/m²K	0.12W/m²K
Windows	2.20W/m²K	1.40W/m²K	1.40W/m²K	1.40W/m²K
Roof lights	2.20W/m²K	1.20W/m²K	1.20W/m²K	1.20W/m²K
Door	3.00W/m²K	2.50W/m²K	2.50W/m²K	2.50W/m²K
Air permeability Rate	10.00m³/m²@50pa	4.2m³/m²@50pa	1.0m³/m²@50pa	4.2m³/m²@50pa

Table 5 Proposed Thermal (U Value) Improvements.

Air Permeability Rates

An air permeability rate of 2.5m3/m2 @ 50pa, (75% improvement over Part L) has beneficial results of reducing heat loss through uncontrolled infiltration through the external fabric. This also reduces the fresh air change rate of dwellings, which could increase the risk of condensation and damp from poor ventilation.

Achieving air tightness of less than $5m^3/m^2@50pa$ can often be difficult using traditional building methods. The architect will probably adopted frame construction system which provides the opportunity to seal the building using taped joint damp proof membrane. Having very low air tightness will result in large Mechanical Ventilation Unit (MVHR) to compensate for the lower air exchange rates. MVHR units have multiple fan speed settings allowing occupants to add more fresh air in winter, when the windows are closed.

Window Orientation, Ventilation and Summer Time over Heating

Modern dwellings with low air permeability rates and low heat loss from the fabric, often suffer from high internal temperatures on warmer days. To remove the trapped heat the window design has to include the ability to provide additional ventilation without cold draughts and purge ventilation to quickly remove pollutants. This will be achieved using a combination of window opening sizes, from large openings using sliding doors, to smaller openings created from smaller centre hung sash window openings.

The roof lights are designed to maximize the quality of daylight into living area and kitchen. The Code for Sustainable Homes daylights credits requires that these rooms have windows allowing a sky view.

The access to the dwelling is through a door set into a high brick wall. The entrance through the door in the brick wall leads onto a bridge across the small garden courtyard. This ensures that the courtyard is private, quiet and open to the sky. All windows open on to the courtyard. The roof lights provide a second opening to ensure a ventilation path through the building in summer. The cool air in the shaded courtyard is designed to ensure the building does not over heat in summer. (Climate Change Mitigation).

The dwelling has very low useful solar gains in winter, which is compensated for by the lower fabric U values and increased air tightness.

The windows will be selected with BFRC Window “C” energy rating, which take into account the thermal performance of glass, air tightness and solar control, and is considered a better than single U value which is only the performance of the windows to reduce heat loss from the dwelling.

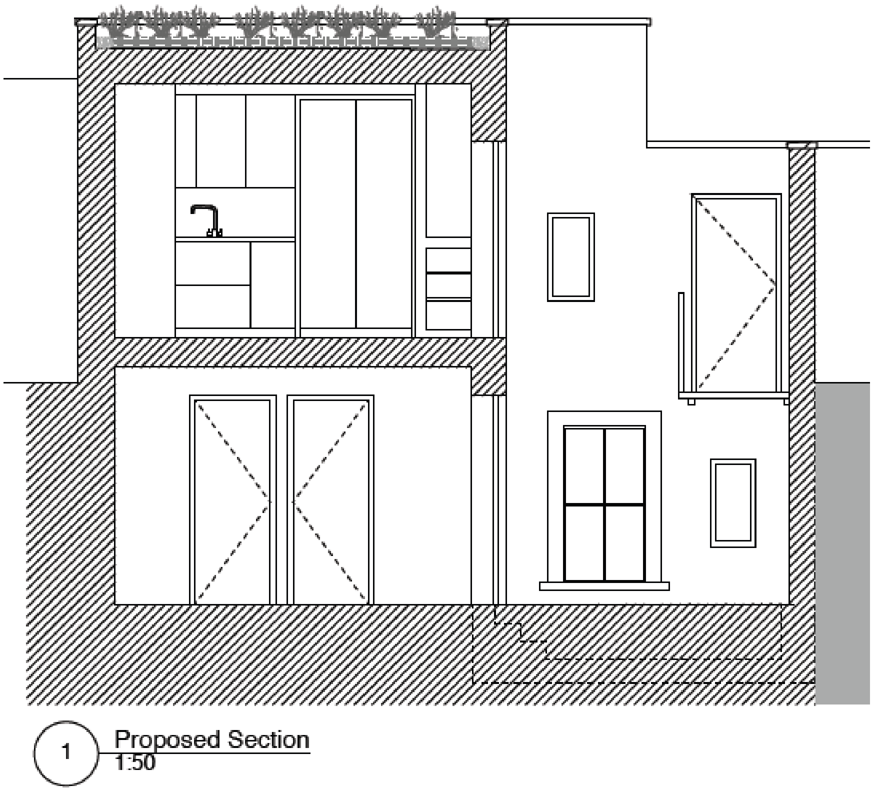

Figure 6 Cross Section through Dwelling,. Showing Openings onto Courtyard.

Whole House Mechanical Ventilation with Heat Recovery

The whole house ventilation system is the primary background ventilation. The ventilation design will include balanced whole house ventilation units with heat recovery, (such as the Vent Axia Kinetic).

Whole house ventilation units have been recommended for this development because these units are predicted to recover between 300kWh and 500kWh of heat energy per year and saving the occupants on their heating bills. The saving is greater than the increased cost of using electrical energy to operate the fans. MVHR units are the key element of passive house design where heat recovered from the air exchanger is utilised to keep the dwelling comfortable and moisture free.

Due to the compact size of the dwelling it is important that the MVHR unit is designed to provide a higher ventilation rate than the rates specified in the Building Regulations Approved Document Part F Standards.

Figure 7 Vent Axia Whole House Ventilation with Heat Recovery.

The main bathroom will be provided with a clothes-drying rack encouraging occupants to reduce the use of electric tumble dryers. The whole house ventilation unit requires additional boost controls, connected to a humidity sensor to avoid the build-up of condensation in the bathroom from drying clothes.

A separate cooker hood extract unit is specified to extract air from above the cooker and vent to the outside through dedicated duct work. This is required to avoid contaminating the heat exchange unit with grease from the cooking.

Most of the manufacturers also provide a commissioning service with on-going annual maintenance contracts. This option is recommended to the occupants / building operators. Regular servicing of the whole house ventilation units should ensure the regular replacement of filters and upgrading of fans and controls.

It should be noted that failure of the fans does not result in the total loss of ventilation, since the units are designed with very low frictional losses and will operate in a passive mode, although less air volume.

The alternative to whole house mechanical ventilation units, are large trickle vent grilles built into the windows or walls. These manually operated grilles often cause cold draughts in winter and the grilles are closed off by the occupants. Once closed, the grills are rarely reopened, resulting in the total loss of background ventilation to the dwellings.

Water Requirements

The Department of Communities and Local Government have amended the Building Regulations to limit water flow rates (water efficiency in new buildings December 2006). This limits shower flow rates to 12 litres per minute. To provide good flow rates and bath sizes either grey water recovery or rainwater recovery should be adopted for WC flushing and external water use.

To achieve Code of Sustainable Homes Levels 3 or 4, the internal water use has to be limited to 105 litres per person per day. This is a mandatory requirement and failure to achieve this element will result in a lower or zero level CfSH rating.

LBC Core Strategy 13 promotes the reduction of water consumption through low water use fittings the table below show the proposed water flow rates. The site is extremely compact and has no available space for a rainwater storage tank. The existing site is a concrete hard standing car park; the change of use of the site to dwelling will not increase the surface water runoff rate to the local sewer system.

INSTALLATION	DESCRIPTION	WATER USE
WC	Dual Siphon Flush	6/4 litres
Wash Hand Basin	Flow Regulators or Aerating	4 litres / minutes
Bath	Standard	180 litres
Shower	Flow Rate Between	8 litres / minute
Kitchen Sink	Standard Monoblock	6 litres / minute
Washing Machine	Best Practice	6.14 litres / kg (Supplied)
Dish Washer	Best Practice	1.25 litres / place (Not Supplied)

Table 6 Water fitting Flow rates to achieve 105liters per person per day.

6 Space Heating Be Clean

There is not great choice for emission heating, as the site is extremely compact. The development is design to provide comfortable living for two people and as such has low energy requirement for hot water and space heating.

Using the SAP energy modelling compliance software a number of options have been considered for space heating and hot water.

Heat Pumps

Heat pumps use the refrigeration cycle to provide heat for space heating and hot water and are powered by electricity. These units consist of an outdoor unit which collects heat from the air and an indoor unit which upgrades the heat to a useful temperature. Heat pumps are most efficient when there is a small temperature difference between the inside and outside units. The efficiency drop is considerable as the external temperature falls below $3°C$. Heat pumps are less efficient when providing hot water at $50°C$. Heat pumps only offer an emission reduction and energy cost saving when compared to oil or electric heating system.

Due to the compact nature of site and proximity to other residential buildings, it is not practical to use air source heat pumps with a large noise emitting out door unit. Internally there is not the space for a large hot water storage cylinder required to store the heat for later use. Heat pumps are not proposed.

Combine Heat Power (CHP)

Micro-cogeneration provides both heat and electricity. It is assumed to be heat-led, meaning that it is allowed to operate only when there is a demand for space heating or hot water. The domestic application of micro-cogeneration is treated as an alternative to a conventional domestic boiler, using natural gas, LPG, oil or solid fuel. It is also assumed that it is connected to the public electricity supply in such a way that all surplus electricity generated is exported.

The heat produced by the package and the electrical energy consumed/generated are based on operation during an average year, taking account of its output rating and the design heat loss for the dwelling in which it is installed. The amount of auxiliary heating is determined by the plant size ratio (full output power of the micro-cogeneration package divided by the design heat loss). If the plant size ratio is less than 0.2 then the package cannot be regarded as a main heating system, and the performance data is invalid for SAP.

The plant size ratio at 62 Mansfield road is to low to allow the economic use of Micro CHP and therefore it is not proposed.

Gas Combination Condensing Boiler

Modern gas combination boilers have in recent years become extremely efficient due to increasing regulation. The advances made to the boiler design include modulating flame control which reduces the size of the flame to the require heat output, results in new boiler achieving 90% efficiency ratings. The main advantage of combination boiler is that there is no hot water cylinder and the associated system heat-losses in storing hot water. The boiler produces hot water on demand. This type of unit is design for small dwellings with single bathrooms. Most combination boilers are unable to provide hot water to more than one outlet simultaneously.

For both Code for Sustainable Homes option A &B a gas combination boiler supplying heat to under floor heating system is proposed for 62 Mansfield Road. A combination provides the best and most efficient heating solution for a small dwelling.

7 Renewable Energy Be Green

62 Mansfield Road is required to achieve the Code for Sustainable Homes Level 4 rating which requires a 25% emission reduction. Using the SAP Energy compliance model two options have been considered:-

The option A Code for Sustainable Homes level 4 without renewables is to reduce the emission reduction through improving the U value and air tightness to a minimum level. It was possible to demonstrate that proposed design could achieve the required 25% emission reduction without the use of a low or zero carbon power generation. This required reducing wall, roof and floor U values to 0.1W/m^2K and an air permeability rate of 1.5m³/m^2@$50Pa$. Additional emission reduction is achieved through using waste water heat recovery.

Waste water heat recovery

The standard Recho-tray installation comprises a high quality enamelled steel Bette shower base under which is coupled a high efficiency Shower Save heat exchanger. The shower tray is mounted above floor level. The Recho tray .saves energy by rising the temperature of the cold water from the recove3rd heat from the waste water. The of the cold water temperatures of 10C° reduces the amount hot water required by the shower. This can save surprising amount of energy across the year , The SAP model predicts 475kWH energy saving (£35per year)120kgCO_2/year

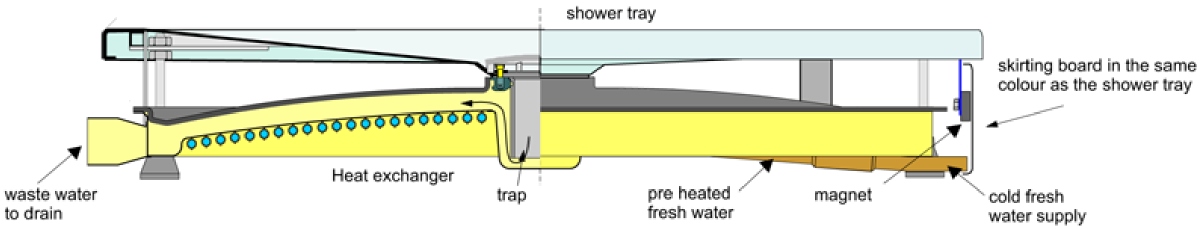

Figure 8 Shower Save Recho-tray.

The option B Code for Sustainable Homes level 4 with renewables is to reduce the Carbon emission by generating electricity from a Photo voltaic array on the roof of the development. This requires an array of 0.8kW producing 686kWh/year and feed in tariff income of approximately £100/year.

Ene 7 Low or Zero Carbon Reduction	%	Kg/m^2/year
Standard Case CO_2 emissions		44.72
Standard DER		24.68
Actual Case CO_2 emissions		38.29
Actual DER		18.25
Reduction in CO_2 emissions	14.38%	

Table 7 Ene 7 Emission reduction Calculation (Ene 7= 1 credit).

Other Low or Zero Carbon technologies where also considered:

- Wind turbines – not suitable in urban location with turbulent wind flow from surrounding buildings.

- Solar water – hot water usage is a low in single bedroom dwelling and there were space limitations for a hot water storage cylinder and for solar collector on the roof.

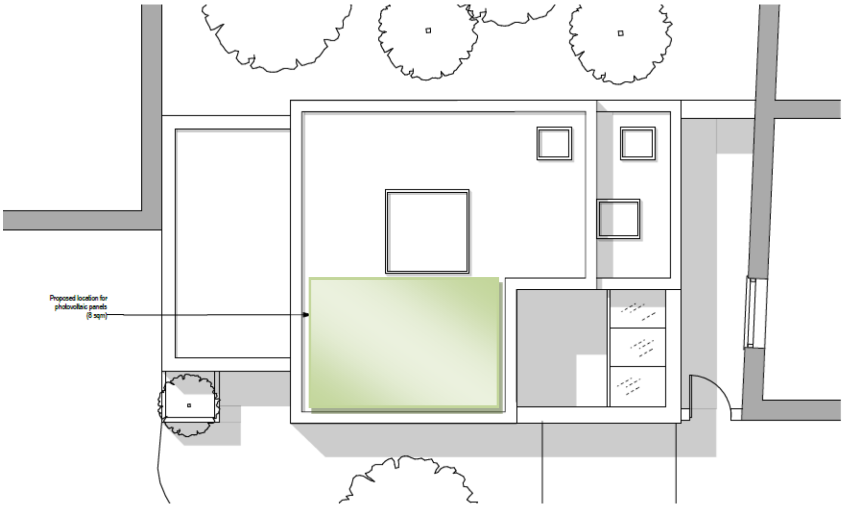

Figure 9 location of roof PV 0.8kW686kWh/year. (Horizontal)

8 Energy Modelling Conclusion.

Two option have been considered on how to reduce the energy and as result emission reduction to achieve code for sustainable Home Level 4 in option A, whereas option B reduce cost by relaxing U values and air permeability and replace emission reduction through on site zero carbon electricity. Both option have merit and achieve the same result.

Option A Level 4 Code Level 4 with Thermal improvements and Waste Water Heat Recovery.

Option A can be considered as non-compliant with the London Mayor and Borough planning policy to produce 10% of the electricity from on-site low or Zero Carbon Energy source. This option is likely to be most costliest option to build, since the addition of extra insulation to bring wall roof U vales to $0.1W/m^2K$ is considerable more expensive than the roof PV array. There is also considerable risk in building to an air permeability of less than $2m^3/m^2$@50pa. The risk should be assessed with the understanding that almost 40% the building is below ground and will be tanked. The other 60% is to be constructed using modern steel or timber frame system which through the use of taping the membrane before construction of the outer wall often results in very low air Permeability rates

Option A Code 4 Thermal Improvements	U Values	Improvements
Walls	$0.10W/m^2K$	71%
Floors	$0.10W/m^2K$	60%
Roof	$0.10W/m^2K$	60%
Windows	$1.40W/m^2K$	36%
Roof lights	$1.20W/m^2K$	45%
Door	$2.50W/m^2K$	17%
Air permeability Rate	$1.0m^3/m^2$@50pa	

Table 8 Option A U Values

Energy saving from under shower waste water heat recovery.

2012 Building Regulation TER 24.07 $kgCO_2/m^2$ DER 18.03$kgCO_2/m^2$ 25.1% emission reduction

Option B Code Level 4 with Photo Voltaic

Option B has marginal less thermal efficient and simpler construction using approximately 10% less insulation and higher air permeability rate. This proved great design flexibility when specifying the building construction materials. The thermal U-Values are considerable better than the Building Regulation. This option will have marginal higher heating energy costs will more than recovered through Feed in Tariff received from the zero carbon electricity produced by the PV array. Both option will result in building with similar energy costs.

Option B Code 4 With PV	U Values	Improvements

Walls	0.12W/m²K	66%
Floors	0.12W/m²K	52%
Roof	0.12W/m²K	52%
Windows	1.40W/m²K	36%
Roof lights	1.20W/m²K	45%
Door	2.50W/m²K	17%
Air permeability Rate	4.2m³/m²@50pa	

Table 9 Option B U values

0.8kW of PV.

2012 Building Regulation TER 24.07 $kgCO_2/m^2$ DER 17.09$kgCO_2/m^2$ 27% emission reduction

The preferred solution is to adopt option A, without roof PV , however this option may add considerable cost to the new building and additional risk to the builder by having to achieve an extremely air permeability rate. At the time planning there has not enough time to under full research into the viability of achieving and air permeability rate of less than 2m³/m²@50pa. Manufactures such of wall system such as Kingspan are not able to offer an guarantees to the builders that their products can achieve these low air permeability rates. This is because the final air tightness test are more of result of the build quality than fabric systems used.

To mitigate against this risk the proposal is to design the building to option A but make allowance for the possible inclusion of PV panels should it prove to difficult to achieve.

9 Code for Sustainable Homes certification

In line with London Borough of Camden requirements, the dwelling will achieve a 'Level 4' rating under the Code for Sustainable Homes scheme. The pre-assessment estimator has been completed and the dwelling has scored 69.01% which is within the parameters of a 'Level 4' rating.

The Code for Sustainable Homes assesses the environmental sustainability of the dwelling over 9 categories of environmental sustainability. Each section has a weighting, dependent on its environmental impact, as such each of the measures that are outlined within this report do not carry equal influence. We have included the Code weighting of each section alongside each heading in brackets. This section will summarise the proposed sustainability measures for each category

	Score	Maximum	Percentage
Total	72.4	107	68%
Ecology	7	9	7%
Management	8	9	7%
Health and Wellbeing	12	12	11%
Pollution	3	4	3%
Waste	6	8	6%
Surface Water	3	4	3%
Materials	14	24	13%
Water	3	6	3%
Energy	16.4	31	15%

Table 10 Summary Table of the Code for Sustainable Homes Credits.

Management (89%)

This category ensures that the building is constructed and managed in an environmentally sustainable manner.

A home user guide (in addition to the Operation and Maintenance manual) will be provided for the dwelling and it will cover both operational issues and information relating to the site and surroundings. It will also be available in alternative formats.

The contractor is required to register the site with Considerate Contactors Scheme. This scheme is designed to monitor the site impacts on the local residents and the welfare of the workforce. The contractor is required to achieve a score of between 32 and 40. .As part of the scheme the contractor is required to monitoring, report and to setting targets on CO_2 and water and adopting best practice policies on water and air pollution. In addition more than 80% of the site timber will be legally sourced.

The compact nature of site will require the contractor to organise alternative store area away from site and time deliveries to site, to avoid inconvenience to the neighbours

The Architect is required to consultant with local Metropolitan Police Architectural Liaison Officer (ALO) t implement their recommendations regarding the security of the dwelling. On completion of the project the ALO is required to visit the site and award the secure by design certificate.

Energy & CO_2 emissions (15%)

This category ensures that the energy and CO_2 emissions from the dwelling are minimised.

- The dwelling will achieve at least a 25% improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER), as calculated by the Standard Assessment Procedure (SAP).
- The dwelling will achieve a fabric energy efficiency of 3.5 credits
- Energy display devices will be provided to monitor electricity and primary heating fuel consumption.
- There will be adequate space and fittings provided to hold 6m+ of drying line.
- The dwelling will be provided A or A+ rated white goods.
- All external space and security lighting will be energy efficient and code compliant, i.e. all burglar security lighting have a maximum wattage of 150W, motion detecting control devices and daylight cut-off sensors.
- There will be a 10% reduction in CO_2 emissions for the dwelling arising from the use of PV.
- The dwelling will provide adequate, safe and secure cycle storage for its occupants in line with the Code for Sustainable Homes requirements.
- A Home office would be provided in line with the code requirements.

Cycle storage is not provided currently as there is question of the practicality of providing a Code for Sustainable Homes secure cycle rack. This credit may be sought if other credits are lost during design development.

Water (3%)

This category ensures that water use in the dwelling is minimised.

The water consumption for the dwelling will not exceed 105/person/day – this will be achieved through the installation of low water consuming sanitary fittings and white goods. See Table 6 Water fitting Flow rates to achieve 105liters per person per day.

Surface Water Run-Off (3%)

This category ensures that the surface water run-off from the site does not create a flood risk to the surrounding areas.

Section 7 Hydrology and Flood Risk of the Ashton Bennett basement impact assessment, details the potential local flood risks from rivers, reservoirs and surface water. The report concludes that site has very low probability of flooding and is suitable for allowing sleeping accommodation in the basement.

The site currently drains into the local sewer through existing drains which will reused post construction.

The peak rate of run-off into watercourses will not be any greater than it was for the pre-developed site and the run-off from hard surfaces will receive an appropriate level of treatment. This will ensure the proposed development will not increase the risk of local flooding.

Health & Wellbeing (11%)

This category ensures that the health and wellbeing of the residents is a priority.

The planning and daylight report by BLDA Consultancy confirms that living room and kitchen areas have the required 2% Daylight factors and there is sky view through the sky light.

Sound insulation levels of at least 5db below Part E or better will be designed into the wall and floor structures.

The proposed development will implement all the 16 Life Time Homes Criteria.

Waste (6%)

This category ensures that the waste on site and in the dwelling is responsibly managed in an environmentally sound manner.

There will be adequate external space to accommodate the containers provided by the Local Authority, or for minimum capacity as calculated from BS 5906 (whichever is larger) for non-recyclable household waste. There will be adequate internal space with a minimum total capacity of 60 litres.

The contractor will develop a Site Waste Management Plan (SWMP) in line with best practice, monitoring waste generated on site and setting targets to improve resource efficiency. The SWMP will include procedures for sorting, reusing and recycling construction waste.

Adequate composting facility will be provided in a suitable location

Materials (13%)

This category ensures that the materials used in the construction of the building will have a low environmental impact and will be responsibly sourced.

The key building elements will have a low environmental impact according to the BRE Green Guide to Specification.

The basic building elements will be responsibly sourced (i.e. be traceable through a certification or Environmental Management scheme).

The finishing elements of the dwelling will be responsibly sourced (i.e. be traceable through a certification or Environmental Management scheme).

Pollution (3%)

This category ensures that the pollution generated from the dwelling is minimised.
Any insulating materials specified only use substances with a Global Warming Potential (GWP) of <5.

Ecology (7%)

This category ensures that the impact of the dwelling on the ecology of the site is minimised.
The Ecology Report has established that the land is of a low ecological value.
Biodiversity, the richness and variety of nature is essential to the preservation of a healthy environment. Its decline reduces the pool of biological resources available to future generations. The London Borough of Camden supports the conservation and enhancement of biodiversity as part of its broad approach to sustainable development and growth in the Borough.

The proposed infill development at 62 Mansfield road is located on brownfield current used as hard standing parking bays. The site has no Ecological valve beyond the existing plane trees. (See Arboriculture Report and Basement Impact Assessment). To improve the site ecological value it is proposed to include a green roof.

Green / Brown / Living roofs are import part of a sustainable design building. These roofs provide an opportunity to support and increase local wild life, providing scenic interest through out the year.

The roof can contribute towards the following:

- Reducing surface water run off as part of the Sustainable Urban Drainage (SUD) design. The green roof is designed to hold rainwater within the substrate materials and contained within the living plants.
- Green roof in winter help to insulate the roof and tend to have lower thermal loss that standard flat roof.
- In summer green roof's help to reduce the heat island effect, by reducing the amount solar energy absorb by dark flat roofs. The living roofs tend to absorb less solar energy and retain heat for longer. The roof is often cooler due to the transpiration of water from the plants and soil.
- Green roof construction use at least 80% recycled material content.

Green roofs are generally defined as being either 'extensive' or 'intensive', terms that indicate their cost, their use and the amount of maintenance the plants need. However, their use also affects the components used in the construction of both the roof itself and the structure of the building.

Extensive green roofs are designed to reap the benefits that green roofs offer but at minimal cost and with very little maintenance. A shallow layer of growing medium is used to support low growing, stress-tolerant plants such as grasses, mosses and sedums - plants that can generally look after themselves. Apart from being low cost and low maintenance, their low weight means the building's structure may not need strengthening so sometimes they can be added to an existing building.

Intensive green roofs, or 'roof gardens', are at the other end of the scale and are often designed to provide recreational space for the building's occupants. They may contain a wide variety of plants, including shrubs and trees, and will need as much care and maintenance as any garden. In addition, large plants need more growing medium which means the building's structure will have to be designed to take the additional weight. An intensive green roof is not proposed for this project.

Biodiversity roofs are another form of semi-extensive green roof (i.e. low maintenance) that makes use of recycled materials (e.g. crushed brick, crushed concrete etc.) in the growing medium.This type of green roof is intended to create a natural wasteland and can be seeded initially with selected species to create some growth. However the basic design is to attract fauna and flora of all kinds. As the growing medium is not of high nutritional value, larger plants are not likely to survive and will die off creating further suitable habitat for invertebrates which in turn will attract other fauna.

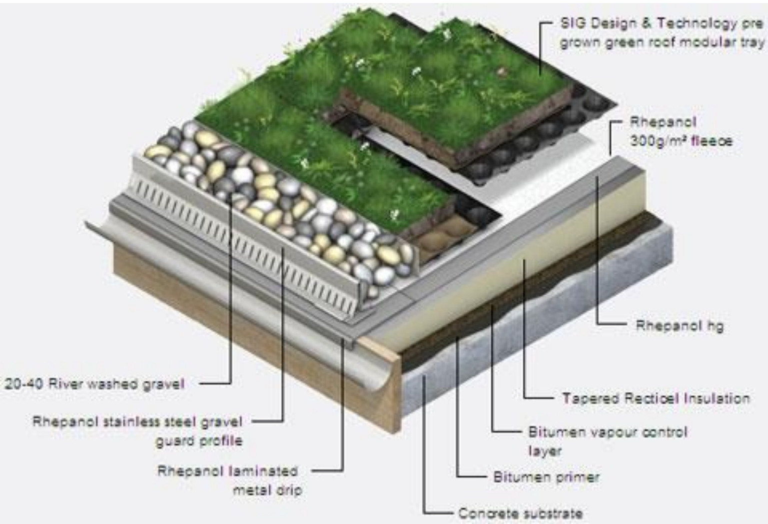

Figure 10 Typical Section for Green Roof.

The development of the infill house at 62 Mansfield Road has number of small flat roof which are over looked by neighbouring properties. Access to roof is limited and requires low maintenance planting. The roof is the only real opportunity to improve the local biodiversity and gains additions Code for Sustainable Homes level 4 credits. The proposal is to seek advice on the planting scheme to increase the local bio-diverse roof which is design to encourage local wild life, provide seasonal interest, low maintenance, contribute towards the SUDs design, low maintenance (access issues, contribute toward using recycled materials, and consider the impact of the roof on the building structure and cost.

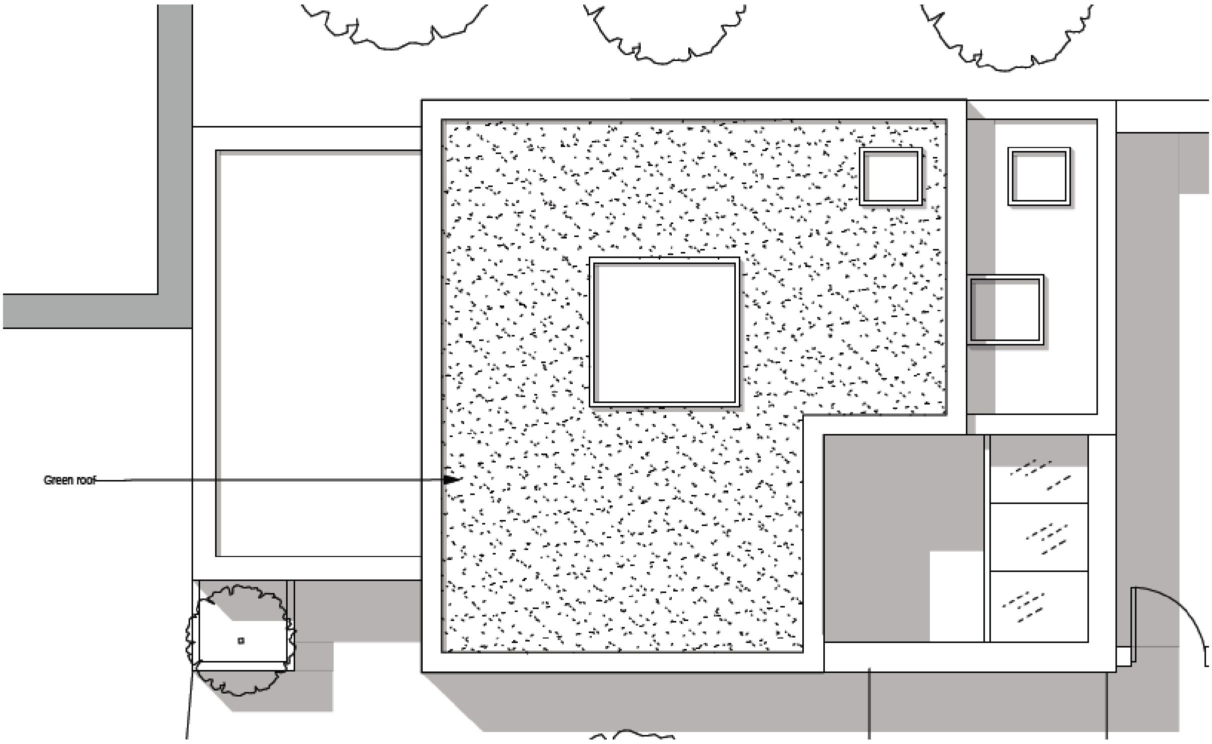

Figure 11 Location of Green Roof

Code for Sustainable Homes

All key recommendations and more than 30% of the Ecologist's recommendations will be implemented.

The existing ecological features (trees) will be protected throughout site preparation and construction (see tree plan).

There will be no negative change in the ecological value of the site as a result of dwelling. It is intended that there will be a minor enhancement of between 3 and 9 species to the site's ecology.

The land use ratio of NIFA to NIGFA is greater than 3:1 for the proposed development.

Appendix A 2006 SAP Outputs Reports

Building regulation minimum compliance

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71
Printed on 21 May 2014 at 12:04:03

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : 62 Mansfield Road

Plot Reference: Part L compliance

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name: Allan Properties Ltd

Address :

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

1 TER and DER

Fuel for main heating system: Natural gas
Fuel factor: 1.00 (natural gas)

Target Carbon Dioxide Emission Rate (TER)	24.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.84 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.44 (max. 2.00)	1.80 (max. 3.30)	OK

3 Air permeability

Air permeability at 50 pascals	5.00	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Boiler system with radiators or underfloor - mains gas
Data from manufacturer
Combi boiler
Efficiency 87.0 % SEDBUK2009
Minimum 88.0 % **Fail**

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Programmer, TRVs and boiler energy manager	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

Regulations Compliance Report

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.41	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	0.27m²,
Windows facing: North East	1.26m²,
Windows facing: North West	3.37m²,
Windows facing: South West	3.2m²,
Windows facing: North West	3.21m²,
Windows facing: North East	0.27m²,
Roof windows facing: Horizontal	2.25m²
Roof windows facing: Horizontal	0.29m²
Roof windows facing: Horizontal	0.58m²
Ventilation rate:	8.00
Blinds/curtains:	None
	shutter closed 100% of daylight hours

10 Key features

Roof window U-value	1.4 W/m²K
Windows U-value	1.4 W/m²K
Roofs U-value	0.12 W/m²K
External Walls U-value	0.12 W/m²K
Floors U-value	0.12 W/m²K

Building minimum compliance

SAP Input

Property Details: Part L compliance

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 414.05
Dwelling designed to use less than 125 litres per Person per day:	True

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.36 m
Floor 1	28.26 m²	2.52 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

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Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	1.8	1.58	1
LG P NE 1	6mm	0.8	0.77	1.4	0.27	1
LG P NE 2	6mm	0.8	0.77	1.4	1.26	1
LG P NW	6mm	0.8	0.77	1.4	3.37	1
G SW K/LR	6mm	0.8	0.77	1.4	1.6	2
G P NW	6mm	0.8	0.77	1.4	3.21	1
G P NE	6mm	0.8	0.77	1.4	0.27	1
RL 1	6mm	0.7	0.77	1.4	2.25	1
RL 2	6mm	0.7	0.77	1.4	0.29	1
RL 3	6mm	0.7	0.77	1.4	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2
G P NE		G P	North East	0.35	0.768

Building minimum compliance

SAP Input

RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.12	0	False	190
LG P	11.892	4.9	6.99	0.12	0	False	190
G	48.581	3.2	45.38	0.12	0	False	190
G P	12.703	5.06	7.64	0.12	0	False	190
Roof 1	27.04	2.54	24.5	0.12	0		9
Roof 2	3.8	0.58	3.22	0.12	0		9
ground floor	28.26			0.12			110
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Balanced with heat recovery
Brand/Model: Vent Axia Sentinel Kinetic Plus BS
Test efficiency: 90%, SFP: 0.41
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True
Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of sides sheltered: 0
Pressure test: 5

Main heating system:

Main heating system: Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Manufacturer Declaration
Manufacturer's data
Efficiency: 87.0% (SEDBUK2009)
Condensing combi with automatic ignition
Fuel Burning Type:
Underfloor heating, pipes in screed above insulation
Pump in heat space: Yes

Main heating Control:

Main heating Control: Programmer, TRVs and boiler energy manager
Control code: 2109
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

SAP Input

	Water code: 901
	Fuel :mains gas
	No hot water cylinder
	Solar panel: False

Others:

Electricity tariff:	standard tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

Building minimum compliance

Predicted Energy Assessment

SAP
© Crown copyright 2009

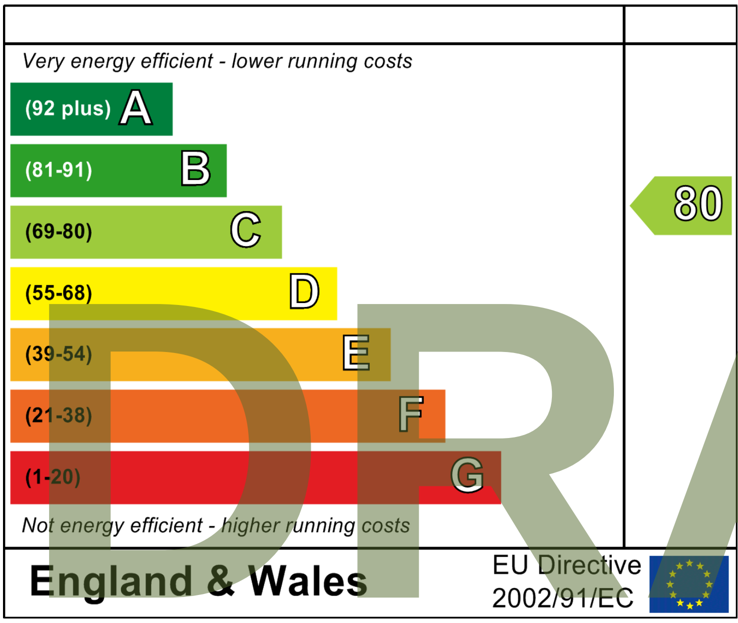
62, Mansfield Road
LONDON
NW3 2HU

Dwelling type:	Detached House
Date of assessment:	01 May 2014
Produced by:	Stroma Certification
Total floor area:	56.52 m²

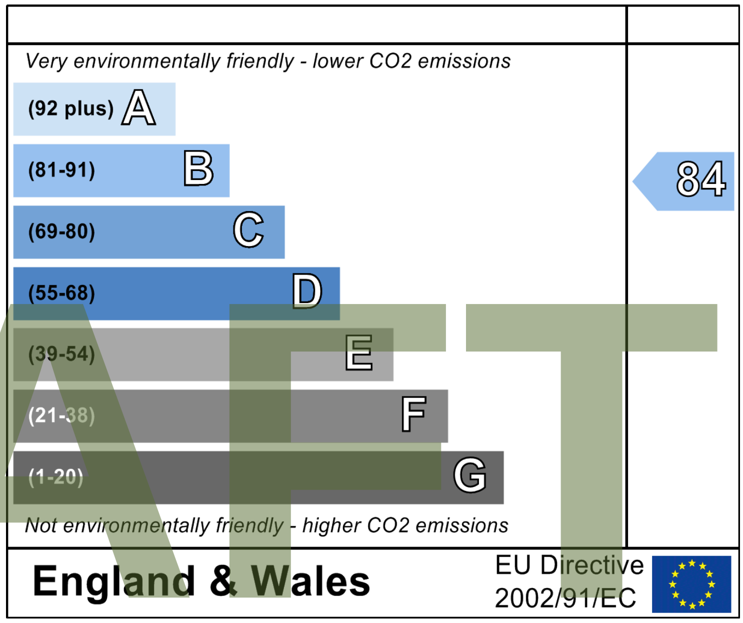
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2009 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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

The environmental impact rating is a measure of a home’s impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

Building minimum compliance

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: **Assessor Number:**

Property Address: 62, Mansfield Road
LONDON
NW3 2HU

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	23.84

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		23.84	(ZC1)
TER		24.07	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricty generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		23.84	
% improvement DER/TER	1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	23.84	(ZC1)
CO2 emissions from appliances, equation (L14)	17.14	(ZC2)
CO2 emissions from cooking, equation (L16)	2.9	(ZC3)
Net CO2 emissions	43.9	(ZC8)

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Result:

Credits awarded for Ene 1 = 0.1

Code Level = 3

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 70.67

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		44.79
Standard DER		24.75
Actual Case CO2 emissions		44.79
Actual DER		24.75
Reduction in CO2 emissions	0	

Credits awarded for Ene 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Option A Thermal Improvements

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71
Printed on 21 May 2014 at 12:03:58

Project Information:

Assessed By: () **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : 62 Mansfield Road **Plot Reference:** Option A Thermal improvements

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name: Allan Properties Ltd

Address :

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

1 TER and DER

Fuel for main heating system: Natural gas
Fuel factor: 1.00 (natural gas)

Target Carbon Dioxide Emission Rate (TER)	24.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.03 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.10 (max. 0.30)	0.10 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.26 (max. 2.00)	1.80 (max. 3.30)	OK

3 Air permeability

Air permeability at 50 pascals	1.00	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

Option A Thermal Improvements

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.41	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	0.27m²,	
Windows facing: North East	1.26m²,	
Windows facing: North West	3.37m²,	
Windows facing: South West	3.2m²,	
Windows facing: North West	3.21m²,	
Windows facing: North East	0.27m²,	
Roof windows facing: Horizontal	2.25m²	
Roof windows facing: Horizontal	0.29m²	
Roof windows facing: Horizontal	0.58m²	
Ventilation rate:	8.00	
Blinds/curtains:	None shutter closed 100% of daylight hours	

10 Key features

Air permeablility	1.0 m³/m²h
Roof window U-value	1.2 W/m²K
Windows U-value	1.2 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K

Option A Thermal Improvements

SAP Input

Property Details: Option A Thermal improvements

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 414.05

Dwelling designed to use less than 125 litres per Person per day: True

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.36 m
Floor 1	28.26 m²	2.52 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	1.8	1.58	1
LG P NE 1	6mm	0.8	0.77	1.2	0.27	1
LG P NE 2	6mm	0.8	0.77	1.2	1.26	1
LG P NW	6mm	0.8	0.77	1.2	3.37	1
G SW K/LR	6mm	0.8	0.77	1.2	1.6	2
G P NW	6mm	0.8	0.77	1.2	3.21	1
G P NE	6mm	0.8	0.77	1.2	0.27	1
RL 1	6mm	0.7	0.77	1.2	2.25	1
RL 2	6mm	0.7	0.77	1.2	0.29	1
RL 3	6mm	0.7	0.77	1.2	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2
G P NE		G P	North East	0.35	0.768

Option A Thermal Improvements

SAP Input

RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.1	0	False	190
LG P	11.892	4.9	6.99	0.1	0	False	190
G	48.581	3.2	45.38	0.1	0	False	190
G P	12.703	5.06	7.64	0.1	0	False	190
Roof 1	27.04	2.54	24.5	0.1	0		9
Roof 2	3.8	0.58	3.22	0.1	0		9
Floor	28.26			0.1			110
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Brand/Model: Vent Axia Sentinel Kinetic Plus BS
Test efficiency: 90%, SFP: 0.41
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of sides sheltered: 0
Pressure test: 1

Main heating system:

Main heating system: Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 358, product index 015282) SEDBUK2009 89.4%
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi boiler)
Underfloor heating, pipes in screed above insulation
Pump in heat space: Yes

Main heating Control:

Main heating Control: Time and temperature zone control
Control code: 2110
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

SAP Input

Water code: 901
Fuel :mains gas
No hot water cylinder
Waste Water Heat Recovery System:
  Total rooms with shower and/or bath: 1
  Product index: 080003, Shower-Save Recoh-vert RV3 System A
    Number of mixer showers in rooms with a bath: 0
    Number of mixer showers in rooms without a bath: 1
Solar panel: False

Others:

Electricity tariff:	standard tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

Option A Thermal Improvements

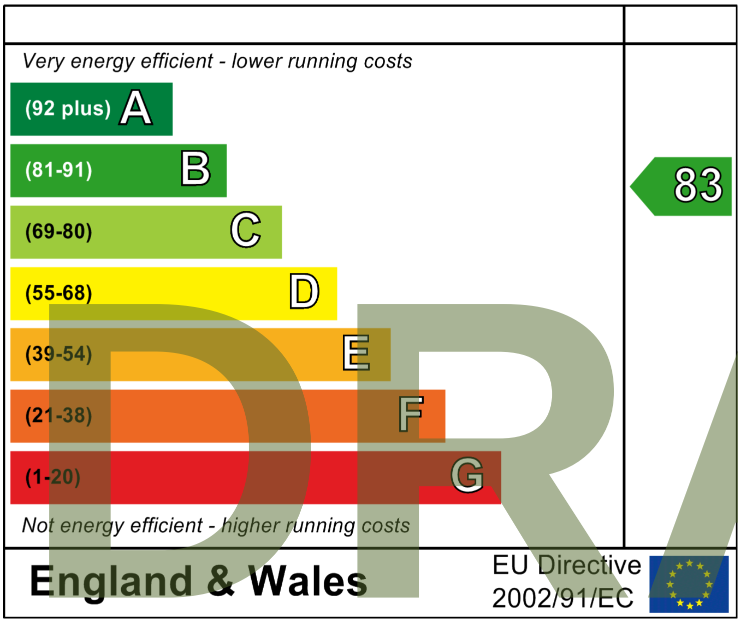
Predicted Energy Assessment

62, Mansfield Road LONDON NW3 2HU	Dwelling type: Date of assessment: Produced by: Total floor area:	Detached House 01 May 2014 Stroma Certification 56.52 m²

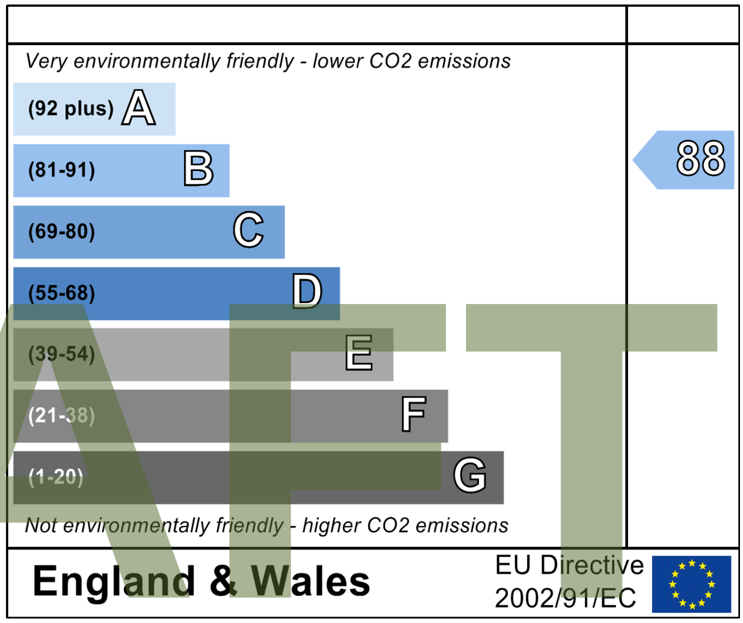
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2009 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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

The environmental impact rating is a measure of a home’s impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

Option A Thermal Improvements

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: **Assessor Number:**

Property Address: 62, Mansfield Road
LONDON
NW3 2HU

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	18.03

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		18.03	(ZC1)
TER		24.07	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricty generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		18.03	
% improvement DER/TER	25.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	18.03	(ZC1)
CO2 emissions from appliances, equation (L14)	17.14	(ZC2)
CO2 emissions from cooking, equation (L16)	2.9	(ZC3)
Net CO2 emissions	38.1	(ZC8)

DRAFT

Result:

Credits awarded for Ene 1 = 3

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 61.12

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		41.13
Standard DER		21.09
Actual Case CO2 emissions		41.13
Actual DER		21.09
Reduction in CO2 emissions	0	

Credits awarded for Ene 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Option B PV

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71
Printed on 21 May 2014 at 12:03:54

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : 62 Mansfield Road

Plot Reference: Option B Code 4 with PV

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name: Allan Properties Ltd

Address :

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

1 TER and DER

Fuel for main heating system: Natural gas
Fuel factor: 1.00 (natural gas)

Target Carbon Dioxide Emission Rate (TER)	24.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.19 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.80 (max. 3.30)	OK

3 Air permeability

Air permeability at 50 pascals	5.00	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

Option B PV

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.41	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	0.27m²,
Windows facing: North East	1.26m²,
Windows facing: North West	3.37m²,
Windows facing: South West	3.2m²,
Windows facing: North West	3.21m²,
Windows facing: North East	0.27m²,
Roof windows facing: Horizontal	2.25m²
Roof windows facing: Horizontal	0.29m²
Roof windows facing: Horizontal	0.58m²
Ventilation rate:	8.00
Blinds/curtains:	None shutter closed 100% of daylight hours

10 Key features

Roof window U-value	1.2 W/m²K
Windows U-value	1.4 W/m²K
External Walls U-value	0.12 W/m²K
Floors U-value	0.1 W/m²K
Photovaltaic array	

Option B PV

SAP Input

Property Details: Option B Code 4 with PV

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 396.55
Dwelling designed to use less than 125 litres per Person per day:	True

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.36 m
Floor 1	28.26 m²	2.52 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

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Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	1.8	1.58	1
LG P NE 1	6mm	0.8	0.77	1.4	0.27	1
LG P NE 2	6mm	0.8	0.77	1.4	1.26	1
LG P NW	6mm	0.8	0.77	1.4	3.37	1
G SW K/LR	6mm	0.8	0.77	1.4	1.6	2
G P NW	6mm	0.8	0.77	1.4	3.21	1
G P NE	6mm	0.8	0.77	1.4	0.27	1
RL 1	6mm	0.7	0.77	1.2	2.25	1
RL 2	6mm	0.7	0.77	1.2	0.29	1
RL 3	6mm	0.7	0.77	1.2	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2
G P NE		G P	North East	0.35	0.768

SAP Input

RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.12	0	False	190
LG P	11.892	4.9	6.99	0.12	0	False	190
G	48.581	3.2	45.38	0.12	0	False	190
G P	12.703	5.06	7.64	0.12	0	False	190
Roof 1	27.04	2.54	24.5	0.15	0		9
Roof 2	3.8	0.58	3.22	0.15	0		9
floor	28.26			0.1			75
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Brand/Model: Vent Axia Sentinel Kinetic Plus BS
Test efficiency: 90%, SFP: 0.41
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of sides sheltered: 0
Pressure test: 5

Main heating system:

Main heating system: Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 358, product index 015282) SEDBUK2009 89.4%
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi boiler)
Underfloor heating, pipes in screed above insulation
Pump in heat space: Yes

Main heating Control:

Main heating Control: Time and temperature zone control
Control code: 2110
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Option B PV

SAP Input

	Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff:	standard tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	<u>Photovoltaic 1</u> Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

Predicted Energy Assessment

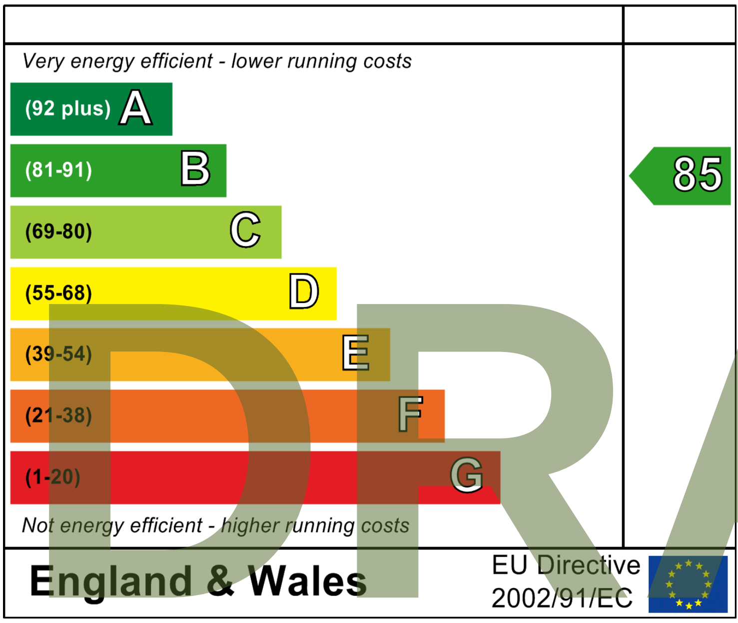
62, Mansfield Road
LONDON
NW3 2HU

Dwelling type: Detached House
Date of assessment: 01 May 2014
Produced by: Stroma Certification
Total floor area: 56.52 m²

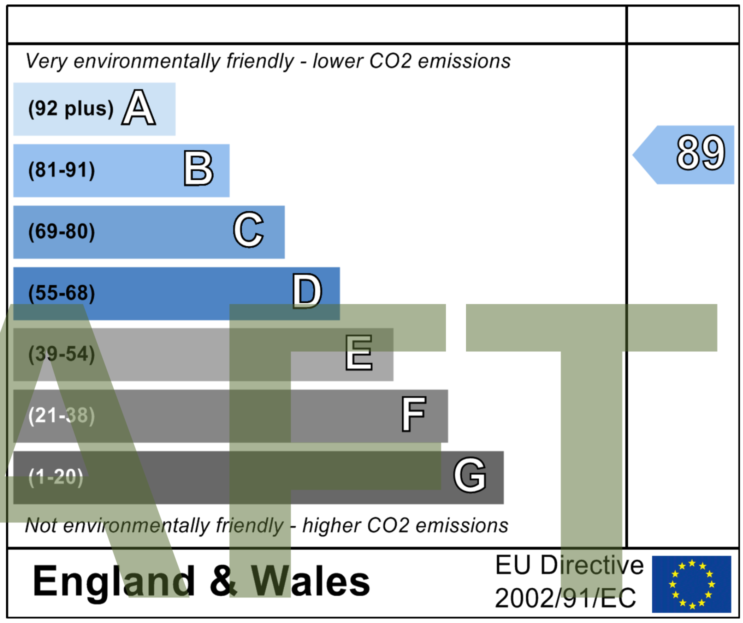
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2009 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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

The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

Option B PV

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: **Assessor Number:**

Property Address: 62, Mansfield Road
LONDON
NW3 2HU

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	17.19

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		17.19	*(ZC1)*
TER		24.07	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		17.19	
% improvement DER/TER	28.6		

DRAFT

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	17.19	*(ZC1)*
CO2 emissions from appliances, equation (L14)	17.14	*(ZC2)*
CO2 emissions from cooking, equation (L16)	2.9	*(ZC3)*
Net CO2 emissions	37.2	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.3

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 70.26

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		44.72
Standard DER		24.68
Actual Case CO2 emissions		38.29
Actual DER		18.25
Reduction in CO2 emissions	14.38	

Credits awarded for Ene 7 = 1

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Appendix B 2012 SAP output reports

Building Regulation Minimum Compliance

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.20
Printed on 21 May 2014 at 12:31:53

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 56.52m²

Site Reference : 62 mansfield Road

Plot Reference: 62 Mansfield Road

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	23.84 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.76 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	69.60 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	66.10 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.10 (max. 0.30)	0.10 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.51 (max. 2.00)	2.50 (max. 3.30)	OK

DRAFT

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	3.20 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Database: (rev 355, product index 015282):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi)
Efficiency 89.4 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

Building Regulation
Minimum Compliance

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.52	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):		OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	0.27m²,
Windows facing: North East	1.26m²,
Windows facing: North West	3.37m²,
Windows facing: South West	3.2m²,
Windows facing: North West	3.21m²,
Windows facing: North East	0.27m²,
Roof windows facing: Horizontal	2.25m²
Roof windows facing: Horizontal	0.29m²
Roof windows facing: Horizontal	0.58m²
Ventilation rate:	5.00
Blinds/curtains:	None
	Closed 100% of daylight hours

10 Key features

Air permeablility	3.2 m³/m²h
Roofs U-value	0.12 W/m²K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K

Building Regulation Minimum Compliance

SAP Input

Property Details: 62 Mansfield Road

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 414.05
Water use <= 125 litres/person/day:	True
PCDF Version:	355

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.4 m
Floor 1	28.26 m²	2.4 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

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Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	2.5	1.58	1
LG P NE 1	6mm	0.8	0.77	1.4	0.27	1
LG P NE 2	6mm	0.8	0.77	1.4	1.26	1
LG P NW	6mm	0.8	0.77	1.4	3.37	1
G SW K/LR	6mm	0.8	0.77	1.4	1.6	2
G P NW	6mm	0.8	0.77	1.4	3.21	1
G P NE	6mm	0.8	0.77	1.4	0.27	1
RL 1	6mm	0.7	0.77	1.4	2.25	1
RL 2	6mm	0.7	0.77	1.4	0.29	1
RL 3	6mm	0.7	0.77	1.4	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2

Building Regulation Minimum Compliance

SAP Input

G P NE	G P	North East	0.35	0.768
RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.1	0	False	190
LG P	11.892	4.9	6.99	0.1	0	False	190
G	48.581	3.2	45.38	0.1	0	False	190
G P	12.703	5.06	7.64	0.1	0	False	190
Roof 1	27.04	2.54	24.5	0.12	0		9
Roof 2	3.8	0.58	3.22	0.12	0		9
floor	28.26			0.1			110
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 3.2

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 355, product index 015282) Efficiency: Winter 80.2 % Summer: 90.3
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi boiler)
Underfloor heating, pipes in screed above insulation
Central heating pump : 2012 or earlier
Design flow temperature: Design flow temperature<=35°C
Boiler interlock: Yes

Main heating Control:

Main heating Control: Time and temperature zone control
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Building Regulation
Minimum Compliance

SAP Input

	Water code: 901
	Fuel :mains gas
	No hot water cylinder
	Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

Building Regulation Minimum Compliance

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:
Stroma Number:
Software Name: Stroma FSAP 2012
Software Version: Version: 1.0.0.20

Property Address: 62 Mansfield Road

Address : 62, Mansfield Road, LONDON, NW3 2HU

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	28.26	(1a)	x	2.4	(2a)	=	67.82	(3a)
Ground floor	28.26	(1b)	x	2.4	(2b)	=	67.82	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56.52	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	135.65	(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)

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			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		3.2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.16	(18)

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

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.16	(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

Building Regulation Minimum Compliance

SAP 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

0.2	0.2	0.2	0.18	0.17	0.15	0.15	0.15	0.16	0.17	0.18	0.19

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=	0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31	(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=	0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31	(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	
Doors			1.58	x 2.5	= 3.95			(26)
Windows Type 1			0.27	x1/[1/(1.4)+ 0.04]	= 0.36			(27)
Windows Type 2			1.26	x1/[1/(1.4)+ 0.04]	= 1.67			(27)
Windows Type 3			3.37	x1/[1/(1.4)+ 0.04]	= 4.47			(27)
Windows Type 4			1.6	x1/[1/(1.4)+ 0.04]	= 2.12			(27)
Windows Type 5			3.21	x1/[1/(1.4)+ 0.04]	= 4.26			(27)
Windows Type 6			0.27	x1/[1/(1.4)+ 0.04]	= 0.36			(27)
Rooflights Type 1			2.25	x1/[1/(1.4) + 0.04]	= 3.15			(27b)
Rooflights Type 2			0.29	x1/[1/(1.4) + 0.04]	= 0.406			(27b)
Rooflights Type 3			0.29	x1/[1/(1.4) + 0.04]	= 0.406			(27b)
Floor			28.26	x 0.1	= 2.826	110	3108.6	(28)
Walls Type1	45.48	0	45.48	x 0.1	= 4.55	190	8641.2	(29)
Walls Type2	11.89	4.9	6.99	x 0.1	= 0.7	190	1328.48	(29)
Walls Type3	48.58	3.2	45.38	x 0.1	= 4.54	190	8622.39	(29)
Walls Type4	12.7	5.06	7.64	x 0.1	= 0.76	190	1452.17	(29)
Roof Type1	27.04	2.54	24.5	x 0.12	= 2.94	9	220.5	(30)
Roof Type2	3.8	0.58	3.22	x 0.12	= 0.39	9	28.98	(30)

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Total area of elements, m² | 177.76 | (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) =	40.14	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	23402.32	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	414.05	(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 | 26.66 | (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss | (33) + (36) = | 66.8 | (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=	14.39	14.21	14.03	13.14	12.96	12.06	12.06	11.88	12.42	12.96	13.32	13.68	(38)

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

(39)m=	81.2	81.02	80.84	79.94	79.76	78.87	78.87	78.69	79.23	79.76	80.12	80.48	

Average = Sum(39)$_{1…12}$ /12= | 79.9 | (39)

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

(40)m=	1.44	1.43	1.43	1.41	1.41	1.4	1.4	1.39	1.4	1.41	1.42	1.42	

Average = Sum(40)$_{1…12}$ /12= | 1.41 | (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 | 1.88 | (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 | 78.89 | (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=	86.78	83.62	80.47	77.31	74.16	71	71	74.16	77.31	80.47	83.62	86.78	

Total = Sum(44)$_{1…12}$ = | 946.68 | (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=	128.69	112.55	116.15	101.26	97.16	83.84	77.69	89.15	90.22	105.14	114.77	124.63	

Total = Sum(45)$_{1…12}$ = | 1241.25 | (45)

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

(46)m=	19.3	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.22	18.69	(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

(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=	44.22	38.49	41.01	38.13	37.79	35.01	36.18	37.79	38.13	41.01	41.24	44.22	(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=	172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85	(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=	172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85

Output from water heater (annual)$_{1...12}$ 1714.47 (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=	53.85	47.05	48.87	43.2	41.75	36.63	34.88	39.09	39.53	45.21	48.47	52.5	(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=	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.57	32.48	26.42	20	14.95	12.62	13.64	17.73	23.79	30.21	35.26	37.59	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	244.91	247.45	241.05	227.42	210.21	194.03	183.22	180.68	187.09	200.72	217.93	234.11	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	(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=	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	(71)

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Water heating gains (Table 5)

(72)m=	72.37	70.01	65.69	60	56.12	50.88	46.88	52.54	54.9	60.77	67.32	70.56	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	449.66	445.75	428.96	403.22	377.08	353.33	339.55	346.76	361.59	387.5	416.32	438.06	(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)	
Northeast 0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast 0.9x	0.54	x	1.26	x	11.28	x	0.77	x	0.8	=	4.26	(75)
Northeast 0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast 0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast 0.9x	0.54	x	1.26	x	22.97	x	0.77	x	0.8	=	8.66	(75)
Northeast 0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast 0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast 0.9x	0.54	x	1.26	x	41.38	x	0.77	x	0.8	=	15.61	(75)
Northeast 0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast 0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast 0.9x	0.54	x	1.26	x	67.96	x	0.77	x	0.8	=	25.63	(75)
Northeast 0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast 0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast 0.9x	0.54	x	1.26	x	91.35	x	0.77	x	0.8	=	34.46	(75)
Northeast 0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast 0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast 0.9x	0.54	x	1.26	x	97.38	x	0.77	x	0.8	=	36.73	(75)
Northeast 0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast 0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast 0.9x	0.54	x	1.26	x	91.1	x	0.77	x	0.8	=	34.36	(75)
Northeast 0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast 0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast 0.9x	0.54	x	1.26	x	72.63	x	0.77	x	0.8	=	27.4	(75)
Northeast 0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast 0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast 0.9x	0.54	x	1.26	x	50.42	x	0.77	x	0.8	=	19.02	(75)
Northeast 0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast 0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast 0.9x	0.54	x	1.26	x	28.07	x	0.77	x	0.8	=	10.59	(75)
Northeast 0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast 0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast 0.9x	0.54	x	1.26	x	14.2	x	0.77	x	0.8	=	5.36	(75)

SAP WorkSheet: New dwelling design stage

Northeast	0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Northeast	0.9x	0.54	x	1.26	x	9.21	x	0.77	x	0.8	=	3.48	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Southwest	0.9x	0.54	x	1.6	x	36.79		0.77	x	0.8	=	35.25	(79)
Southwest	0.9x	0.54	x	1.6	x	62.67		0.77	x	0.8	=	60.04	(79)
Southwest	0.9x	0.54	x	1.6	x	85.75		0.77	x	0.8	=	82.15	(79)
Southwest	0.9x	0.54	x	1.6	x	106.25		0.77	x	0.8	=	101.79	(79)
Southwest	0.9x	0.54	x	1.6	x	119.01		0.77	x	0.8	=	114.01	(79)
Southwest	0.9x	0.54	x	1.6	x	118.15		0.77	x	0.8	=	113.19	(79)
Southwest	0.9x	0.54	x	1.6	x	113.91		0.77	x	0.8	=	109.13	(79)
Southwest	0.9x	0.54	x	1.6	x	104.39		0.77	x	0.8	=	100.01	(79)
Southwest	0.9x	0.54	x	1.6	x	92.85		0.77	x	0.8	=	88.95	(79)
Southwest	0.9x	0.54	x	1.6	x	69.27		0.77	x	0.8	=	66.36	(79)
Southwest	0.9x	0.54	x	1.6	x	44.07		0.77	x	0.8	=	42.22	(79)
Southwest	0.9x	0.54	x	1.6	x	31.49		0.77	x	0.8	=	30.17	(79)
Northwest	0.9x	0.54	x	3.37	x	11.28	x	0.77	x	0.8	=	11.38	(81)
Northwest	0.9x	0.54	x	3.21	x	11.28	x	0.77	x	0.8	=	10.84	(81)
Northwest	0.9x	0.54	x	3.37	x	22.97	x	0.77	x	0.8	=	23.17	(81)
Northwest	0.9x	0.54	x	3.21	x	22.97	x	0.77	x	0.8	=	22.07	(81)
Northwest	0.9x	0.54	x	3.37	x	41.38	x	0.77	x	0.8	=	41.75	(81)
Northwest	0.9x	0.54	x	3.21	x	41.38	x	0.77	x	0.8	=	39.76	(81)
Northwest	0.9x	0.54	x	3.37	x	67.96	x	0.77	x	0.8	=	68.56	(81)
Northwest	0.9x	0.54	x	3.21	x	67.96	x	0.77	x	0.8	=	65.31	(81)
Northwest	0.9x	0.54	x	3.37	x	91.35	x	0.77	x	0.8	=	92.16	(81)
Northwest	0.9x	0.54	x	3.21	x	91.35	x	0.77	x	0.8	=	87.78	(81)
Northwest	0.9x	0.54	x	3.37	x	97.38	x	0.77	x	0.8	=	98.25	(81)
Northwest	0.9x	0.54	x	3.21	x	97.38	x	0.77	x	0.8	=	93.59	(81)
Northwest	0.9x	0.54	x	3.37	x	91.1	x	0.77	x	0.8	=	91.91	(81)
Northwest	0.9x	0.54	x	3.21	x	91.1	x	0.77	x	0.8	=	87.55	(81)
Northwest	0.9x	0.54	x	3.37	x	72.63	x	0.77	x	0.8	=	73.27	(81)
Northwest	0.9x	0.54	x	3.21	x	72.63	x	0.77	x	0.8	=	69.79	(81)
Northwest	0.9x	0.54	x	3.37	x	50.42	x	0.77	x	0.8	=	50.87	(81)
Northwest	0.9x	0.54	x	3.21	x	50.42	x	0.77	x	0.8	=	48.45	(81)
Northwest	0.9x	0.54	x	3.37	x	28.07	x	0.77	x	0.8	=	28.32	(81)
Northwest	0.9x	0.54	x	3.21	x	28.07	x	0.77	x	0.8	=	26.97	(81)
Northwest	0.9x	0.54	x	3.37	x	14.2	x	0.77	x	0.8	=	14.32	(81)
Northwest	0.9x	0.54	x	3.21	x	14.2	x	0.77	x	0.8	=	13.64	(81)
Northwest	0.9x	0.54	x	3.37	x	9.21	x	0.77	x	0.8	=	9.3	(81)
Northwest	0.9x	0.54	x	3.21	x	9.21	x	0.77	x	0.8	=	8.85	(81)
Rooflights	0.9x	1	x	2.25	x	26	x	0.77	x	0.7	=	28.38	(82)

Rooflights 0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	3.66	(82)
Rooflights 0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	7.32	(82)
Rooflights 0.9x	1	x	2.25	x	54	x	0.77	x	0.7	=	58.94	(82)
Rooflights 0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	7.6	(82)
Rooflights 0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	15.19	(82)
Rooflights 0.9x	1	x	2.25	x	96	x	0.77	x	0.7	=	104.78	(82)
Rooflights 0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	13.51	(82)
Rooflights 0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	27.01	(82)
Rooflights 0.9x	1	x	2.25	x	150	x	0.77	x	0.7	=	163.72	(82)
Rooflights 0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	21.1	(82)
Rooflights 0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	42.2	(82)
Rooflights 0.9x	1	x	2.25	x	192	x	0.77	x	0.7	=	209.56	(82)
Rooflights 0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	27.01	(82)
Rooflights 0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	54.02	(82)
Rooflights 0.9x	1	x	2.25	x	200	x	0.77	x	0.7	=	218.29	(82)
Rooflights 0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	28.14	(82)
Rooflights 0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	56.27	(82)
Rooflights 0.9x	1	x	2.25	x	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights 0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	26.59	(82)
Rooflights 0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	53.18	(82)
Rooflights 0.9x	1	x	2.25	x	157	x	0.77	x	0.7	=	171.36	(82)
Rooflights 0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	22.09	(82)
Rooflights 0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	44.17	(82)
Rooflights 0.9x	1	x	2.25	x	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights 0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	16.18	(82)
Rooflights 0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	32.36	(82)
Rooflights 0.9x	1	x	2.25	x	66	x	0.77	x	0.7	=	72.04	(82)
Rooflights 0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	9.28	(82)
Rooflights 0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	18.57	(82)
Rooflights 0.9x	1	x	2.25	x	33	x	0.77	x	0.7	=	36.02	(82)
Rooflights 0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	4.64	(82)
Rooflights 0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	9.28	(82)
Rooflights 0.9x	1	x	2.25	x	21	x	0.77	x	0.7	=	22.92	(82)
Rooflights 0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	2.95	(82)
Rooflights 0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	5.91	(82)

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

(83)m=	102.91	199.39	331.26	499.3	633.77	660.21	623.73	519.83	389.5	236.66	127.78	85.07	(83)

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

(84)m=	552.57	645.14	760.22	902.52	1010.85	1013.54	963.28	866.59	751.09	624.17	544.1	523.12	(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

SAP WorkSheet: New dwelling design stage

(86)m=	1	0.99	0.98	0.89	0.7	0.5	0.36	0.42	0.7	0.95	0.99	1	(86)

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

(87)m=	20.32	20.43	20.62	20.83	20.93	20.96	20.96	20.96	20.94	20.77	20.5	20.3	(87)

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

(88)m=	19.74	19.74	19.74	19.75	19.75	19.77	19.77	19.77	19.76	19.75	19.75	19.75	(88)

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

(89)m=	1	0.99	0.96	0.85	0.62	0.4	0.26	0.31	0.59	0.92	0.99	1	(89)

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

(90)m=	18.86	19.02	19.29	19.57	19.68	19.7	19.71	19.71	19.69	19.51	19.14	18.83	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.35	19.5	19.73	19.99	20.1	20.13	20.13	20.13	20.11	19.94	19.6	19.33	(92)

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

(93)m=	19.35	19.5	19.73	19.99	20.1	20.13	20.13	20.13	20.11	19.94	19.6	19.33	(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=	1	0.99	0.96	0.86	0.65	0.43	0.29	0.34	0.62	0.93	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	550.58	638.82	733	774	653.21	434.71	278.1	293.17	466.88	579.79	539.04	521.76	(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=	1221.83	1182.44	1069.71	886.87	670	435.78	278.13	293.35	476.34	744.7	1001.12	1217.37	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	499.41	365.31	250.51	81.27	12.49	0	0	0	0	122.69	332.7	517.53	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2181.92 (98)

Space heating requirement in kWh/m²/year 38.6 (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		93.3	(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)													
	499.41	365.31	250.51	81.27	12.49	0	0	0	0	122.69	332.7	517.53	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)													(211)
	535.28	391.54	268.5	87.1	13.39	0	0	0	0	131.51	356.59	554.7	

Total (kWh/year) =$Sum(211)_{1...5,10...12}$= 2338.61 (211)

SAP WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] + (214) m } 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)

172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85

Efficiency of water heater 80.2 (216)

(217)m=	87.47	87.09	86.12	83.65	80.97	80.2	80.2	80.2	80.2	84.51	86.81	87.59	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	197.69	173.43	182.48	166.64	166.67	148.2	141.99	158.28	160.03	172.92	179.71	192.78

Total = Sum(219a)$_{1...12}$ = 2040.83 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2338.61	
Water heating fuel used		2040.83	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	107.57		(230a)
central heating pump:	120		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year — sum of (230a)…(230g) =		272.57	(231)
Electricity for lighting		258.35	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211)	x	3.48	x 0.01 =	81.3836	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	71.02	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	35.95	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)		13.19	x 0.01 =	34.08	(250)
Additional standing charges (Table 12)					120	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 342.43 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.42	(257)
SAP rating (Section 12)		80.24	(258)

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	=	505.14	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	440.82	(264)
Space and water heating	(261) + (262) + (263) + (264) =				945.96	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	141.46	(267)
Electricity for lighting	(232)	x	0.519	=	134.08	(268)
Total CO2, kg/year			sum of (265)…(271) =		1221.51	(272)
CO2 emissions per m²			(272) ÷ (4) =		21.61	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2853.1	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2489.81	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5342.92	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	836.79	(267)
Electricity for lighting	(232)	x	0	=	793.14	(268)
'Total Primary Energy			sum of (265)…(271) =		6972.84	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		123.37	(273)

Option A Thermal Improvements

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.20
Printed on 21 May 2014 at 12:31:52

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 56.52m²

Site Reference : 62 mansfield Road

Plot Reference: Code 4 WWR Thermal Improvem

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	23.84 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.11 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	69.60 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	61.00 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.10 (max. 0.30)	0.10 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.26 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	1.50 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Database: (rev 355, product index 015282):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi)
Efficiency 89.4 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

Option A Thermal Improvements

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder		

6 Controls

Space heating controls	Time and temperature zone control		OK
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.52	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):		OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	0.27m²,
Windows facing: North East	1.26m²,
Windows facing: North West	3.37m²,
Windows facing: South West	3.2m²,
Windows facing: North West	3.21m²,
Windows facing: North East	0.27m²,
Roof windows facing: Horizontal	2.25m²,
Roof windows facing: Horizontal	0.29m²,
Roof windows facing: Horizontal	0.58m²,
Ventilation rate:	5.00
Blinds/curtains:	None Closed 100% of daylight hours

10 Key features

Air permeablility	1.5 m³/m²h
Roofs U-value	0.12 W/m²K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K

Option A Thermal Improvements

SAP Input

Property Details: Code 4 WWR Thermal Improvements

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 414.05
Water use <= 125 litres/person/day:	True
PCDF Version:	355

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.4 m
Floor 1	28.26 m²	2.4 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	1.8	1.58	1
LG P NE 1	6mm	0.8	0.77	1.2	0.27	1
LG P NE 2	6mm	0.8	0.77	1.2	1.26	1
LG P NW	6mm	0.8	0.77	1.2	3.37	1
G SW K/LR	6mm	0.8	0.77	1.2	1.6	2
G P NW	6mm	0.8	0.77	1.2	3.21	1
G P NE	6mm	0.8	0.77	1.2	0.27	1
RL 1	6mm	0.7	0.77	1.2	2.25	1
RL 2	6mm	0.7	0.77	1.2	0.29	1
RL 3	6mm	0.7	0.77	1.2	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2

SAP Input

G P NE	G P	North East	0.35	0.768
RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.1	0	False	190
LG P	11.892	4.9	6.99	0.1	0	False	190
G	48.581	3.2	45.38	0.1	0	False	190
G P	12.703	5.06	7.64	0.1	0	False	190
Roof 1	27.04	2.54	24.5	0.12	0		9
Roof 2	3.8	0.58	3.22	0.12	0		9
ground	28.26			0.1			110
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 1.5

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 355, product index 015282) Efficiency: Winter 80.2 % Summer: 90.3
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi boiler)
Underfloor heating, pipes in screed above insulation
Central heating pump : 2012 or earlier
Design flow temperature: Design flow temperature<=35°C
Boiler interlock: Yes

Main heating Control:

Main heating Control: Time and temperature zone control
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Option A Thermal Improvements

SAP Input

Water code: 901
Fuel :mains gas
No hot water cylinder
Waste Water Heat Recovery System:
  Total rooms with shower and/or bath: 0
  Product index: 080003, Shower-save Recoh-vert RV3 System A
    Number of mixer showers in rooms with a bath: 0
    Number of mixer showers in rooms without a bath: 1
Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

Option A Thermal Improvements

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: **Stroma Number:**
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.0.20

Property Address: Code 4 WWR Thermal Improvements

Address : 62, Mansfield Road, LONDON, NW3 2HU

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	28.26	(1a)	x	2.4	(2a)	=	67.82	(3a)
Ground floor	28.26	(1b)	x	2.4	(2b)	=	67.82	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56.52	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	135.65	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(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

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

0.1	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.08	0.08	0.08	0.09

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	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.19	0.2	0.2	0.21	(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	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.19	0.2	0.2	0.21	(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	
Doors			1.58	x	1.8	=	2.844			(26)
Windows Type 1			0.27		x1/[1/(1.2)+ 0.04]	=	0.31			(27)
Windows Type 2			1.26		x1/[1/(1.2)+ 0.04]	=	1.44			(27)
Windows Type 3			3.37		x1/[1/(1.2)+ 0.04]	=	3.86			(27)
Windows Type 4			1.6		x1/[1/(1.2)+ 0.04]	=	1.83			(27)
Windows Type 5			3.21		x1/[1/(1.2)+ 0.04]	=	3.68			(27)
Windows Type 6			0.27		x1/[1/(1.2)+ 0.04]	=	0.31			(27)
Rooflights Type 1			2.25		x1/[1/(1.2) + 0.04]	=	2.7			(27b)
Rooflights Type 2			0.29		x1/[1/(1.2) + 0.04]	=	0.348			(27b)
Rooflights Type 3			0.29		x1/[1/(1.2) + 0.04]	=	0.348			(27b)
Floor			28.26	x	0.1	=	2.826	110	3108.6	(28)
Walls Type1	45.48	0	45.48	x	0.1	=	4.55	190	8641.2	(29)
Walls Type2	11.89	4.9	6.99	x	0.1	=	0.7	190	1328.48	(29)
Walls Type3	48.58	3.2	45.38	x	0.1	=	4.54	190	8622.39	(29)
Walls Type4	12.7	5.06	7.64	x	0.1	=	0.76	190	1452.17	(29)
Roof Type1	27.04	2.54	24.5	x	0.12	=	2.94	9	220.5	(30)
Roof Type2	3.8	0.58	3.22	x	0.12	=	0.39	9	28.98	(30)

Option A Thermal Improvements

SAP WorkSheet: New dwelling design stage

Total area of elements, m² 177.76 (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) = 36.38 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 23402.32 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 414.05 (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 26.66 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 63.04 (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=	9.54	9.46	9.37	8.95	8.87	8.45	8.45	8.37	8.62	8.87	9.04	9.2	(38)

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

(39)m=	72.58	72.5	72.42	71.99	71.91	71.49	71.49	71.41	71.66	71.91	72.08	72.24	

Average = Sum(39)$_{1…12}$ /12= 71.97 (39)

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

(40)m=	1.28	1.28	1.28	1.27	1.27	1.26	1.26	1.26	1.27	1.27	1.28	1.28

Average = Sum(40)$_{1…12}$ /12= 1.27 (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 1.88 (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 78.89 (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=	86.78	83.62	80.47	77.31	74.16	71	71	74.16	77.31	80.47	83.62	86.78	

Total = Sum(44)$_{1…12}$ = 946.68 (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=	128.69	112.55	116.15	101.26	97.16	83.84	77.69	89.15	90.22	105.14	114.77	124.63

Total = Sum(45)$_{1…12}$ = 1241.25 (45)

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

(46)m=	19.3	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.22	18.69	(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

(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=	44.22	38.49	41.01	38.13	37.79	35.01	36.18	37.79	38.13	41.01	41.24	44.22	(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=	172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85	(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)
WWHRS	-42.4	-37.3	-38.07	-31.37	-29.15	-24.07	-20.4	-24.69	-25.39	-31.36	-36.28	-40.97	(63) (G10)

Output from water heater

(64)m=	130.51	113.75	119.08	108.02	105.8	94.79	93.48	102.25	102.95	114.79	119.73	127.88	

Output from water heater (annual)$_{1…12}$ — 1333.02 (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=	53.85	47.05	48.87	43.2	41.75	36.63	34.88	39.09	39.53	45.21	48.47	52.5	(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=	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.57	32.48	26.42	20	14.95	12.62	13.64	17.73	23.79	30.21	35.26	37.59	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	244.91	247.45	241.05	227.42	210.21	194.03	183.22	180.68	187.09	200.72	217.93	234.11	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	(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=	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	(71)

Option A Thermal Improvements

SAP WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	72.37	70.01	65.69	60	56.12	50.88	46.88	52.54	54.9	60.77	67.32	70.56	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	449.66	445.75	428.96	403.22	377.08	353.33	339.55	346.76	361.59	387.5	416.32	438.06	(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)	
Northeast 0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast 0.9x	0.54	x	1.26	x	11.28	x	0.77	x	0.8	=	4.26	(75)
Northeast 0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast 0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast 0.9x	0.54	x	1.26	x	22.97	x	0.77	x	0.8	=	8.66	(75)
Northeast 0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast 0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast 0.9x	0.54	x	1.26	x	41.38	x	0.77	x	0.8	=	15.61	(75)
Northeast 0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast 0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast 0.9x	0.54	x	1.26	x	67.96	x	0.77	x	0.8	=	25.63	(75)
Northeast 0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast 0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast 0.9x	0.54	x	1.26	x	91.35	x	0.77	x	0.8	=	34.46	(75)
Northeast 0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast 0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast 0.9x	0.54	x	1.26	x	97.38	x	0.77	x	0.8	=	36.73	(75)
Northeast 0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast 0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast 0.9x	0.54	x	1.26	x	91.1	x	0.77	x	0.8	=	34.36	(75)
Northeast 0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast 0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast 0.9x	0.54	x	1.26	x	72.63	x	0.77	x	0.8	=	27.4	(75)
Northeast 0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast 0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast 0.9x	0.54	x	1.26	x	50.42	x	0.77	x	0.8	=	19.02	(75)
Northeast 0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast 0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast 0.9x	0.54	x	1.26	x	28.07	x	0.77	x	0.8	=	10.59	(75)
Northeast 0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast 0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast 0.9x	0.54	x	1.26	x	14.2	x	0.77	x	0.8	=	5.36	(75)

Northeast	0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Northeast	0.9x	0.54	x	1.26	x	9.21	x	0.77	x	0.8	=	3.48	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Southwest	0.9x	0.54	x	1.6	x	36.79		0.77	x	0.8	=	35.25	(79)
Southwest	0.9x	0.54	x	1.6	x	62.67		0.77	x	0.8	=	60.04	(79)
Southwest	0.9x	0.54	x	1.6	x	85.75		0.77	x	0.8	=	82.15	(79)
Southwest	0.9x	0.54	x	1.6	x	106.25		0.77	x	0.8	=	101.79	(79)
Southwest	0.9x	0.54	x	1.6	x	119.01		0.77	x	0.8	=	114.01	(79)
Southwest	0.9x	0.54	x	1.6	x	118.15		0.77	x	0.8	=	113.19	(79)
Southwest	0.9x	0.54	x	1.6	x	113.91		0.77	x	0.8	=	109.13	(79)
Southwest	0.9x	0.54	x	1.6	x	104.39		0.77	x	0.8	=	100.01	(79)
Southwest	0.9x	0.54	x	1.6	x	92.85		0.77	x	0.8	=	88.95	(79)
Southwest	0.9x	0.54	x	1.6	x	69.27		0.77	x	0.8	=	66.36	(79)
Southwest	0.9x	0.54	x	1.6	x	44.07		0.77	x	0.8	=	42.22	(79)
Southwest	0.9x	0.54	x	1.6	x	31.49		0.77	x	0.8	=	30.17	(79)
Northwest	0.9x	0.54	x	3.37	x	11.28	x	0.77	x	0.8	=	11.38	(81)
Northwest	0.9x	0.54	x	3.21	x	11.28	x	0.77	x	0.8	=	10.84	(81)
Northwest	0.9x	0.54	x	3.37	x	22.97	x	0.77	x	0.8	=	23.17	(81)
Northwest	0.9x	0.54	x	3.21	x	22.97	x	0.77	x	0.8	=	22.07	(81)
Northwest	0.9x	0.54	x	3.37	x	41.38	x	0.77	x	0.8	=	41.75	(81)
Northwest	0.9x	0.54	x	3.21	x	41.38	x	0.77	x	0.8	=	39.76	(81)
Northwest	0.9x	0.54	x	3.37	x	67.96	x	0.77	x	0.8	=	68.56	(81)
Northwest	0.9x	0.54	x	3.21	x	67.96	x	0.77	x	0.8	=	65.31	(81)
Northwest	0.9x	0.54	x	3.37	x	91.35	x	0.77	x	0.8	=	92.16	(81)
Northwest	0.9x	0.54	x	3.21	x	91.35	x	0.77	x	0.8	=	87.78	(81)
Northwest	0.9x	0.54	x	3.37	x	97.38	x	0.77	x	0.8	=	98.25	(81)
Northwest	0.9x	0.54	x	3.21	x	97.38	x	0.77	x	0.8	=	93.59	(81)
Northwest	0.9x	0.54	x	3.37	x	91.1	x	0.77	x	0.8	=	91.91	(81)
Northwest	0.9x	0.54	x	3.21	x	91.1	x	0.77	x	0.8	=	87.55	(81)
Northwest	0.9x	0.54	x	3.37	x	72.63	x	0.77	x	0.8	=	73.27	(81)
Northwest	0.9x	0.54	x	3.21	x	72.63	x	0.77	x	0.8	=	69.79	(81)
Northwest	0.9x	0.54	x	3.37	x	50.42	x	0.77	x	0.8	=	50.87	(81)
Northwest	0.9x	0.54	x	3.21	x	50.42	x	0.77	x	0.8	=	48.45	(81)
Northwest	0.9x	0.54	x	3.37	x	28.07	x	0.77	x	0.8	=	28.32	(81)
Northwest	0.9x	0.54	x	3.21	x	28.07	x	0.77	x	0.8	=	26.97	(81)
Northwest	0.9x	0.54	x	3.37	x	14.2	x	0.77	x	0.8	=	14.32	(81)
Northwest	0.9x	0.54	x	3.21	x	14.2	x	0.77	x	0.8	=	13.64	(81)
Northwest	0.9x	0.54	x	3.37	x	9.21	x	0.77	x	0.8	=	9.3	(81)
Northwest	0.9x	0.54	x	3.21	x	9.21	x	0.77	x	0.8	=	8.85	(81)
Rooflights	0.9x	1	x	2.25	x	26	x	0.77	x	0.7	=	28.38	(82)

Rooflights	0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	3.66	(82)
Rooflights	0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	7.32	(82)
Rooflights	0.9x	1	x	2.25	x	54	x	0.77	x	0.7	=	58.94	(82)
Rooflights	0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	7.6	(82)
Rooflights	0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	15.19	(82)
Rooflights	0.9x	1	x	2.25	x	96	x	0.77	x	0.7	=	104.78	(82)
Rooflights	0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	13.51	(82)
Rooflights	0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	27.01	(82)
Rooflights	0.9x	1	x	2.25	x	150	x	0.77	x	0.7	=	163.72	(82)
Rooflights	0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	21.1	(82)
Rooflights	0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	42.2	(82)
Rooflights	0.9x	1	x	2.25	x	192	x	0.77	x	0.7	=	209.56	(82)
Rooflights	0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	27.01	(82)
Rooflights	0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	54.02	(82)
Rooflights	0.9x	1	x	2.25	x	200	x	0.77	x	0.7	=	218.29	(82)
Rooflights	0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	28.14	(82)
Rooflights	0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	56.27	(82)
Rooflights	0.9x	1	x	2.25	x	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights	0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	26.59	(82)
Rooflights	0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	53.18	(82)
Rooflights	0.9x	1	x	2.25	x	157	x	0.77	x	0.7	=	171.36	(82)
Rooflights	0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	22.09	(82)
Rooflights	0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	44.17	(82)
Rooflights	0.9x	1	x	2.25	x	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights	0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	16.18	(82)
Rooflights	0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	32.36	(82)
Rooflights	0.9x	1	x	2.25	x	66	x	0.77	x	0.7	=	72.04	(82)
Rooflights	0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	9.28	(82)
Rooflights	0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	18.57	(82)
Rooflights	0.9x	1	x	2.25	x	33	x	0.77	x	0.7	=	36.02	(82)
Rooflights	0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	4.64	(82)
Rooflights	0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	9.28	(82)
Rooflights	0.9x	1	x	2.25	x	21	x	0.77	x	0.7	=	22.92	(82)
Rooflights	0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	2.95	(82)
Rooflights	0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	5.91	(82)

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

(83)m=	102.91	199.39	331.26	499.3	633.77	660.21	623.73	519.83	389.5	236.66	127.78	85.07	(83)

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

(84)m=	552.57	645.14	760.22	902.52	1010.85	1013.54	963.28	866.59	751.09	624.17	544.1	523.12	(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

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(86)m=	1	0.99	0.97	0.86	0.65	0.45	0.33	0.38	0.65	0.94	0.99	1	(86)

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

(87)m=	20.43	20.54	20.71	20.88	20.95	20.96	20.96	20.96	20.95	20.83	20.59	20.4	(87)

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

(88)m=	19.85	19.85	19.86	19.86	19.86	19.87	19.87	19.87	19.87	19.86	19.86	19.86	(88)

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

(89)m=	1	0.99	0.95	0.81	0.58	0.37	0.24	0.29	0.55	0.9	0.99	1	(89)

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

(90)m=	19.11	19.27	19.51	19.74	19.8	19.81	19.81	19.81	19.81	19.68	19.35	19.08	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.55	19.7	19.91	20.12	20.19	20.2	20.2	20.2	20.19	20.07	19.77	19.52	(92)

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

(93)m=	19.55	19.7	19.91	20.12	20.19	20.2	20.2	20.2	20.19	20.07	19.77	19.52	(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=	1	0.99	0.95	0.82	0.6	0.39	0.27	0.31	0.58	0.91	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	550.36	637.59	725.48	741.78	603.18	399.84	257.2	271.24	432.48	567.99	538.17	521.66	(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=	1107.16	1072.65	971.36	807.88	610.26	400.2	257.24	271.29	436.55	680.93	913.06	1107.11	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	414.26	292.35	182.94	47.59	5.27	0	0	0	0	84.02	269.93	435.57	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1731.93 (98)

Space heating requirement in kWh/m²/year 30.64 (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		93.3	(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)													
	414.26	292.35	182.94	47.59	5.27	0	0	0	0	84.02	269.93	435.57	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)													(211)
	444.01	313.35	196.08	51	5.65	0	0	0	0	90.06	289.31	466.85	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1856.3 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] + (214) m } 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)

130.51	113.75	119.08	108.02	105.8	94.79	93.48	102.25	102.95	114.79	119.73	127.88

Efficiency of water heater 80.2 (216)

(217)m=	87.66	87.22	86.03	83.04	80.63	80.2	80.2	80.2	80.2	84.18	86.94	87.79	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	148.9	130.41	138.42	130.08	131.22	118.19	116.55	127.5	128.37	136.36	137.72	145.67

Total = Sum(219a)$_{1...12}$ = 1589.37 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1856.3	
Water heating fuel used			1589.37	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		107.57		(230a)
central heating pump:		120		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		272.57	(231)
Electricity for lighting			258.35	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211)	x	3.48	x 0.01 =	64.5994	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	55.31	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	35.95	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)	13.19	x 0.01 =	34.08	(250)
Additional standing charges (Table 12)				120	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 309.94 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.28	(257)
SAP rating (Section 12)		82.11	(258)

SAP WorkSheet: New dwelling design stage

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	=	400.96	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	343.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =				744.27	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	141.46	(267)
Electricity for lighting	(232)	x	0.519	=	134.08	(268)
Total CO2, kg/year			sum of (265)…(271) =		1019.81	(272)
CO2 emissions per m²			(272) ÷ (4) =		18.04	(273)
EI rating (section 14)					87	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2264.69	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	1939.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4203.73	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	836.79	(267)
Electricity for lighting	(232)	x	0	=	793.14	(268)
'Total Primary Energy			sum of (265)…(271) =		5833.65	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		103.21	(273)

Option B With PV

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.20
Printed on 21 May 2014 at 12:31:51

Project Information:

Assessed By: ()

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 56.52m²

Site Reference : 62 mansfield Road

Plot Reference: Code 4 with PV

Address : 62, Mansfield Road, LONDON, NW3 2HU

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	23.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.59 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	70.00 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	67.20 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.47 (max. 2.00)	2.50 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 355, product index 015282):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi)
Efficiency 89.4 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

Option B with PV

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.52	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):		OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	0.27m²,
Windows facing: North East	1.26m²,
Windows facing: North West	3.37m²,
Windows facing: South West	3.2m²,
Windows facing: North West	3.21m²,
Windows facing: North East	0.27m²,
Roof windows facing: Horizontal	2.25m²,
Roof windows facing: Horizontal	0.29m²,
Roof windows facing: Horizontal	0.58m²,
Ventilation rate:	5.00
Blinds/curtains:	None Closed 100% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Roofs U-value	0.1 W/m²K
External Walls U-value	0.12 W/m²K
Floors U-value	0.1 W/m²K
Photovoltaic array	

Option B with PV

SAP Input

Property Details: Code 4 with PV

Address:	62, Mansfield Road, LONDON, NW3 2HU
Located in:	England
Region:	Thames valley
UPRN:	0376892178
Date of assessment:	01 May 2014
Date of certificate:	21 May 2014
Assessment type:	New dwelling design stage
Transaction type:	Non marketed sale
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Calculated 414.05
Water use <= 125 litres/person/day:	True
PCDF Version:	355

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	28.26 m²	2.36 m
Floor 1	28.26 m²	2.52 m

Living area:	19 m² (fraction 0.336)
Front of dwelling faces:	South West

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Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
G NE FD	Manufacturer	Solid			
LG P NE 1	Manufacturer	Windows	double-glazed	No	
LG P NE 2	Manufacturer	Windows	double-glazed	No	
LG P NW	Manufacturer	Windows	double-glazed	No	
G SW K/LR	Manufacturer	Windows	double-glazed	No	
G P NW	Manufacturer	Windows	double-glazed	No	
G P NE	Manufacturer	Windows	double-glazed	No	
RL 1	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glazed	No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glazed	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
G NE FD	mm	0	0	2.5	1.58	1
LG P NE 1	6mm	0.8	0.77	1.4	0.27	1
LG P NE 2	6mm	0.8	0.77	1.4	1.26	1
LG P NW	6mm	0.8	0.77	1.4	3.37	1
G SW K/LR	6mm	0.8	0.77	1.4	1.6	2
G P NW	6mm	0.8	0.77	1.4	3.21	1
G P NE	6mm	0.8	0.77	1.4	0.27	1
RL 1	6mm	0.7	0.77	1.2	2.25	1
RL 2	6mm	0.7	0.77	1.2	0.29	1
RL 3	6mm	0.7	0.77	1.2	0.29	2

Name:	Type-Name:	Location:	Orient:	Width:	Height:
G NE FD		G P	North East	0.795	1.984
LG P NE 1		LG P	North East	0.35	0.768
LG P NE 2		LG P	North East	0.815	1.551
LG P NW		LG P	North West	1.604	2.1
G SW K/LR		G	South West	1	1.6
G P NW		G P	North West	1.605	2

Option B with PV

SAP Input

G P NE	G P	North East	0.35	0.768
RL 1	Roof 1	Horizontal	1.5	1.5
RL 2	Roof 1	Horizontal	0.565	0.518
RL 3	Roof 2	Horizontal	0.565	0.518

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
LG	45.48	0	45.48	0.12	0	False	190
LG P	11.892	4.9	6.99	0.12	0	False	190
G	48.581	3.2	45.38	0.12	0	False	190
G P	12.703	5.06	7.64	0.12	0	False	190
Roof 1	27.04	2.54	24.5	0.1	0		9
Roof 2	3.8	0.58	3.22	0.1	0		9
floor	28.26			0.1			110
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 3
Ductwork: Insulation, rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 0
Pressure test: 3

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 355, product index 015282) Efficiency: Winter 80.2 % Summer: 90.3
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 27 CDi
(Combi boiler)
Underfloor heating, pipes in screed above insulation
Central heating pump : 2012 or earlier
Design flow temperature: Design flow temperature<=35°C
Boiler interlock: Yes

Main heating Control:

Main heating Control: Time and temperature zone control
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Option B with PV

SAP Input

	Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

Option B with PV

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: | **Stroma Number:**
Software Name: Stroma FSAP 2012 | **Software Version:** Version: 1.0.0.20

Property Address: Code 4 with PV

Address : 62, Mansfield Road, LONDON, NW3 2HU

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	28.26	(1a)	x	2.36	(2a)	=	66.69	(3a)
Ground floor	28.26	(1b)	x	2.52	(2b)	=	71.22	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56.52	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	137.91	(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)

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			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		3	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.15	(18)

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

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(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

Option B with PV

SAP 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

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18

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=	0.31	0.3	0.3	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.29	(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=	0.31	0.3	0.3	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.29	(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	
Doors			1.58	x	2.5	=	3.95			(26)
Windows Type 1			0.27		x1/[1/(1.4)+ 0.04]	=	0.36			(27)
Windows Type 2			1.26		x1/[1/(1.4)+ 0.04]	=	1.67			(27)
Windows Type 3			3.37		x1/[1/(1.4)+ 0.04]	=	4.47			(27)
Windows Type 4			1.6		x1/[1/(1.4)+ 0.04]	=	2.12			(27)
Windows Type 5			3.21		x1/[1/(1.4)+ 0.04]	=	4.26			(27)
Windows Type 6			0.27		x1/[1/(1.4)+ 0.04]	=	0.36			(27)
Rooflights Type 1			2.25		x1/[1/(1.2) + 0.04]	=	2.7			(27b)
Rooflights Type 2			0.29		x1/[1/(1.2) + 0.04]	=	0.348			(27b)
Rooflights Type 3			0.29		x1/[1/(1.2) + 0.04]	=	0.348			(27b)
Floor			28.26	x	0.1	=	2.826	110	3108.6	(28)
Walls Type1	45.48	0	45.48	x	0.12	=	5.46	190	8641.2	(29)
Walls Type2	11.89	4.9	6.99	x	0.12	=	0.84	190	1328.48	(29)
Walls Type3	48.58	3.2	45.38	x	0.12	=	5.45	190	8622.39	(29)
Walls Type4	12.7	5.06	7.64	x	0.12	=	0.92	190	1452.17	(29)
Roof Type1	27.04	2.54	24.5	x	0.1	=	2.45	9	220.5	(30)
Roof Type2	3.8	0.58	3.22	x	0.1	=	0.32	9	28.98	(30)

Option B with PV

SAP WorkSheet: New dwelling design stage

Total area of elements, m² | 177.76 | (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) = | 41.13 | (33)

Heat capacity Cm = S(A x k) — ((28)…(30) + (32) + (32a)…(32e) = | 23402.32 | (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K — = (34) ÷ (4) = | 414.05 | (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 | 26.66 | (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss — (33) + (36) = | 67.8 | (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=	14.05	13.88	13.71	12.86	12.68	11.83	11.83	11.66	12.17	12.68	13.02	13.37	(38)

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

(39)m=	81.84	81.68	81.51	80.65	80.48	79.63	79.63	79.46	79.97	80.48	80.82	81.16	

Average = Sum(39)1…12 /12= | 80.61 | (39)

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

(40)m=	1.45	1.45	1.44	1.43	1.42	1.41	1.41	1.41	1.41	1.42	1.43	1.44

Average = Sum(40)1…12 /12= | 1.43 | (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 | 1.88 | (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 | 78.89 | (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=	86.78	83.62	80.47	77.31	74.16	71	71	74.16	77.31	80.47	83.62	86.78

Total = Sum(44)1…12 = | 946.68 | (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=	128.69	112.55	116.15	101.26	97.16	83.84	77.69	89.15	90.22	105.14	114.77	124.63

Total = Sum(45)1…12 = | 1241.25 | (45)

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

(46)m=	19.3	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.22	18.69	(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)

SAP WorkSheet: New dwelling design stage

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

(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=	44.22	38.49	41.01	38.13	37.79	35.01	36.18	37.79	38.13	41.01	41.24	44.22	(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=	172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85	(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=	172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85

Output from water heater (annual)$_{1...12}$ 1714.47 (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=	53.85	47.05	48.87	43.2	41.75	36.63	34.88	39.09	39.53	45.21	48.47	52.5	(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=	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	112.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.57	32.48	26.42	20	14.95	12.62	13.64	17.73	23.79	30.21	35.26	37.59	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	244.91	247.45	241.05	227.42	210.21	194.03	183.22	180.68	187.09	200.72	217.93	234.11	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	48.17	(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=	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27	(71)

Water heating gains (Table 5)

(72)m=	72.37	70.01	65.69	60	56.12	50.88	46.88	52.54	54.9	60.77	67.32	70.56	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	449.66	445.75	428.96	403.22	377.08	353.33	339.55	346.76	361.59	387.5	416.32	438.06	(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)	
Northeast	0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast	0.9x	0.54	x	1.26	x	11.28	x	0.77	x	0.8	=	4.26	(75)
Northeast	0.9x	0.54	x	0.27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northeast	0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast	0.9x	0.54	x	1.26	x	22.97	x	0.77	x	0.8	=	8.66	(75)
Northeast	0.9x	0.54	x	0.27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northeast	0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast	0.9x	0.54	x	1.26	x	41.38	x	0.77	x	0.8	=	15.61	(75)
Northeast	0.9x	0.54	x	0.27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northeast	0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast	0.9x	0.54	x	1.26	x	67.96	x	0.77	x	0.8	=	25.63	(75)
Northeast	0.9x	0.54	x	0.27	x	67.96	x	0.77	x	0.8	=	5.49	(75)
Northeast	0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast	0.9x	0.54	x	1.26	x	91.35	x	0.77	x	0.8	=	34.46	(75)
Northeast	0.9x	0.54	x	0.27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northeast	0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast	0.9x	0.54	x	1.26	x	97.38	x	0.77	x	0.8	=	36.73	(75)
Northeast	0.9x	0.54	x	0.27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northeast	0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast	0.9x	0.54	x	1.26	x	91.1	x	0.77	x	0.8	=	34.36	(75)
Northeast	0.9x	0.54	x	0.27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northeast	0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast	0.9x	0.54	x	1.26	x	72.63	x	0.77	x	0.8	=	27.4	(75)
Northeast	0.9x	0.54	x	0.27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northeast	0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast	0.9x	0.54	x	1.26	x	50.42	x	0.77	x	0.8	=	19.02	(75)
Northeast	0.9x	0.54	x	0.27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northeast	0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast	0.9x	0.54	x	1.26	x	28.07	x	0.77	x	0.8	=	10.59	(75)
Northeast	0.9x	0.54	x	0.27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
Northeast	0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast	0.9x	0.54	x	1.26	x	14.2	x	0.77	x	0.8	=	5.36	(75)

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Northeast	0.9x	0.54	x	0.27	x	14.2	x	0.77	x	0.8	=	1.15	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Northeast	0.9x	0.54	x	1.26	x	9.21	x	0.77	x	0.8	=	3.48	(75)
Northeast	0.9x	0.54	x	0.27	x	9.21	x	0.77	x	0.8	=	0.74	(75)
Southwest	0.9x	0.54	x	1.6	x	36.79		0.77	x	0.8	=	35.25	(79)
Southwest	0.9x	0.54	x	1.6	x	62.67		0.77	x	0.8	=	60.04	(79)
Southwest	0.9x	0.54	x	1.6	x	85.75		0.77	x	0.8	=	82.15	(79)
Southwest	0.9x	0.54	x	1.6	x	106.25		0.77	x	0.8	=	101.79	(79)
Southwest	0.9x	0.54	x	1.6	x	119.01		0.77	x	0.8	=	114.01	(79)
Southwest	0.9x	0.54	x	1.6	x	118.15		0.77	x	0.8	=	113.19	(79)
Southwest	0.9x	0.54	x	1.6	x	113.91		0.77	x	0.8	=	109.13	(79)
Southwest	0.9x	0.54	x	1.6	x	104.39		0.77	x	0.8	=	100.01	(79)
Southwest	0.9x	0.54	x	1.6	x	92.85		0.77	x	0.8	=	88.95	(79)
Southwest	0.9x	0.54	x	1.6	x	69.27		0.77	x	0.8	=	66.36	(79)
Southwest	0.9x	0.54	x	1.6	x	44.07		0.77	x	0.8	=	42.22	(79)
Southwest	0.9x	0.54	x	1.6	x	31.49		0.77	x	0.8	=	30.17	(79)
Northwest	0.9x	0.54	x	3.37	x	11.28	x	0.77	x	0.8	=	11.38	(81)
Northwest	0.9x	0.54	x	3.21	x	11.28	x	0.77	x	0.8	=	10.84	(81)
Northwest	0.9x	0.54	x	3.37	x	22.97	x	0.77	x	0.8	=	23.17	(81)
Northwest	0.9x	0.54	x	3.21	x	22.97	x	0.77	x	0.8	=	22.07	(81)
Northwest	0.9x	0.54	x	3.37	x	41.38	x	0.77	x	0.8	=	41.75	(81)
Northwest	0.9x	0.54	x	3.21	x	41.38	x	0.77	x	0.8	=	39.76	(81)
Northwest	0.9x	0.54	x	3.37	x	67.96	x	0.77	x	0.8	=	68.56	(81)
Northwest	0.9x	0.54	x	3.21	x	67.96	x	0.77	x	0.8	=	65.31	(81)
Northwest	0.9x	0.54	x	3.37	x	91.35	x	0.77	x	0.8	=	92.16	(81)
Northwest	0.9x	0.54	x	3.21	x	91.35	x	0.77	x	0.8	=	87.78	(81)
Northwest	0.9x	0.54	x	3.37	x	97.38	x	0.77	x	0.8	=	98.25	(81)
Northwest	0.9x	0.54	x	3.21	x	97.38	x	0.77	x	0.8	=	93.59	(81)
Northwest	0.9x	0.54	x	3.37	x	91.1	x	0.77	x	0.8	=	91.91	(81)
Northwest	0.9x	0.54	x	3.21	x	91.1	x	0.77	x	0.8	=	87.55	(81)
Northwest	0.9x	0.54	x	3.37	x	72.63	x	0.77	x	0.8	=	73.27	(81)
Northwest	0.9x	0.54	x	3.21	x	72.63	x	0.77	x	0.8	=	69.79	(81)
Northwest	0.9x	0.54	x	3.37	x	50.42	x	0.77	x	0.8	=	50.87	(81)
Northwest	0.9x	0.54	x	3.21	x	50.42	x	0.77	x	0.8	=	48.45	(81)
Northwest	0.9x	0.54	x	3.37	x	28.07	x	0.77	x	0.8	=	28.32	(81)
Northwest	0.9x	0.54	x	3.21	x	28.07	x	0.77	x	0.8	=	26.97	(81)
Northwest	0.9x	0.54	x	3.37	x	14.2	x	0.77	x	0.8	=	14.32	(81)
Northwest	0.9x	0.54	x	3.21	x	14.2	x	0.77	x	0.8	=	13.64	(81)
Northwest	0.9x	0.54	x	3.37	x	9.21	x	0.77	x	0.8	=	9.3	(81)
Northwest	0.9x	0.54	x	3.21	x	9.21	x	0.77	x	0.8	=	8.85	(81)
Rooflights	0.9x	1	x	2.25	x	26	x	0.77	x	0.7	=	28.38	(82)

Rooflights 0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	3.66	(82)
Rooflights 0.9x	1	x	0.29	x	26	x	0.77	x	0.7	=	7.32	(82)
Rooflights 0.9x	1	x	2.25	x	54	x	0.77	x	0.7	=	58.94	(82)
Rooflights 0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	7.6	(82)
Rooflights 0.9x	1	x	0.29	x	54	x	0.77	x	0.7	=	15.19	(82)
Rooflights 0.9x	1	x	2.25	x	96	x	0.77	x	0.7	=	104.78	(82)
Rooflights 0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	13.51	(82)
Rooflights 0.9x	1	x	0.29	x	96	x	0.77	x	0.7	=	27.01	(82)
Rooflights 0.9x	1	x	2.25	x	150	x	0.77	x	0.7	=	163.72	(82)
Rooflights 0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	21.1	(82)
Rooflights 0.9x	1	x	0.29	x	150	x	0.77	x	0.7	=	42.2	(82)
Rooflights 0.9x	1	x	2.25	x	192	x	0.77	x	0.7	=	209.56	(82)
Rooflights 0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	27.01	(82)
Rooflights 0.9x	1	x	0.29	x	192	x	0.77	x	0.7	=	54.02	(82)
Rooflights 0.9x	1	x	2.25	x	200	x	0.77	x	0.7	=	218.29	(82)
Rooflights 0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	28.14	(82)
Rooflights 0.9x	1	x	0.29	x	200	x	0.77	x	0.7	=	56.27	(82)
Rooflights 0.9x	1	x	2.25	x	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights 0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	26.59	(82)
Rooflights 0.9x	1	x	0.29	x	189	x	0.77	x	0.7	=	53.18	(82)
Rooflights 0.9x	1	x	2.25	x	157	x	0.77	x	0.7	=	171.36	(82)
Rooflights 0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	22.09	(82)
Rooflights 0.9x	1	x	0.29	x	157	x	0.77	x	0.7	=	44.17	(82)
Rooflights 0.9x	1	x	2.25	x	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights 0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	16.18	(82)
Rooflights 0.9x	1	x	0.29	x	115	x	0.77	x	0.7	=	32.36	(82)
Rooflights 0.9x	1	x	2.25	x	66	x	0.77	x	0.7	=	72.04	(82)
Rooflights 0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	9.28	(82)
Rooflights 0.9x	1	x	0.29	x	66	x	0.77	x	0.7	=	18.57	(82)
Rooflights 0.9x	1	x	2.25	x	33	x	0.77	x	0.7	=	36.02	(82)
Rooflights 0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	4.64	(82)
Rooflights 0.9x	1	x	0.29	x	33	x	0.77	x	0.7	=	9.28	(82)
Rooflights 0.9x	1	x	2.25	x	21	x	0.77	x	0.7	=	22.92	(82)
Rooflights 0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	2.95	(82)
Rooflights 0.9x	1	x	0.29	x	21	x	0.77	x	0.7	=	5.91	(82)

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

(83)m=	102.91	199.39	331.26	499.3	633.77	660.21	623.73	519.83	389.5	236.66	127.78	85.07	(83)

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

(84)m=	552.57	645.14	760.22	902.52	1010.85	1013.54	963.28	866.59	751.09	624.17	544.1	523.12	(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=	1	0.99	0.98	0.9	0.71	0.5	0.36	0.42	0.7	0.96	0.99	1	(86)

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

(87)m=	20.31	20.42	20.61	20.82	20.93	20.96	20.96	20.96	20.94	20.77	20.5	20.29	(87)

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

(88)m=	19.73	19.73	19.73	19.74	19.75	19.76	19.76	19.76	19.75	19.75	19.74	19.74	(88)

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

(89)m=	1	0.99	0.96	0.85	0.63	0.4	0.26	0.31	0.59	0.92	0.99	1	(89)

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

(90)m=	18.84	19	19.27	19.56	19.67	19.69	19.69	19.7	19.68	19.5	19.12	18.81	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.33	19.48	19.72	19.98	20.09	20.12	20.12	20.12	20.1	19.92	19.58	19.31	(92)

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

(93)m=	19.33	19.48	19.72	19.98	20.09	20.12	20.12	20.12	20.1	19.92	19.58	19.31	(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=	1	0.99	0.96	0.86	0.65	0.43	0.29	0.34	0.63	0.93	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	550.58	638.88	733.38	776.26	657.36	438.25	280.12	295.42	470.03	580.6	539.09	521.76	(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=	1230.36	1190.82	1077.41	893.8	675.37	439.38	280.23	295.65	480.19	750.41	1008.67	1226.39	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	505.75	370.9	255.96	84.63	13.4	0	0	0	0	126.34	338.1	524.24	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2219.33 (98)

Space heating requirement in kWh/m²/year 39.27 (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		93.3	(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)												
505.75	370.9	255.96	84.63	13.4	0	0	0	0	126.34	338.1	524.24	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)												(211)
542.07	397.54	274.34	90.71	14.36	0	0	0	0	135.41	362.38	561.89	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2378.7 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] + (214) m } 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)

172.91	151.04	157.15	139.39	134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85

Efficiency of water heater 80.2 (216)

(217)m=	87.49	87.12	86.17	83.74	81.02	80.2	80.2	80.2	80.2	84.59	86.85	87.61

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	197.63	173.37	182.37	166.45	166.57	148.2	141.99	158.28	160.03	172.78	179.63	192.73

Total = Sum(219a)$_{1...12}$ = 2040.02 (219)

Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		2378.7	
Water heating fuel used		2040.02	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	109.36		(230a)
central heating pump:	120		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		274.36	(231)
Electricity for lighting		258.35	(232)
Electricity generated by PVs		-690.9	(233)

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10a. Fuel costs - individual heating systems:

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	3.48	x 0.01 =	82.7787	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	70.99	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	36.19	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)		13.19	x 0.01 =	34.08	(250)
Additional standing charges (Table 12)					120	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 252.91 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12) 0.42 (256)

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Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.05	(257)
SAP rating (Section 12)		85.4	(258)

12a. CO_2 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	=	513.8	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	440.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =			954.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	142.39	(267)
Electricity for lighting	(232) x	0.519	=	134.08	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year		sum of (265)…(271) =		872.35	(272)
CO2 emissions per m²		(272) ÷ (4) =		15.43	(273)
EI rating (section 14)				88	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	1.22	=	2902.01	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2488.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5390.84	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	842.29	(267)
Electricity for lighting	(232) x	0	=	793.14	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy		sum of (265)…(271) =		4905.22	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		86.79	(273)

Appendix C SAP Design Requirements

1.1. “A” Rated Domestic Combination Boilers

Recommend Worcester Bosh Green Star or Valliant Ecotech Combination boilers as these units have very good turn down ratio for low heat out put.

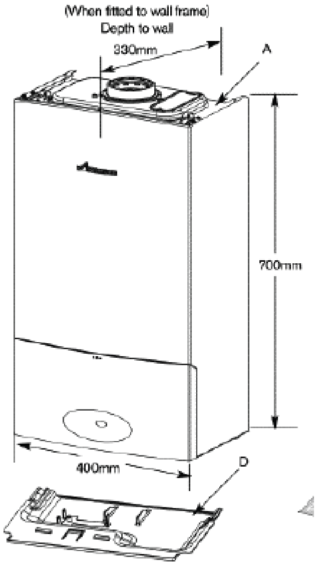


Figure 12 Typical Boiler dimension. Allow 300mm for flue above boiler.

Typical dimensions are H 750 by W 450 by D 350. All boilers require a hot condensate drain.

1.1.1. Heating Controls

Heating control for one and two bedroom dwellings, are single zones with outside weather compensation boiler inter lock, weather compensation and enhanced Load Compensation.

1.1.2. Seven Day Programmer

Seven day time and temperature control with two room thermostat, one in the living areas and second in the hall or main bedroom. Dwellings over 150m².floor area will have two separate time and temperature programmers

1.1.3. Weather Compensator

A device, or feature within a device, which maintains the temperature inside the building by sensing and limiting the temperature of the water circulating through the boiler and heat emitters in relation to the temperatures measured outside the building.

1.1.4. Enhanced Load Compensator

A device, or feature within a device, which maintains the temperature inside the building by sensing and limiting the temperature of the water circulating through the boiler and heat emitters in relation to the temperature measured inside the building.

Boiler should be A rated units

Recommend Worcester Bosh Green Star Combination boilers as these units have very good turn down ratio for low heat out put. Valliant Ecotech.

1.1.5. Boiler Interlock

A device which ensure the boiler cannot operate in heating when there is no demand.

1.2. Under Floor Heating

Under floor heating will be designed to meet the requirements of BS1264. A dry floor system developed by Knauf Brio board is proposed.

The system involves a polystyrene insulation layer into which Polybutylene pipes are inserted. The Brio Board system uses dense plaster board laid over a polystyrene insulation into which 20mm Polybutylene pipe is laid. The advantages of this system are that it has a low construction weight while still providing thermal mass in the dense plaster board.

Brio Board systems can be covered with most standard flooring systems and in the case of this project, it may involve carpets in the bedroom, and wooden laminated floors in the living areas. The system will be designed to meet the requirements of BS1264 sections 1-4, the manufacturer will be able to demonstrate that the thermal output from each room exceeds the calculated heat loss for that room.

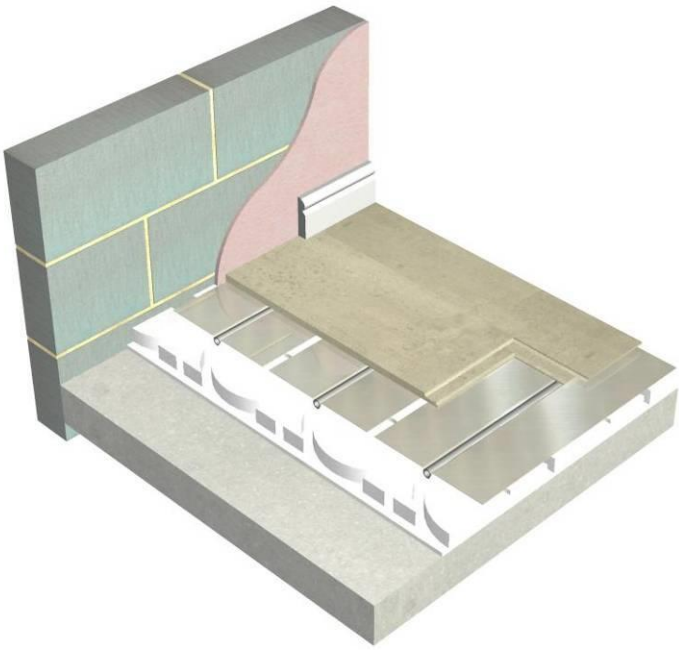


Figure 13 Brio Board System from Knauf/Warmafloor.

Typical Design Parameters will be as follows:-

Heating Temperatures Design set points		Variation	Control
Bedrooms	21°c set	+/- 2	Room Sensor Room Thermostat
Living Area	21°c	+/- 2	Room sensor Room Thermostat
Bathroom	21°c	+/- 2	Thermostat within towel rail
Corridor	**21°c**		**No Control**

A seven day programmer with minimum of two time zones per day shall be included.

1.3. Mechanical Ventilation Rates

To achieve a heat loss parameter of less than 1.1 it has been determined that whole house ventilation is required.

The chosen system will be extremely energy efficient recovering heat from the extract air as well as utilising inverter technologies for the fan motor.

The ventilation rates for whole house ventilation are shown in Part F of the Building Regulations and are minimum rates. Since the air permeability is low in this type of dwelling, the calculated air flow rates in the tables below exceed Building Regulations Part F.

The whole house ventilation unit will be listed on the BRE SAP Appendix Q website. Both Vent Axia and Nuaire manufacture units that appear within Appendix Q and are compatible with the product scheme.

Typically, Dimensions w 700 h 600 d 500. Typical ducts 60h 100 w or diameter 150mm

Figure 14 Typical MVHR

Table of Ventilation Rates for Each Room:-

Room	Supply	Extract
Shower Room		8l/s
Bathroom		8l/s
Living Room	12l/s	
Kitchen (1 bed)		13l/s
Kitchen (2 bed)		13l/s
Main Bedroom	6l/s	
Second Bedroom	5l/s	
Single Bedroom	**4l/s**	

Typical Components	
204mm by 60mm plastic duct	1.5pa/m
Horizontal Bend	8.4pa
204mm by 60mm air brick with 50% free area	16.4pa
Plenum Box	**30.0pa**

The kitchen will have additionally a cooker hood extract unit venting directly to the outside. Since there will be opening windows within the living room/kitchen area the extra supply air to cover the increased extract will be achieved by opening of the window when required.

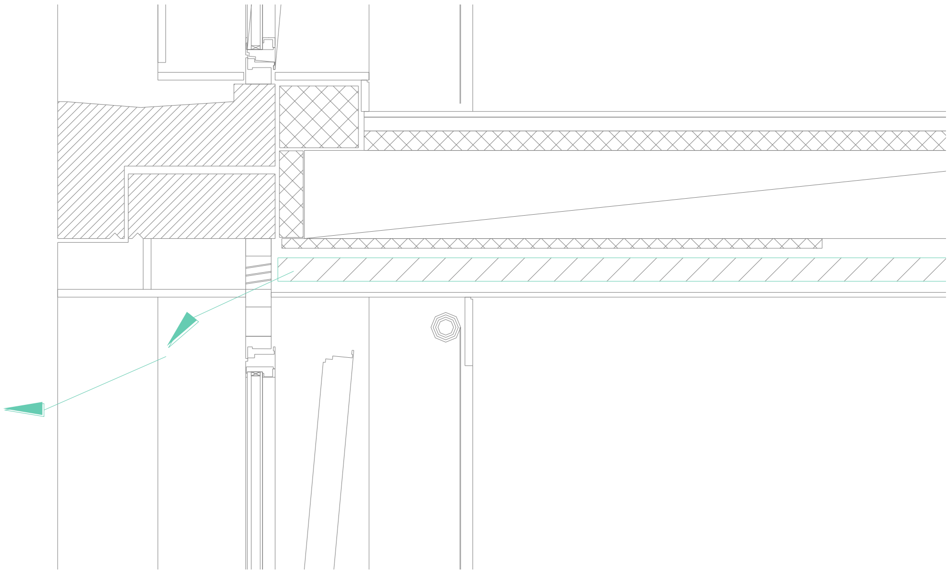


Figure 15 An example of a ventilation grill above a window detail

The external cladding system incorporates a vent built into the individual window lintels. Supply and extract air will be via different windows in order to avoid re-circulation.

Whole house ventilation systems will work passively in the event of a fan motor failure. Towards the end of the units life (the manufacturers claim 20 years plus) if the fan motor stops working, the wind pressure will drive air through the ductwork maintaining the fresh air requirements until a replacement unit can be obtained.

1.4. Water Requirements

To achieve Code of Sustainable Homes levels 3 or 4, the internal water use has to be limited to 105 litres per person per day.

This is a mandatory requirement and failure to achieve this element will result in a lower or zero level.

To achieve level 3 or 4 requires the use of low flow rate fittings.

INSTALLATION	DESCRIPTION	WATER USE
WC	Dual Siphon Flush	6/4 litres
Wash Hand Basin	Flow Regulators or Aerating	4 litres / minutes
Bath	Standard	180 litres
Shower	Flow Rate Between	8 litres / minute
Kitchen Sink	Standard Monoblock	6 litres / minute
Washing Machine	Best Practice	6.14 litres / kg (Supplied)
Dish Washer	Best Practice	1.25 litres / place (Not Supplied)

1.5. Noise Control

The design and selection of the mechanical services system shall be based upon the following maximum internal design noise targets, and those given in CIBSE Guide Volume A section A1 Environmental Criteria for Design.

Location	NR Index
Bedrooms	25
Kitchens	40
Living Rooms	**30**

The materials used for the under floor heating system should be designed to also help achieve the requirements of Part E airborne noise and impact sound attenuation.

There is a commitment to achieve the maximum 4 points where airborne sound attenuation values are at 8dB higher and impact sound attenuation values are at least 8dB lower.

For further information see Code for Sustainable Homes Technical Guide 2008

1.6. Residential Apartments Lighting

Throughout the residential apartments the lighting scheme will consist of low energy luminaires, all selected to be compliant with the Code for Sustainable Homes. i.e. all fixed light fittings must be capable of accepting only low wattage lamps.

The following are the typical illumination levels.

Room	Average Maintained Luminance
Bathrooms	100-200 lux at FFL
Bedrooms	100-200 lux at FFL
Hall	100 lux at FFL
Stairs/Landings	150 lux at worst case tread
Kitchen	150-300 lux on work surfaces
Living Rooms	50-300 lux at FFL
Toilets	200 lux at FFL
Entrance	200 lux at FFL
Plant Rooms	200 lux at FFL
Storage Spaces	**100 lux at FFL**

Average initial efficacy: Not less than 45 luminaire-lumens per circuit-Watt (averaged over the whole area of the building).

1.7. Residential Power Supplies

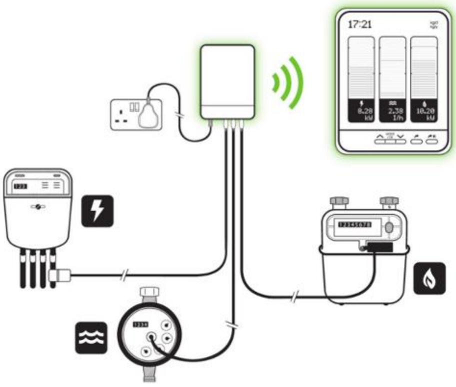
General purpose power will be provided throughout the apartments utilizing white PVC accessories, the exact location and quantity to suit the architectural floor plans.

Power distribution systems within the residential areas shall include the following allowances:

Residential			
Room	Lighting	Small Power	Mechanical
Flat/House	2.5-3.5kVA per dwelling (diversified load)		
Room	Lighting	Small Power	Mechanical
Circulation Space	3W/m^2	15W/m^2	10W/m^2
Entrances	5W/m^2	15W/m^2	10W/m^2
Plant	5W/m^2	5W/m^2	5W/m^2
Storage Areas	**3W/m^2**	**5W/m^2**	**5W/m^2**

Dedicated power supplies will be provided for all appliances within the kitchen together with the mechanical security and IT/comms systems within the apartment

1.8. Display Energy Devices




The primary purpose of an energy display device is to educate the occupants of a house as to how much energy is being used by a peripheral. For example, if the energy display device is used to monitor mains electricity, you will be able to see in real time how much electricity is used by your TV when it is turned on, and when it is on standby. Likewise when you turn the lights on in a room you will see how much energy they are using. You will be able to compare the cost of running your energy efficient lights against your older lights.

Energy display devices that allow you to input your tariff costs (required for the code for sustainable homes) will show you the actual cost of using your TV and the amount it is costing you when left turned on or turned to standby.

An example of this is the amount of electricity a kettle can use - approximately 40 pence per hour. It does not normally take long for bill payers to realise which products are more expensive to run and make behavioural changes to reduce unnecessary consumption.

Ultimately this leads to less energy being wasted which has numerous benefits for both the consumer and environment:

Reduction of CO_2 emissions

Reduction in waste of valuable resources

Reduction in bills for home owner

Can help home owner find most cost effective energy tariff for their use

2. Code of Sustainable Homes Requirements

The dwellings will be designed to achieve Code of Sustainable Homes Level 4. The information listed in this report is consistent with meeting these requirements.

The dwelling layouts and design will meet the following additional requirement, not previously detailed within this report.

- The dwelling will be designed to incorporate a home office area complete with two power points and telephone and internet connection. The room in which the home office is located will have a daylight factor of 1.5%.
- Drying space will be provided, usually within the bathroom with a fitted drying rack system above the bath. The extract ventilation for the drying room will have a humidity control to operate the fan.

Picture 1 Typical Drying Rack above Bath.

Drying racks will have line length of:

Minimum 4m Studio and one bed.

Minimum 6m 2 and 3 bed apartments

Secure by design award will be sought and the design will incorporate the comments of the Police Architectural Liaison Officer or Crime Prevention design advisor.

The windows and door will have been tested to meet BS7950 requirements, listed below:-

To replicate forced entry using a tool such as a screwdriver, a lever is used to try and prise open the window, both at the locks and fittings.

A ‘burglar’s tool kit’ is used by a professional expert to try and force entry in under three minutes. An attempt is made to remove the glass pane externally.

A mechanical loading test is made using parallel and perpendicular loads to gain entry.

White goods supplied at sale to the dwelling will be A Rated and in the case of a dishwasher and washing machine shall meet the water consumption requirement. Information on white A Rated goods not supplied will be provided in the Family Mosaic Homeowner Pack.

All dwellings will be provided with an easily understood Homeowner Pack containing information about the operation of the following points;

Heating System.

Recycling Information.

Entertainment System.

Billing Systems.

White Good etc.

Each dwelling will be provided with three-compartment recycling facilities of the site and Council facilities.

Picture 2 Example of a Code Compliant Inter Bin Storage System

Home Information Packs will contain information promoting cycling and will identify the location for cycle storage. Transport facilities and car sharing schemes should also be included.

Additional reports will be written addressing the opportunities for renewable energy for the site with a brief to demonstrate the viability of these systems.

A Daylight Report will be undertaken showing that the key rooms will have an appropriate daylight factor of 1.5% and a sky view

External lighting will be designed to meet ‘secure by design’ requirements. PIR and daylight controls will be included. Where possible solar powered lamps will be used (GLA request).

An Ecologist will be commissioned to write a report to demonstrate that the site is of low ecological value. This report will include recommendations of how to improve the ecological value of the site.

All dwellings will meet Lifetime Homes requirements.

Sustainable drainage systems will be used to meet the reduced surface run-off requirements.

The Contractor will sign up to:-

Considerate Contractor Scheme.

Monitor and reduce waste from the site.

Reduce construction site impacts to the local residents.

Appendix D Code for Sustainable Homes Level 4 Pre-Assessment

breglobal

Results

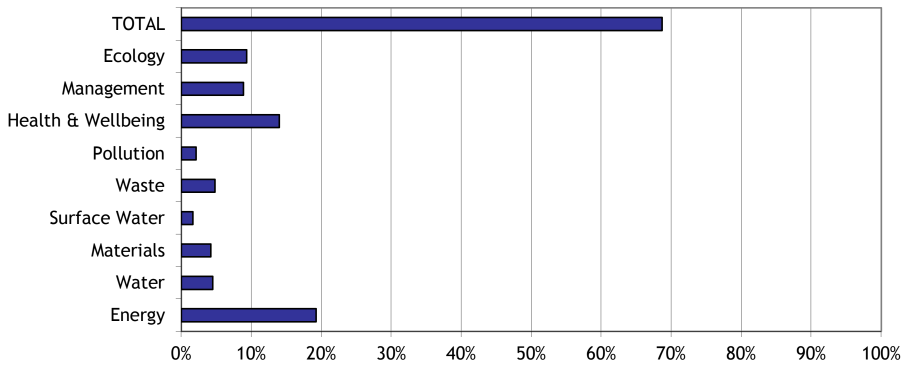
Development Name:	62 Mansfiled Road Camden, London. NW3 2HU.
Dwelling Description:	Two story single bedroom dwelling
Name of Company:	Peter Deer Associuates
Code Assessor's Name:	Adrian Holmes
Company Address:	321 Chase Road, Southgate . London. N14 6JT
Notes/Comments:	

PREDICTED RATING - CODE LEVEL: 4

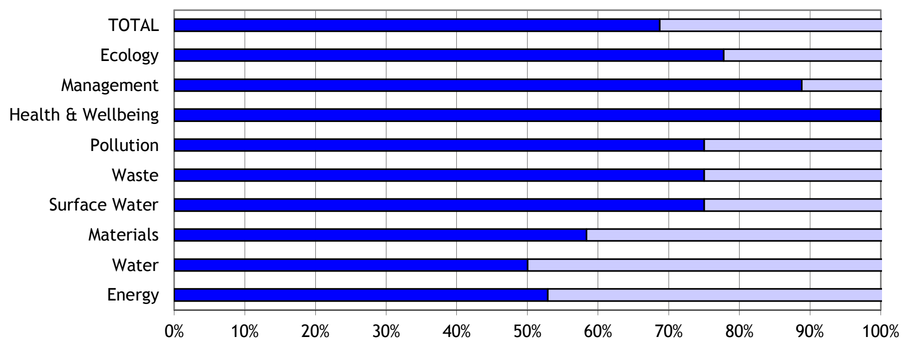
Mandatory Requirements: **All Levels**

% Points:	68.71%	- Code Level: 4
Breakdown:	Energy	- Code Level: 4
	Water	- Code Level: 4

Graph 1: Predicted contribution of individual sections to the total score and percentage of total achievable score



Graph 2: Predicted percentage of credits achievable: Total and by Category



NOTE: The rating obtained by using this Pre Assessment Estimator is for guidance only. Predicted ratings may differ from those obtained through a formal assessment, which must be carried out by a licensed Code assessor.

CATEGORY 1 ENERGY % of Section Credits Predicted: 52.90 Contribution to Overall % Score: 19.25 points	Overall Level: 4	Overall Score Credits 16.4 of 31 Credits	68.71 Level Level 4	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
Ene 1 Dwelling Emission Rate	Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER) as calculated using SAP 2009. Minimum standards for each Code level apply. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score What is the predicted number of credits? 4.1 OR Are zero net CO_2 emissions achieved? ☐	4.1 of 10 Credits	Level 4	See SAP Code complaince documents. 25% emission reduction from use of highly efficient condensing boiler, with roof mounted PV. Thermal improvments from lower U values and air permeability rates.	SAP code Compliance document
Ene 2 Fabric Energy Efficiency	Credits are awarded based on the Fabric Energy Efficiency ($kWh/m^2/yr$) of the dwelling. Minimum standards apply at Code levels 5 and 6. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score Apartments, Mid-terrace ○ OR End terrace, Semi and Detached ○ OR Staggered Mid terrace ◉ What is the predicted number of credits? 3.3	3.3 of 9 Credits	-	End of terrace house, see SAP compliance document.	SAP code Compliance document
Ene 3 Energy Display Devices	Credits are awarded where a correctly specified Energy Display Device is installed monitoring electricity and/or primary heating fuel consumption. Select whether the EDD monitors electricity and/or fuel None Specified ○ Primary Heating only ○ OR Electricity only ○ OR Electricity and primary heating fuel ◉	2 of 2 Credits	-	Smart energy meters will be specified with data repeaters and or internet access.	

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 4 Drying Space	One credit is awarded for the provision of either internal or external secure drying space with posts and footings or fixings capable of holding 4m+ of drying line for 1-2 bed dwellings and 6m+ for dwellings with 3 bedrooms or greater. Will drying space meeting the criteria be provided? Yes ◉ OR No ○	1 of 1 Credits	-	Drying rack located above bath. Humidity control extract fan.	Drying areas are shown on plan drawings and specification of drying rack in architects specification document.
Ene 5 Energy Labelled White Goods	Credits are awarded where each dwelling is provided with either information about the EU Energy Labelling Scheme, White Goods with ratings ranging from A+ to B or a combination of the previous according to the technical guide. Select the appropriate option below EU Energy labelling information **only** ☐ A+ rated appliances ☑ A rated washing machine and dishwasher ☑ B rated tumble dryer or washer dryer ☐ EU Energy labelling information provided ☑	2 of 2 Credits	-	Client to install A and A+ rated white goods.	List of white goods and copies
Ene 6 External Lighting	Credits are awarded based on the provision of space lighting* with dedicated energy efficient fittings and security lighting fittings with appropriate control gear.. Space Lighting None provided ○ OR Non Code compliant lighting ○ OR Code compliant lighting ◉ Security Lighting None provided ◉ OR Non Code compliant lighting ○ OR Code compliant lighting and controls ○ Dual lamp luminaires Compliant with both above criteria ☐ * Statutory safety lighting is not covered by this requirement	2 of 2 Credits	-	All internal / external space lighting, including lighting in common areas, is provided by dedicated energy efficient fittings with appropriate control systems.	M&E specification/ shown on lamp location drawings

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 7 Low or Zero Carbon Technologies	Credits are awarded where there is a 10% or 15% reduction in CO_2 emissions resulting from the use of low or zero carbon technologies. Select % contribution made by low or zero carbon technologies Less than 10% of demand ○ OR 10% of demand or greater ◉ OR 15% of demand or greater ○	1 of 2 Credits	-		
Ene 8 Cycle Storage	Credits are awarded where adequate, safe, secure and weather proof cycle storage is provided according to the Code requirements. Fill in the development details below Number of bedrooms: Number of cycles stored per dwelling* * if you have storage for 1 cycle per two dwellings insert 0.5 in number of cycles stored per dwelling	0 of 2 Credits	-		
Ene 9 Home Office	A credit is awarded for the provision of a home office. The location, space and services provided must meet the Code requirements. Will there be provision for a Home Office? Yes ◉ OR No ○	1 of 1 Credits	-	Home office would be provided on the first floor in the study. The requirement is for two double power sockets telephone and internet points, with 1.5m of clear wall space for a desk and table. The living room has a large window.	Loation of study shown obn architects plan drawings. With correctly sized desk and stoarge unit. Room to have correct daylight factor and sky view. M&E drawings to show 2 double power socket, telephone point and braodband connection.

CATEGORY 2 WATER	Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 50.00 Contribution to Overall Score: 4.50 points		Credits 3 of 6 Credits	Level Level 4		
Wat 1 Indoor Water Use	Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply. Select the predicted water use / Mandatory Requirement greater than 120 litres/ person/ day ○ OR ≤ less than 120 litres/ person/ day ○ OR ≤ less than 110 litres/ person/ day ○ OR ≤ less than 105 litres/ person/ day ◉ OR ≤ less than 90 litres/ person/ day ○ OR ≤ less than 80 litres/ person/ day ○	3 of 5 Credits	Level 3 AND Level 4	Water calculation provided in the energy statement. WC 6/4 flush. WHB taps 4l/m. bath 180 litres. Shower 8 l/m. sink 6 l/m. washing machine 6.14 (supplied).dishwasher 1.25 (not supplied).	Architects specification to give items water outlets and flow rates. See Energy Statement for details.
Wat 2 External Water Use	A credit is awarded where a compliant system is specified for collecting rainwater for external irrigation purposes. Where no outdoor space is provided the credit can be achieved by default. Select the scenario that applies No internal or communal outdoor space ○ OR Outdoor space with collection system ○ OR Outdoor space without collection system ◉	0 of 1 Credits	-	There is no rainwater collection system.	

CATEGORY 3 MATERIALS Overall Level: 4		Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 58.33		Credits	Level		
Contribution to Overall Score: 4.20 points		14 of 24 Credits	All Levels		
Mat 1 Environm-ental Impact of Materials	Mandatory Requirement: At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D. Tradable Credits: Points are awarded on a scale based on the Green Guide Rating of the specifications. The Code Materials Calculator can be used to predict a potential score. Mandatory Requirement Will the mandatory requirement be met? ☑ Enter the predicted score What is the predicted number of credits? 10	10 of 15 Credits	All Levels	The architect will specify materials from the green guide for each building element, to achieved 10 credits.	Completed Code Mat 1 Calculator Tool, showing building elements at the design stage with the relevant Green Guide element numbers and references stating the design or specification documentation used to complete the tool.
Mat 2 Responsible Sourcing of Materials - Basic Building Elements	Credits are awarded where materials used in the basic building elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits? 3	3 of 6 Credits	-	The contractor will be required as a condition of employment to responsibly resource all building materials and keeping records including quantities suppliers and FSC Certificates for compliance with CSH.	Completed Code Mat 2 Calculator Tool, showing building elements at the design stage and detailed documentary evidence stating the materials specified in each element.
Mat 3 Responsible Sourcing of Materials - Finishing Elements	Credits are awarded where materials used in the finishing elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits? 1	1 of 3 Credits	-	All materials will be responsibly resourced and appropriate documentation records kept by main contractor.	Completed Code Mat 3 Calculator Tool, showing building elements at the design stage and detailed documentary evidence stating the materials specified in each element.

CATEGORY 4 SURFACE WATER RUN-OFF Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 75.00% Contribution to Overall Score: 1.65 points	Credits 3 of 4 Credits	Level All Levels		
Sur 1 Management of Surface Water Run-off from developments Mandatory Requirement: Peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. Desiging the drainage system to be able to cope with local drainage system failure. Tradable Credits: Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters. Mandatory Requirement Will the mandatory requirement be met? ☑ Select the appropriate option No SUDS ☐ No runoff into watercourses for the first 5 mm of rainfall ☐ Runoff from hard surfaces will receive an appropriate level of treatment ☑	1 of 2 Credits	All Levels	It is assumed that SUDS would be designed to take water from hard surfaces. The surface water calculations will confirm the credits.	Surface water calculations and tanking sizing for design stage, with location of SUD system on drianage drawings. Contractor to provide details of the instalation for construction stage sign off.
Sur 2 Flood Risk Credits are awarded where developments are located in areas of low flood risk or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide. Select the annual probability of flooding (from PPS25*) Zone 1 - Low ◉ OR Zone 2 - Medium ○ OR Zone 3 - High ○ Select the apropriate option(s) Low risk of flooding from FRA** ☑ All measures of protection are demonstrated in FRA ☐ Ground floor level and access routes are 600 mm above design flood level ☐ * Planning Policy Statement 25 - Planning and Flood Risk ** FRA - Flood Risk Assessment	2 of 2 Credits	-	Low Flood Risk Area. A report from a qualified person confirm the site is in low flood risk area	A Flood Risk Assessment (prepared according to good practice guidance as outlined in PPS25 Development and Flood Risk), which shows that there is a low risk of flooding from all sources.

CATEGORY 5 WASTE	Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 75.00%		Credits	Level		
Contribution to Overall Score: 4.80 points		6 of 8 Credits	All Levels		
Was 1 Storage of non-recyclable waste and recyclable household waste	Mandatory Requirement: The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906. Tradable Credits are awarded for adequate internal and/ or external recycling facilities. **Mandatory Requirement** Will the minimum space be provided and be accessible to disabled people? ☑ **Internal Recyclable household waste storage** Where there is no external recyclable waste storage and no Local Authority collection scheme Internal storage (capacity 60 litres) ☐	0 of 2 Credits		There is local authority collection scheme. The design access statement section on waste provides the details of how this development complies with the waste storage requirements.	At design stage detailed documentary evidence is to be provided. Architect to specify location on plan drawings, and size of main bins for council collection. Provide details of council recycling scheme. Construction photographic evidence.
	Local Authority collection Scheme Post Collection sorting Internal storage (capacity 30 litres) ☐ Pre-collection sorting Internal storage (3 separate bins, capacity 30 litres) ☑	4 of 4 Credits	All Levels		
	External Storage, no Local Authority collection scheme 3 separate internal storage bins (capacity 30 litres) ☐ **AND** Houses External Storage(capacity 180 litres) ☐ Flats Private recycling operator ☐ 3 or greater types of waste collected ☐	0 of 4 Credits			

Issue		Credits	Level	Assumptions Made	Evidence Required
Was 2 Construction Site Waste Management	A credit is awarded where a compliant SWMP is provided with targets and procedures to minimise construction waste. Credits are available where the SWMP include procedures and commitments for diverting either 50% or 85% of waste generated from landfill. SWMP details Does the SWMP include: + No SWMP ○ + SWMP with targets and procedures to minimise waste? ○ + SWMP with procedures to divert 50% of waste ◉ + SWMP with procedures to divert 85% of waste ○	2 of 3 Credits		it is assumed that the contractor will provide a compliant SWMP and more than 85% of the waste will be diverted from landfill.	At design stage the contractor to be required to produce compliant SWMP. Construction stage to provide documentary evidence.
Was 3 Composting	A credit is awarded where individual home composting facilities are provided, or where a community/ communal composting service, either run by the Local Authority or overseen by a management plan is in operation. Select the facilities available No composting facilities ◉ Individual composting facilities ○ OR Communal/ community composting*? ○ Local Authority ☐ OR Private with management plan ☐ * including if an automated waste collection system is in place	0 of 1 Credit	-	Camden Council offer a local collection for food waste and compostable garden waste.	Show location on plan drawings at design stage. Photographic evidence for construction stage.

CATEGORY 6 POLLUTION	Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 75.00%		Credits	Level		
Contribution to Overall Score: 2.10 points		3 of 4 Credits	All Levels		
Pol 1 Global Warming Potential (GWP) of Insulants	A credit is awarded where <u>all</u> insulating materials only use substances (in manufacture AND installation) that have a GWP of less than 5. Select the most appropriate option (●) All insulants have a GWP less than 5 OR ( ) Some insulants have a GWP of less than 5 OR ( ) No insulants have a GWP of less than 5	1 of 1 Credits	-	All Insulation will have GWP of less than 5. Details provide in the services section of the Design and Access statement.	Information provide in M&E and Architects specification documents.
Pol 2 NOx Emissions	Credits are awarded on the basis of NOx emissions arising from the operation of the space and water heating system within the dwelling. Select the most appropriate option ( ) Greater than 100 mg/kWh OR ( ) Less than 100 mg/kWh OR ( ) Less than 70 mg/kWh OR ( ) Less than 40 mg/kWh OR ( ) Class 4 boiler OR (●) Class 5 boiler OR ( ) All space and hot water energy requirements are met by systems who do not produce NOx emissions	2 of 3 Credits	-	A Class 5 boiler will be specified.	Information provide in M&E and Architects specification documents.

CATEGORY 7 HEALTH & WELLBEING	Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00%		Credits	Level		
Contribution to Overall Score: 14.00 points		12 of 12 Credits	No level		
Hea 1 Daylighting	Credits are awarded for ensuring key rooms in the dwelling have high daylight factors (DF) and a view of the sky. Select the compliant areas Room Kitchen: Avg DF of at least 2% ☑ Living Room*: Avg DF of at least 1.5% ☑ Dining Room*: Avg DF of at least 1.5% ☑ Study*: Avg DF of at least 1.5% ☑ 80% of working plane in all above rooms receive direct light from the sky? ☑ Any room used for Ene 9 Home Office must also achieve a min DF of 1.5%.	3 of 3 Credits	-	There is a skylight in the ground floor living area. This sky light provide the sky view and day light to the living space.	Copy of calculations as detailed in the methodology to demonstrate: Average daylight factor using the formula described in the definitions section (method described in Littlefair (1998) as set out in BS 8206-2) or computer simulation or scale model measurements. Position of the no-sky line and percentage of area of the working plane that receives direct light from the sky Confirmation from the developer that the calculations accurately reflect the dwelling as designed.
Hea 2 Sound Insulation	Credits are awarded where performance standards exceed those required in Building Regulations Part E. This can be demonstrated by carrying out pre-completion testing or through the use of Robust Details Limited. Select a type of property Detached Property ◉ Attached Properties: - Separating walls and floors only exist between non habitable spaces ○ - Separating walls and floors exist between habitable spaces ○ Select a performance standard Performance standard not sought ◉ Airborne: 3db higher; Impact: 3dB lower ○ OR Airborne: 5db higher; Impact: 5dB lower ○ OR Airborne: 8db higher; Impact: 8dB lower ○	4 of 4 Credits	-	Detached dwelling no posibility of sound transfer between dwellings. Points awarded by default.	At design stage architect to specify the correct insulation levels. Acoustician report and calculation. Test certificates for construction stage compliance.

Issue		Credits	Level	Assumptions Made	Evidence Required
Hea 3 Private Space	A credit is awarded for the provision of an outdoor space that is at least partially private. The space must allow easy access to all occupants. Will a private/ semi-private space be provided? Yes, private/semi-private space will be provided ◉ OR No private/semi-private space ○	1 of 1 Credits	-	The design allows for a small 6.3m² courtyard outside the living room.	Courtyard areas shown on plan drawings. Photographic evidence at construction stage.
Hea 4 Lifetime Homes	<u>Mandatory</u> <u>Requirement:</u> Lifetime Homes is mandatory when a dwelling is to achieve Code Level 6. <u>Tradable</u> <u>credits:</u> Credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Mandatory Requirement Dwelling to achieve Code Level 6? ☐ Lifetime Homes Compliance All Lifetime Homes criteria will be met ◉ OR Exemption from LTH criteria 2/3 applied ○ Credit not sought ○	4 of 4 Credits	No level	The development has no parking so exempt from first criteria. The design meets with the other fifteen item for life time homes.	Architect to design and specify. Items shown on drawings. Architects to provide short report outlining the Life Time Homes compliant items, with drawings numbers.

CATEGORY 8 MANAGEMENT % of Section Credits Predicted: 88.00% Contribution to Overall Score: 8.88 points	Overall Level: 4	Overall Score Credits 8 of 9 Credits	68.71 Level All Levels	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
Man 1 Home User Guide	Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code requirements. Tick the topics covered by the Home User Guide Operational Issues? ☑ Site and Surroundings? ☑ Is available in alternative formats? ☑	3 of 3 Credits	-	A simple home owner welcome pack will be provided. To all first occupants. One housing developments provide a detailed home owner information package including non-technical information on the use of the heating controls.	A letter from client or specified by Architect at design stage. Copy of Home User Guide at construction stage.
Man 2 Considerate Constructors Scheme	Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme. Select the appropriate scheme and score No scheme used ○ Considerate Constructors OR Best Practice ○ OR Significantly Beyond Best Practice ◉ Alternative Scheme* OR Mandatory + 50% optional requirements ○ OR Mandatory + 80% optional requirements ○ * In the first instance, contact a Code Service Provider if you are considering to use an alternative scheme.	2 of 2 Credits	-	As a condition of the contractors employment. Specification clause or other confirmation of commitment from the contractor or developer to comply with the Considerate Constructors Scheme and achieve formal certification under the scheme. Target 32 to 40 points	Design stage specification clause or other confirmation of commitment from the contractor or developer to comply with the Considerate Constructors Scheme and achieve formal certification under the scheme with either a pass score or a score of 32 points and above AND Confirmation that registration with the Considerate Constructor Scheme has taken place no later than the commencement of the construction phase
Man 3 Construction Site Impacts	Credits are awarded where there is a commitment and strategy to operate site management procedures on site as following: Tick the impacts that will be addressed Monitor, report and set targets, where applicable, for: - CO_2/ energy use from site activities ☑ - CO_2/ energy use from site related transport ☑ - water consumption from site activities ☑ Adopt best practice policies in respect of: - air (dust) pollution from site activities ☐ - water (ground and surface) pollution on site ☐ 80% of site timber is reclaimed, re-used or responsibly sourced ☐	1 of 2 Credits	-	As condition of the employment of the contractor, will provide details of the monitoring of energy and water use on the site. The contractor will be required to adopt best practise for reducing dust and water pollution from the site.	Design stage completed copy of Checklist Man 3 (signed and dated) detailing the procedures that will be employed to minimise construction site impacts. Construction stage: Documentary evidence demonstrating that the procedures detailed in Checklist Man 3* have been achieved. * Checklist Man 3 can be completed on a site wide basis with monthly reviews.

Issue		Credits	Level	Assumptions Made	Evidence Required
Man 4 Security	Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated. Secured by Design Compliance Credit not sought ○ OR Secured by Design Section 2 Compliance ◉	2 of 2 Credits	-	The architectural detailed design team will appoint and liaise with the ALO and amend the design as necessary to achieve secure by design award for new homes.	Deasin stage: Detailed docuemntry evidence showing the ALO?CPDA have been consulted and there recomndation taken on by the design team. At construction the award of the secure by design certifcat

CATEGORY 9 ECOLOGY	Overall Level: 4	Overall Score	68.71	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 77.00%		Credits	Level		
Contribution to Overall Score: 9.33 points		7 of 9 Credits	All Levels		
Eco 1 Ecological Value of Site	One credit is awarded for developing land of inherently low value. Select the appropriate option ○ Credit not sought OR ○ Land has ecological value OR ◉ Land has low/ insignificant ecological value* * Low ecological value is determined either a) by using Checklist Eco 1 across the whole development site; or b) where an suitably qualified ecologist is appointed and can confirm or c) produces an independent ecological report of the site, that the construction zone is of low/ insignificant value; AND the rest of the development site will remain undisturbed by the works.	1 of 1 Credits	-	The Land has Low Ecological value. An existing building onsite. See Ecologist planning report for details	A copy of the ecologist's report highlighting the information required as set out in 'Code for Sustainable Homes Ecology Report Template, and detailed documentary evidence stating: How the key recommendations and 30% of additional recommendations will be incorporated into the design. The planting schedule of any species to be incorporated from suitably qualified ecologists recommendations
Eco 2 Ecological Enhancement	A credit is awarded where there is a commitment to enhance the ecological value of the development site. Tick the appropriate boxes ☑ Will a *Suitably Qualified Ecologist* be appointed to recommend appropriate ecological features? AND ☑ Will all key recommendations be adopted? AND ☑ 30% of other recommendations be adopted?	1 of 1 Credits	-	An Ecologist has been employed to survey the site before construction and make recommendations to enhance the ecological value of the site post construction.	A copy of the ecologist's report highlighting the information required as set out in the CfSH ecology report template.
Eco 3 Protection of Ecological Features	A credit is awarded where there is a commitment to maintain and adequately protect features of ecological value. Type and protection of existing features ○ Site with features of ecological value? OR ◉ Site of low ecological value (as Eco 1)? AND ☐ All* existing features potentially affected by site works are maintained and adequately protected? *If a suitably qualified ecologist has confirmed that a feature can be removed due to insignificant ecological value or poor health conditions, as long all the rest have been protected, then this box can be ticked.	1 of 1 Credits	-	Default. Site is of low ecological value	

Issue		Credits	Level	Assumptions Made	Evidence Required
Eco 4 Change of Ecological Value of Site	Credits are awarded where the change in ecological value has been calculated in accordance with the Code requirements and is calculated to be: Change in Ecological Value Major negative change: fewer than -9 ○ Minor negative change: between -9 and -3 ○ OR Neutral: between -3 and +3 ◉ Minor enhancement: between +3 and +9 ○ Major enhancement: greater than 9 ○	2 of 4 Credits	-	The ecologist will be employed post construction to monitor and record the level of ecological improvements.	Copy of the calculations completed by the assessor and supported by detailed documentary evidence.
Eco 5 Building Footprint	Credits are awarded where the ratio of combined floor area of all dwellings on the site to their footprint is: Ratio of Net Internal Floor Area: Net Internal Ground Floor Area Credit Not Sought ○ OR Houses: 2.5:1 OR Flats: 3:1 ○ OR Houses: 3:1 OR Flats: 4:1 ◉ OR Houses & Flats Weighted (2.5:1 & 3:1) ○ OR Houses & Flats Weighted (3:1 & 4:1) ○	2 of 2 Credits		The site has been predicted to achieve the required foot print ratio for a two storey single dwelling.	Provide calculation of building footprint.