62 Mansfield Road, Camden, London. NW3 2HU

Energy & Sustainability Statement



May 2014

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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.

Contents

Exe	ecutive Summary	5
	Code for Sustainable Homes	7
2	Introduction	9
	Figure 2 Location of 62 Mansfield infill development. Map Courtesy of Google Maps	9
	Aim of this report	11
3	Planning Policies	12
	GLA London Plan Policies (Chapter 5)	12
	POLICY 5.1 CLIMATE CHANGE MITIGATION	12
	Policy 5.2 Minimising Carbon Dioxide Emissions	12
	Policy 5.3 Sustainable Design and Construction Strategy	12
	Policy 5.6 Decentralised energy in development proposals, planning decisions	12
	Policy 5.7 Renewable Energy Strategy	12
	London Borough of Camden Planning Policies	13
4	Energy Modelling	15
	Notional Building	15
	Target Emission Rate	15
	Dwelling Emission Rate	15
	Emission Reduction from Low and Zero Carbon Technologies	16
	Energy Modelling Procedure	16
5	Passive Design and Energy Demand Reduction (Be Lean)	18
6	Space Heating Be Clean	23
7	Renewable Energy Be Green	25
8	Energy Modelling Conclusion.	27
9	Code for Sustainable Homes certification	29

Table of tables

Table 1 Option A Mayor Emission Hierarchy	6
Table 2 option A 2014 Building regulation Compliance	6
Table 3 Option B Mayor Emission Hierarchy	6
Table 4 Option B 2014 Building Regulation compliance	6
Table 5 Proposed Thermal (U Value) Improvements	. 19
Table 6 Water fitting Flow rates to achieve 105liters per person per day	. 22
Table 7 Ene 7 Emission reduction Calculation (Ene 7= 1 credit).	. 25
Table 8 Option A U Values	. 27
Table 9 Option B U values	. 28
Table 10 Summary Table of the Code for Sustainable Homes Credits.	. 29

Table of figures

Figure 1 Graphic summary of the Code for Sustainable Homes Credits.	8
Figure 2 Location of 62 Mansfield infill development. Map Courtesy of Google Maps.	9
Figure 3 Ground Floor	. 10
Figure 4 Lower Ground Floor	. 10
Figure 5 Cross Section(. 17
Figure 6 Cross Section through Dwelling,. Showing Openings onto Courtyard	. 20
Figure 7 Vent Axia Whole House Ventilation with Heat Recovery.	. 21
Figure 8 Shower Save Recho-tray	. 25
Figure 9 location of roof PV 0.8kW686kWh/year. (Horizontal)	. 26
Figure 10 Typical Section for Green Roof	. 33
Figure 11 Location of Green Roof	. 34
Figure 12 Typical Boiler dimension. Allow 300mm for flue above boiler	. 37
Figure 13 Brio Board System from Knauf/Warmafloor	. 38
Figure 14 Typical MVHR	. 39
Figure 15 An example of a ventilation grill above a window detail	. 41

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.

Sustainability Environmental Consultancy

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.

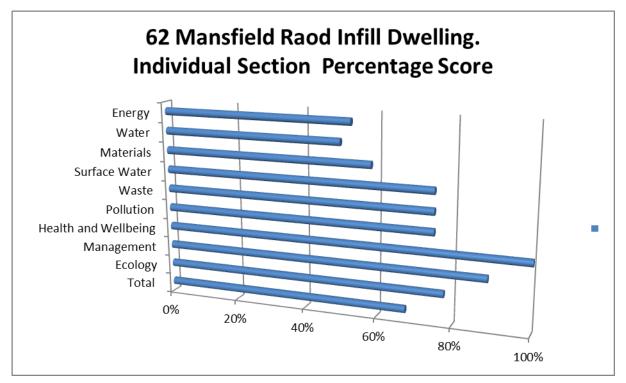


Figure 1 Graphic summary of the Code for Sustainable Homes Credits.

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 56.4m² 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.

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

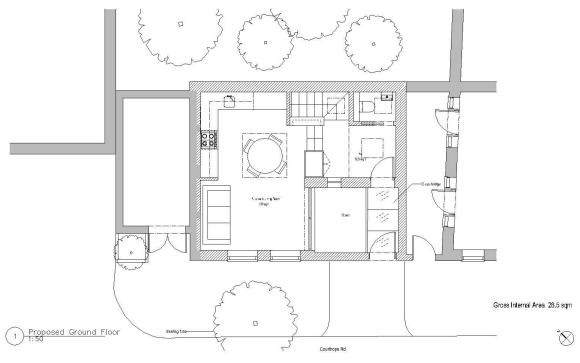


Figure 3 Ground Floor

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	-B		3.119 7 sqr	
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			94.0 6.3 sqr	_

Gross Internal Area 28.5 sqm

×4

1) Proposed Lower 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/m²/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.

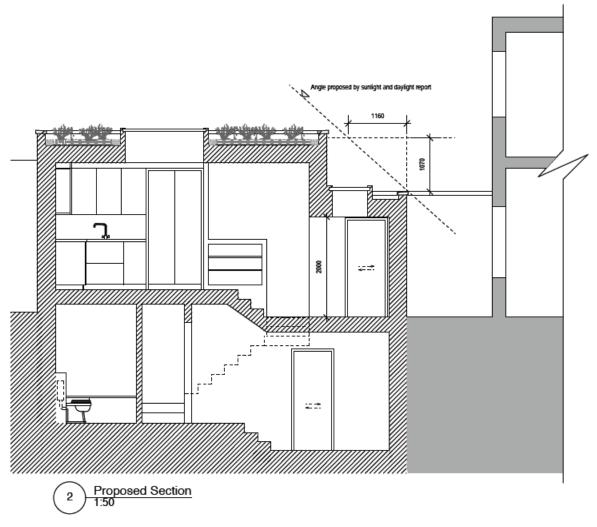


Figure 5 Cross Section(

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	10.00m³/m²@50p	4.2m³/m²@50p	1.0m³/m²@50pa	
Rate	а	а		4.2m³/m²@50p
				а

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 5m³/m²@50*pa* 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.

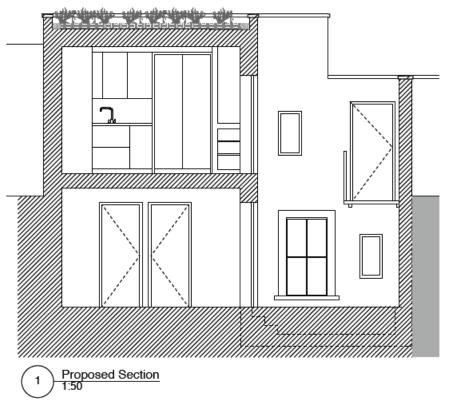


Figure 6 Cross Section through Dwelling,. Showing Openings onto Courtyard.

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 $3^{\circ}C$. Heat pumps are less efficient when providing hot water at $50^{\circ}C$. 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.

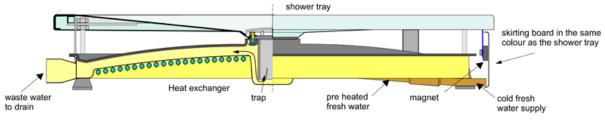
7 Renewable Energy Be Green

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 $1.5m^3/m^2@50Pa$. 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)120kgCO₂/year





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/m²/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.

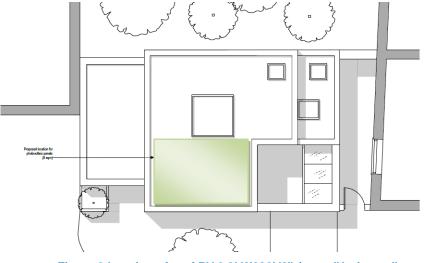


Figure 9 location of roof PV 0.8kW686kWh/year. (Horizontal)

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/m²K	71%
Floors	0.10W/m²K	60%
Roof	0.10W/m²K	60%
Windows	1.40W/m²K	36%
Roof lights	1.20W/m²K	45%
Door	2.50W/m²K	17%
Air permeability Rate	1.0m³/m²@50pa	

Table 8 Option A U Values

Energy saving from under shower waste water heat recovery.

2012 Building Regulation TER 24.07 kgCO2/m² DER 18.03kgCO2/m² 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 Improvement
--

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 kgCO2/m² DER 17.09kgCO2/m² 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 & CO₂ emissions (15%)

This category ensures that the energy and CO₂ 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 CO₂ 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.

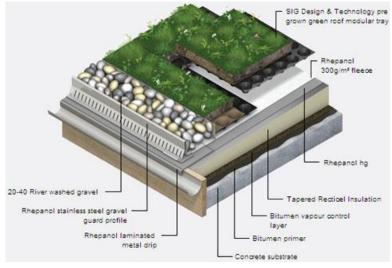


Figure 10 Typical Section for Green Roof.

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.

Sustainability
Environmental Consultancy

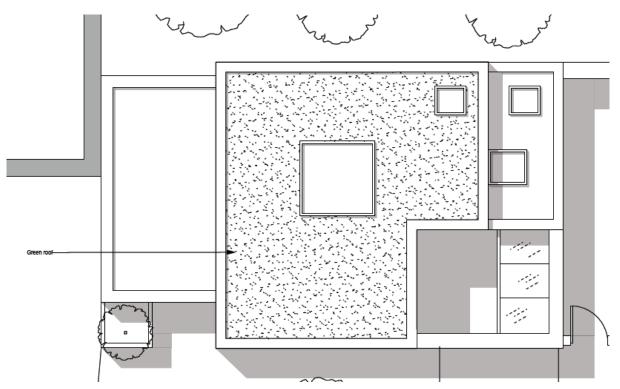


Figure 11 Location of Green Roof

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

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71

-	y 2014 at 12:04:03	,		
Project Informati			Duilding Types	Deteched
Assessed By:	0		Building Type:	Detached House
Dwelling Details:				
Site Reference :	DESIGN STAGE 62 Mansfield Road	4	Plot Reference:	Part L compliance
Address :		d, LONDON, NW3 2HU	FIOL Reference.	Fart L compliance
		u, LONDON, NWS 2110		
Client Details: Name:	Allan Properties L	+d		
Address :	Alian Fropenies L	lu		
It is not a comple	ete report of regulat	ithin the SAP calculations. ions compliance.		
1 TER and DER				
Fuel for main hea Fuel factor: 1.00 (ting system: Natural	gas		
	oxide Emission Rate	(TER)	24.07 kg/m²	
Dwelling Carbon I	Dioxide Emission Rat	te (DER)	23.84 kg/m ²	ОК
2 Fabric U-value	es			
Element External Floor Roof Opening 3 Air permeabil	wall s	Average 0.12 (max. 0.30) 0.12 (max. 0.25) 0.12 (max. 0.20) 1.44 (max. 2.00)	Highest 0.12 (max. 0.70) 0.12 (max. 0.70) 0.12 (max. 0.35) 1.80 (max. 3.30)	ОК ОК ОК ОК
Air permea Maximum 4 Heating efficie	bility at 50 pascals		5.00 10.0	ок
Main Heati		Boiler system with radiators of Data from manufacturer Combi boiler Efficiency 87.0 % SEDBUK20 Minimum 88.0 %	, , , , , , , , , , , , , , , , , , ,	Fail
Secondary	heating system:	None		
5 Cylinder insu	lation			
Hot water S	Storage:	No cylinder		
6 Controls				
Hot water o		Programmer, TRVs and boile No cylinder	er energy manager	ОК
Boiler inter 7 Low energy li		Yes		OK
	e of fixed lights with lo	ow-energy fittings	100.0% 75.0%	ОК

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.41	
Maximum	1.5	ОК
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	2.25m ²	
Roof windows facing: Horizontal	0.29m ²	
Roof windows facing: Horizontal	0.58m ²	
Ventilation rate:	8.00	
Blinds/curtains:	None	
	shutter closed 100% of dayl	ight hours
10 Key jeatures		
Roof window U-value	1.4 W/m²K	
Windows U-value	1.4 W/m²K	
Roofs U-value	0.12 W/m ² K	
External Walls U-value	0.12 W/m²K	
Floors U-value	0.12 W/m²K	

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	on:					
Dwelling type: Detachment:		House Detached				
Year Completed:		2014				
Floor Location:		Floor area:	Stor	rey height	:	
Basement floor		28.26 m ²	2.	36 m		
Floor 1		28.26 m ²	2.	52 m		
Living area:		19 m ² (fraction 0.336)				
Front of dwelling	faces:	South West				
Opening types:						
Name:	Source:	Туре:	Glazing:		Argon:	Frame:
G NE FD	Manufacturer	Solid	Glazing.		Argon.	Traffic.
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 Facto	r: g-value:	U-value:	Area:	No. of Openings:
Name: G NE FD	Gap: mm	Frame Factor	r: g-value: 0	U-value: 1.8	Area: 1.58	No. of Openings: 1
	=		-			
G NE FD LG P NE 1 LG P NE 2	mm	0 0.8 0.8	0 0.77 0.77	1.8	1.58 0.27 1.26	1
G NE FD LG P NE 1 LG P NE 2 LG P NW	mm 6mm	0 0.8 0.8 0.8	0 0.77 0.77 0.77	1.8 1.4 1.4 1.4	1.58 0.27 1.26 3.37	1 1 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR	mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8	0 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6	1 1 1 1 2
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW	mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8	0 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21	1 1 1 2 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE	mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	0 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27	1 1 1 2 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1	mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25	1 1 1 1 2 1 1 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29	1 1 1 2 1 1 1 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1	mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25	1 1 1 1 2 1 1 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29	1 1 1 2 1 1 1 1 1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795	1 1 1 1 2 1 1 1 1 2 Height: 1.984
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 U.7 0.7 Location: G P LG P	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35	1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 U.7 0.7 Location: G P LG P LG P	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35 0.815	1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768 1.551
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 Location: G P LG P LG P LG P	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35 0.815 1.604	1 1 1 1 2 1 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 Location: G P LG P LG P LG P LG P G	0 0.77 0.7	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35 0.815 1.604 1	1 1 1 1 2 1 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1 1.6
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 Location: G P LG P LG P LG P	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35 0.815 1.604	1 1 1 1 2 1 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1

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	e or unknown				
Opaque Element	ts:						
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemer	<u>nts</u>	1 0					
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 Elemen	<u>its</u>						

Party Elements

Thermal bridges:	
Thermal bridges:	No information on thermal bridging ($y=0.15$) ($y=0.15$)
Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of sides sheltered: Pressure test:	Yes (As designed) 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 0 0 0 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: Water heating:	None
Water heating:	From main heating system

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

Others:

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

Predicted Energy Assessment

62, Mansfield Road LONDON NW3 2HU

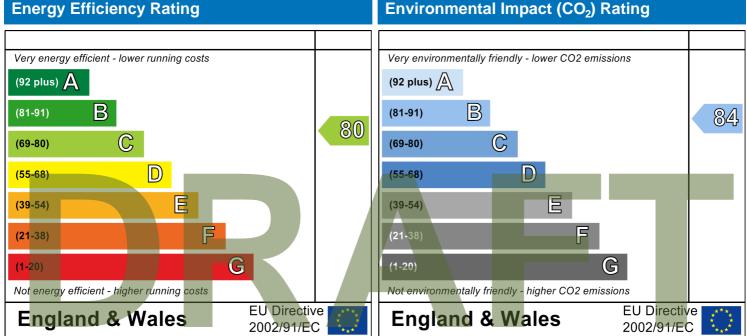
Dwelling type: Date of assessment: Produced by: Total floor area:

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



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.



Jode for Sustainable Homes Report

Assessor and House Details

Assessor Name: Property Address:

62, Mansfield Road LONDON NW3 2HU

Assessor Number:

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	23.84
The following code calculations are taken from the Code for Sustainable Homes Te	echnical 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)

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	

Reduction in CO2 emissions

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 CHPOA.

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

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71

Printed on 21 May	y 2014 at 12:03:58	assessed by Stroma FSAP 2009 p	program, Version: 1.5.0	0.71	
Project Information	bn:				
Assessed By:	()		Building Type:	Detached House	
Dwelling Details:					
NEW DWELLING					
Site Reference :	62 Mansfield Road	ł	Plot Reference:	Option A Thermal	improvements
Address :	62, Mansfield Roa	ad, LONDON, NW3 2HU			
Client Details:					
Name: Address :	Allan Properties Lt	.d			
•	rs items included wi ete report of regulati	rithin the SAP calculations. tions compliance.			
1 TER and DER					
Fuel factor: 1.00 (r Target Carbon Dio	oxide Emission Rate (Dioxide Emission Rate	(TER)	24.07 kg/m² 18.03 kg/m²		ОК
Element External v Floor Roof Openings 3 Air permeabilit Air permeat Maximum	s	Average 0.10 (max. 0.30) 0.10 (max. 0.25) 0.10 (max. 0.20) 1.26 (max. 2.00)	Highest 0.10 (max. 0.70) 0.10 (max. 0.70) 0.10 (max. 0.35) 1.80 (max. 3.30) 1.00 10.0		ОК ОК ОК ОК
			10.0		UN
4 Heating efficie Main Heatir		Database: (rev 358, product inde Boiler system with radiators or u Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 %	underfloor - mains gas		ок
Secondary	heating system:	None			
5 Cylinder insula	ation				
Hot water S	Storage:	No cylinder			
6 Controls					
•	ting controls	Time and temperature zone cont	trol		ΟΚ
Hot water c Boiler interle		No cylinder Yes			ок

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	ОК
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Not significant	OK
ased 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	2.25m ²	
Roof windows facing: Horizontal	0.29m ²	
Roof windows facing: Horizontal	0.58m ²	
Ventilation rate:	8.00	
Blinds/curtains:	None	
	shutter closed 100% of day	light hours
0 Key features		
Air permeablility	1.0 m ³ /m²h	
Roof window U-value	1.2 W/m ² K	
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	

	ls: Option A Thermal impr					
Address:		62, Mansfield Road, LO	NDON, NW3 2HU			
Located in:		England				
Region:		Thames valley				
UPRN:		0376892178				
Date of asses		01 May 2014				
Date of certi		21 May 2014				
Assessment	51	New dwelling design sta Non marketed sale	age			
Transaction		Unknown				
Tenure type: Related part		No related party				
	s Parameter:	Calculated 414.05				
		an 125 litres per Perso	on per day: True			
Property descri	iption:					
Dwelling type:		House				
Detachment:		Detached				
Year Complete	ed:	2014				
Floor Locatic	on:	Floor area:	S	torey height	:	
Basement floo	r	28.26 m ²		2.36 m		
Floor 1		28.26 m ²		2.52 m		
Living area:		19 m ² (fraction 0.336)				
Front of dwelli	ng faces:	South West				
Opening types						
Name:	Source:	Type:	Glazing:		Argon:	Frame:
g ne fd	Manufacturer	Solid				
LG P NE 1	Manufacturer	Windows	double-glaze		No	
LG P NE 2	Manufacturer	Windows	double-glaze		No	
LG P NW	Manufacturer	Windows	double-glaze		No	
G SW K/LR	Manufacturer	Windows	double-glaze		No	
G P NW	Manufacturer	Windows	double-glaze		No	
G P NE	Manufacturer	Windows	double-glaze		No	51/0.11
RL 1	Manufacturer	Roof Windows	double-glaze		No	PVC-U
RL 2	Manufacturer	Roof Windows	double-glaze		No	PVC-U
RL 3	Manufacturer	Roof Windows	double-glaze	a	No	PVC-U
Name:	Gap:		or: g-value:	U-value:	Area:	No. of Opening
G NE FD	mm	0	0	1.8	1.58	1
LG P NE 1 LG P NE 2	6mm	0.8	0.77 0.77	1.2	0.27	1
LG P NE 2 LG P NW	6mm 6mm	0.8 0.8	0.77	1.2 1.2	1.26 3.37	1 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
		C P	North West		1 605	2

GΡ

GΡ

G P NW

G P NE

2

0.768

1.605

0.35

North West

North East

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	e or unknown				
Opaque Elemen	ts:						
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemer		openings.	Net al ca.	0-value.	Nu value.		Карра.
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 Elemer	<u>nts</u>						

Party Elements

Thermal bridges:	
Thermal bridges:	No information on thermal bridging ($y=0.15$) ($y=0.15$)
Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of sides sheltered: Pressure test:	Yes (As designed) 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 0 0 0 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

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:
In Smoke Control Area:
Conservatory:
Low energy lights:
Terrain type:
EPC language:
Wind turbine:
Photovoltaics:
Assess Zero Carbon Home:

standard tariff Yes No conservatory 100% Dense urban English No None No

Predicted Energy Assessment

62, Mansfield Road LONDON NW3 2HU

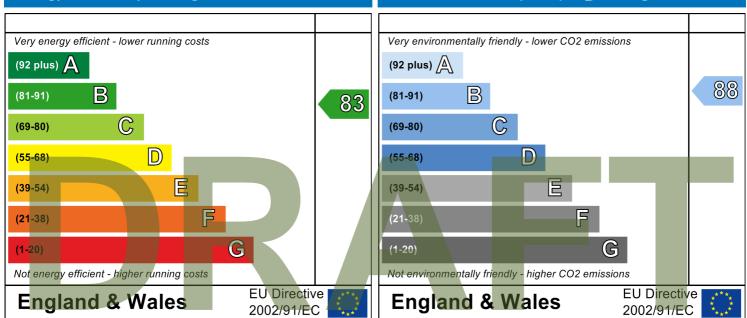
Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 01 May 2014 Stroma Certification 56.52 m²

Environmental Impact (CO₂) Rating

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



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.



Assessor and House Details

Assessor Name: Property Address:

62, Mansfield Road LONDON NW3 2HU

Assessor Number:

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	18.03
The following code calculations are taken from the Code for Sustainable Homes Technica	al 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			
DER accounting for SAP Section 16 allowances		kg/m²/year	(ZC1)
CO2 emissions from appliances, equation (L14)		17.14	(ZC2)
CO2 emissions from cooking, equation (L16)		2.9	(ZC3)

Net CO2 emissions

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	

Reduction in CO2 emissions

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 CHPOA.

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

38.1

(ZC8)

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.71

Project Information: Assessed By: () Building Type: Detached House Owelling Details: NEW DWELLING DESIGN STAGE Site Reference: Option B Code 4 with PV Address: 62, Mansfield Road, LONDON, NW3 2HU 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. The and DER Fuel for main heating system: Natural gas Fuel factor: 1.00 (natural gas) Plot Reference: 0.12 (max, 0.30) Fuel factor: 1.00 (natural gas) 0.12 (max, 0.30) 0.12 (max, 0.30) 0.12 (max, 0.30) Poweling Carbon Dioxide Emission Rate (DER) 0.12 (max, 0.30) 0.12 (max, 0.30) 0.16 (max 0.70) 0K A representability 0.0 (max 0.23) 0.15 (max 0.30) 0.16 (max 0.30) 0K A representability 0.0 (max 0.23) 0.16 (max 0.30) 0K 0K A representability 0.0 paccus 5.00 1.00 (max 0.32) 0K A representability 0.0 paccus 5.00 0K	Approved Docume Printed on 21 May		assessed by Stroma FSAP 20	009 prog	gram, Version: 1.5.	0.71	
Dwelling Details: NEW DVELLING DESIGN STAGE Site Reference : 62 Mansfield Road Plot Reference : Option B Code 4 with PV Address : 62, Mansfield Road, LONDON, NW3 2HU Control Control Control Clent Details: Name : Allan Properties Ltd Address : This report covers items included within the SAP calculations. It is not a complete report of regulations compliance. The and DER Fuel for main heating system: Natural gas Fuel formatin Join (marx 1) (marx 1) (marx 1) (marx 0) OK 2 Fabric U-values 0.12 (marx 0.30) 0.12 (marx 0.70) OK Prevent wath Floor 0.10 (marx 0.70) OK OK 2 Fabric U-values 0.12 (marx 0.30) 0.15 (marx 0.70) OK Arcrage Root Dioxide Emission Rate (DER) 0.16 (marx 0.70) OK OK 2 Fabric U-values 0.12 (marx 0.30) 0.15 (marx 0.70) OK Add permeability 0.16 (marx 0.20) 0.15 (marx 0.30) OK Add permeability 0.16 (marx 0.20) 0.5.00 0.6 All permeability 0.49 (marx 0.20) 0.6 0.6 All permeability 0.5.00 0.6 0.6							
NEW DWELLING DESIGN STAGE Site Reference: 62 Mansfield Road, LONDON, NW3 2HU Client Details Name: Allan Properties Ltd Address : Image: Constraint of the state of the sta	Assessed By:	()			Building Type:	Detached Hou	se
Site Reference: 62 Mansfield Road, LONDON, NW3 2HU Clent Details: Name: Allan Properties Ltd Address :: This report covers items included within the SAP calculations. tir seport covers items included within the SAP calculations. Item and DEM Fuel factor: 1.00 (natural gas) arget Carbon Dioxide Emission Rate (TER) 24 07 kg/m² Detelling Carbon Dioxide Emission Rate (DER) 17.19 kg/m² Otif (nax. 0.30) 0.10 (max 0.70) 0.16 (max. 0.20) 0.10 (max 0.30) 0.16 (max. 0.30) 0.16 (max. 0.30) 0.16 (max. 0.30) 0.16 (max. 0.30) 0.16 (max. 0.30) 0.16 (max 0.30) 0.16 (max. 0.30) 0.16 (max 0.30) 0.16 (max. 0.30) 0.16 (max. 0.30) 1.40 (max. 2.00) 1.80 (max. 3.30)	Dwelling Details:						
Address : 62, Mansfield Road, LONDON, NW3 2HU Clent Details: Mame: Allan Properties Ltd Address : This report covers items included within the SAP calculations. tis not a complete report of regulations compliance. 1 Fuel for main heading 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) 0:10 (natural (Carbon Dioxide Emission Rate (DER) 1:40 (matural (Carbon Dioxide Emission Rate (DER) 0:10 (natural (Carbon Dioxide Emission Rate (DER) 1:40 (matural (Carbon Dioxide Emission Rate (DER) 1:40 (matural	NEW DWELLING	DESIGN STAGE					
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 form min heating system: Natural gas 24.07 kg/m² Target Carbon Dioxide Emission Rate (DER) 17.19 kg/m² OK 2 Fabric U-values Highest Average 0.12 (max. 0.70) 0K OK Colspan="2" Formation Properties Ltd Average Highest 0.70 (max. 0.70) 0K OK Colspan="2" OK Colspan="2" OK Colspan= 2 OK Colspan= 2 OK Colspan= 2 OK Average OK OK Colspan= 2 OK OK OK OK	Site Reference :	62 Mansfield Road	l		Plot Reference:	Option B Code	e 4 with PV
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 DEM Fuel for main heating system: Natural gas Target Carbon Dioxide Emission Rate (TER) 24.07 kg/m² Dwelling Carbon Dioxide Emission Rate (DER) 1 Fir and DEM 2 Fabric U-values Patrematival Average 0.12 (max. 0.70) 0.6 (max. 0.20) 0.10 (max. 0.20) 0.10 (max. 0.20) 0.10 (max. 0.30) 0.11 (max. 0.30) 0.12 (max. 0.30) 0.12 (max. 0.30) 0.13 (max. 0.30) 0.16 (max. 0.20) 0.16 (max. 0.30) 0.18 (max. 3.30) 3 Air primeability Air primeability Air primeability Air primeability Air primeability Main Heating system: Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi	Address :	62, Mansfield Road	d, LONDON, NW3 2HU				
Address : This report covers items included within the SAP calculations. It is not a complete report of regulations compliance. 1TER and DER Fuel for main heating system: Natural gas Fuel factor: 1.00 (natural gas) Target Carbon Dioxide Emission Rate (TER) Dwelling Carbon Dioxide Emission Rate (DER) 24.07 kg/m ² Dwelling Carbon Dioxide Emission Rate (DER) 24.07 kg/m ² OK 2 Fabric U-values Element Foor Foor Roof Dopenings 3.4 it permeability at 50 pascals Main Heating system: Main Heating system: Main Heating system: Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 % Secondary heating system: Nore 5 Cylinder insulation Hot water Storage: No cylinder No cylinder No cylinder No cylinder	Client Details:						
It is not a complete report of regulations compliance. ITER and DER Fuel for main heating system: Natural gas Target Carbon Dioxide Emission Rate (TER) 24.07 kg/m² OK 2 fabric U-values Highest Diverage 0.12 (max. 0.70) 0K OK 2 Fabric U-values Highest 0.12 (max. 0.70) 0K OK Average 0.12 (max. 0.70) 0K OK Particular Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan= 2"Colspan="2">Colspan= 2"Colspan="2">Colspan= 2"Colspan="2">Colspan= 2"Colspan="2"Colspan="2">Colspan= 2"Colspan= 2"Colspan="2"Colspan="2"Colspan="2"Colspan="2">Colspan= 2"Colspan="2"Colspa		Allan Properties Lt	d				
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 Q Former Proventing Carbon Dioxide Emission Rate (TER) 0.12 (max. 0.70) OK 0.12 (max. 0.30) Proventing 0.12 (max. 0.20) Proventing 0.10 (max. 0.25) Openings 0.15 (max. 0.20) Air permeability 0.15 (max. 0.20) Air permeability 0.15 (max. 0.20) Air permeability 0.10 (max. 2.00) Air permeability 0.50 pascals 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 Efficiency 89.4 % SEDBUK2009 Minimum 88.0 % Model califier: 27 CDi Combiner Gottode Ferenstar CDi Model scheating controls No cylinder<	•						
Fuel factor: 1.00 (natural gas) 24.07 kg/m² Target Carbon Dioxide Emission Rate (TER) 24.07 kg/m² Dwelling Carbon Dioxide Emission Rate (DER) 1.7.19 kg/m² OK 2 Fabric U-values Average Highest 0.12 (max. 0.70) OK Price Uratures 0.12 (max. 0.25) 0.10 (max. 0.27) OK OK Openings 0.12 (max. 0.20) 0.15 (max. 0.35) OK OK 3 A recrease 0.12 (max. 0.30) 0.15 (max. 0.35) OK Are crease 5.00 0.05 (max. 2.00) 0.15 (max. 3.30) OK 3 A recrease 5.00 0.06 (max. 3.30) OK OK A recrease influence Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Main Heating system: Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 OK Secondary heating system: None OK OK Secondary heating controls No cylinder OK Space heating controls:	1 TER and DER						
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 Fleinent Floor Rof O,12 (max. 0.30) O,12 (max. 0.70) O,10 (max. 0.25) O,10 (max. 0.70) O,10 (max. 0.20) O,15 (max. 0.35) O,K OK 3 A r cormeability at 50 pascals 5.00 OK 4 Heating etticiency Main Heating system: Doiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi Model: Sepolution boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 % OK OK 5 Cylinder insulation Hot water Storage: No cylinder Hot water Storage: No cylinder		• •	jas				
Dwelling Carbon Dioxide Emission Rate (DER) 17.19 kg/m² OK 2 Fabric U-values Average Highest 0.12 (max. 0.30) 0.12 (max. 0.70) OK Floor 0.10 (max. 0.20) 0.15 (max. 0.20) 0.15 (max. 0.35) OK OK 3 A r cormeability Ai permeability at 50 pascals 5.00 0.00 OK 4 Heating efficiency Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 OK Secondary heating system: None OK OK 5 Cylinder insulation Ho water Storage: No cylinder OK 6 Controls Space heating controls Hot water controls: No cylinder OK	•	• /			04.07.1.5./552		
2 Fabric U-values Average Highest 0.12 (max. 0.70) OK Ploor 0.10 (max. 0.20) 0.10 (max. 0.70) OK OK Openings 0.15 (nax. 0.20) 0.16 (max. 0.35) OK OK Openings 0.40 (max. 2.00) 0.15 (max. 0.30) OK OK 3 A r permeability Ai permeability 5.00 0.60 OK Ai permeability Ai 50 pascas 5.00 0.00 0.60 Main Heating system: Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 % OK Secondary heating system: No e 4 to water Storage: No cylinder 6 Controls Time and temperature zone control OK	-		. ,		-		OK
Element Average Highest External wall 0.12 (max. 0.30) 0.12 (max. 0.70) 0K Roof 0.10 (max. 0.25) 0.10 (max. 0.70) 0K Openings 0.15 (max. 0.20) 0.15 (max. 0.35) 0K 3 Ar poremeability 0.50 pascals 5.00 0.16 (max. 3.30) 0K Air permeability Ais permeability af 50 pascals 5.00 10.0 0K 4 Heating etriclency Main Heating system: Database: (rev 358, product index 015282): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar CDi 0K Model: Greenstar CDi Model: Greenstar CDi 0K Secondary heating system: None 0K Secondary heating system: None 0K Space heating controls Time and temperature zone control 0K	•				17.19 kg/m		UN
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 Generation Hot water Storage: No cylinder Generating controls Hot water controls: Time and temperature zone control No cylinder	External v Floor Roof Openings 3 Air permeabilit Air permeab Maximum 4 Heating etficier	y ility at 50 pascals	0.12 (max. 0.30) 0.10 (max. 0.25) 0.15 (max. 0.20) 1.40 (max. 2.00)	t index (0.12 (max. 0.70) 0.10 (max. 0.70) 0.15 (max. 0.35) 1.80 (max. 3.30) 5.00 10.0		ОК ОК ОК
Hot water Storage: No cylinder 6 Controls Time and temperature zone control OK No cylinder No cylinder OK			Boiler system with radiators Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi boiler) Efficiency 89.4 % SEDBUK Minimum 88.0 %	s or unde	,		ок
Hot water Storage: No cylinder 6 Controls Time and temperature zone control OK Space heating controls: No cylinder OK	5 Cylinder in cyle	tion					
6 Controls Space heating controls Time and temperature zone control OK Hot water controls: No cylinder OK			No cylinder				
Space heating controlsTime and temperature zone controlOKHot water controls:No cylinder							
Hot water controls: No cylinder		na controls	Time and temperature zone	e control			OK
•	•	-	-				
	Boiler interlo	ock:	Yes				ОК



' Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.41	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
Summertime temperature		
Overheating risk (Thames valley):	Not significant	OK
ased 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	2.25m ²	
Roof windows facing: Horizontal	0.29m ²	
Roof windows facing: Horizontal	0.58m ²	
Ventilation rate:	8.00	
Blinds/curtains:	None shutter closed 100% of day	light hours
0 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		

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	on:					
Dwelling type:		House				
Detachment:		Detached 2014				
Year Completed:						
Floor Location:		Floor area:		rey height		
Basement floor		28.26 m ²		36 m		
Floor 1		28.26 m ²	2.	52 m		
Living area:		19 m ² (fraction 0.336)			_	
Front of dwelling	faces:	South West				
Opening types:						
Name:	Source:	Туре:	Glazing:		Argon:	Frame:
G NE FD	Manufacturer	Solid	J.dlg.		, i gom	
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
DI 2	Manufacturer	Roof Windows	double-glazed		No	PVC-U
RL 3	Indi lui dettui ei		double glazed		NO	1000
Name:	Gap:	Frame Facto	-	U-value:	Area:	No. of Openings:
			-	U-value: 1.8		
Name:	Gap:	Frame Facto	r: g-value: 0 0.77		Area:	No. of Openings:
Name: G NE FD LG P NE 1 LG P NE 2	Gap: mm	Frame Facto 0 0.8 0.8	r: g-value: 0 0.77 0.77	1.8 1.4 1.4	Area: 1.58 0.27 1.26	No. of Openings:
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW	Gap: mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.77 0.77	1.8 1.4 1.4 1.4	Area: 1.58 0.27 1.26 3.37	No. of Openings: 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR	Gap: mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4	Area: 1.58 0.27 1.26 3.37 1.6	No. of Openings: 1 1 1 1 2
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW	Gap: mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4	Area: 1.58 0.27 1.26 3.37 1.6 3.21	No. of Openings: 1 1 1 1 2 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE	Gap: mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27	No. of Openings: 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25	No. of Openings: 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29	No. of Openings: 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25	No. of Openings: 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29	No. of Openings: 1 1 1 1 2 1 1 1 1 2 1 1 2 1 2 2 1 1 2
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29	No. of Openings: 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35	No. of Openings: 1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 Width: 0.795 0.35 0.815	No. of Openings: 1 1 1 1 2 1 1 1 1 1 2 Height: 1.984 0.768 1.551
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 0.29 Width: 0.795 0.35 0.815 1.604	No. of Openings: 1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 Location: G P LG P LG P LG P LG P G	r: g-value: 0 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 0.29 Width: 0.795 0.35 0.815 1.604 1	No. of Openings: 1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1 1.6
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3 Name: G NE FD LG P NE 1 LG P NE 2 LG P NW	Gap: mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	Frame Facto 0 0.8 0.8 0.8 0.8 0.8 0.8 0.8	r: g-value: 0 0.77 0.	1.8 1.4 1.4 1.4 1.4 1.4 1.4 1.2 1.2	Area: 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 0.29 Width: 0.795 0.35 0.815 1.604	No. of Openings: 1 1 1 1 2 1 1 1 1 2 Height: 1.984 0.768 1.551 2.1

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	e or unknown				
Opaque Elements							
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen		opermige.	Hot a bai				Rappai
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 Element	ts						

Party Elements

Thermal bridges:	
Thermal bridges:	No information on thermal bridging ($y=0.15$) ($y=0.15$)
Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of sides sheltered: Pressure test:	Yes (As designed) 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 0 0 0 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: Water heating:	None
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: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: standard tariff Yes No conservatory 100% Dense urban English No <u>Photovoltaic 1</u> Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

Predicted Energy Assessment

62, Mansfield Road LONDON NW3 2HU

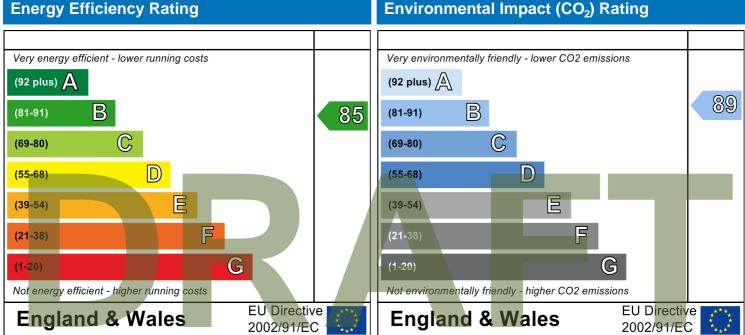
Dwelling type: Date of assessment: Produced by: Total floor area:

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



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.



Assessor and House Details

Assessor Name: Property Address:

62, Mansfield Road LONDON NW3 2HU

Assessor Number:

Buiding regulation assessment

	kg/m²/year
TER	24.07
DER	17.19
The following code calculations are taken from the Code for Sustainable Homes T	Fechnical 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		
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) Net CO2 emissions

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	L
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		

Reduction in CO2 emissions

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 CHPOA.

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

(ZC3)

(ZC8)

2.9

37.2

Appendix B 2012 SAP output reports

Approved Docume Printed on 21 May		, England assessed by S	Stroma FSAF	2012 program, Ve	rsion: 1.0.0.20	
Project Informatio						
Assessed By:	()			Building Type:	Detached House)
Dwelling Details:						
NEW DWELLING	DESIGN STAGE			Total Floor Area: 5	56.52m²	
Site Reference :	62 mansfield Road	I		Plot Reference:	62 Mansfield Ro	ad
Address :	62, Mansfield Roa	d, LONDON, NW3 2HU				
Client Details:						
Name:						
Address :						
-	s items included w te report of regulat	ithin the SAP calculatic ions compliance.	ons.			
1a TER and DER	• •	•				
	ing system: Mains ga	as				
Fuel factor: 1.00 (n	nains gas)					
-	xide Emission Rate	. ,		23.84 kg/m²		
~	ioxide Emission Rat	e (DER)		23.76 kg/m ²		OK
1b TFEE and DF		<u>)</u>		69.60 kWh/m ²		
	gy Efficiency (TFEE ergy Efficiency (DFE			66.10 kWh/m ²		OK
2 Fabric U-value	S					
Element		Average		Highest		
External v	wall	0.10 (max. 0.30)		0.10 (max. 0.70)		OK
Floor Roof		0.10 (max. 0.25) 0.12 (max. 0.20)		0.10 (max. 0.70) 0.12 (max. 0.35)		OK OK
Openings		1.51 (max. 2.00)		2.50 (max. 3.30)		OK
2a Thermal bridg		1.01 (max. 2.00)		2100 (11011 0.00)		UN
		sing user-specified y-val	ue of 0.15			
3 Air permeabilit						
Air permeat Maximum	pility at 50 pascals			3.20 (design val 10.0	ue)	ок
4 Heating efficie	ncy					
Main Heatin		Database: (rev 355, pr	roduct index (015282):		
		Boiler systems with rac Brand name: Worceste Model: Greenstar CDi Model qualifier: 27 CD (Combi) Efficiency 89.4 % SED Minimum 88.0 %	diators or und er li	,	ains gas	ок
Secondary I	heating system:	None				

Hot water Storage:	No cylinder		
Controls	,		
Space heating controls	Time and temperature zo	ne control	ОК
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
Low energy lights			
Percentage of fixed lights with	h low-energy fittings	100.0%	
Minimum		75.0%	OK
Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:	-	0.52	
Maximum		1.5	OK
MVHR efficiency:		90%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	lley):		OK
sed on:			
Overshading:		Average or unknown	
Windows facing: North East		0.27m²,	
Windows facing: North East		1.26m²,	
Windows facing: North West		3.37m ²	
Windows facing: South West		3.2m²,	
Windows facing: North West		3.21m ²	
Windows facing: North East		0.27m ²	
Roof windows facing: Horizo		2.25m ²	
Roof windows facing: Horizo		0.29m ²	
Roof windows facing: Horizo	ntal	0.58m²	
Ventilation rate:		5.00	
Blinds/curtains:		None	
		Closed 100% of daylight h	ours
) 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
Floors U-value	0.1 W/m²K

Property Details	: 62 Mansfield Road					
Address: Located in: Region: UPRN: Date of assess Date of certifi Assessment ty Transaction ty Tenure type: Related party Thermal Mass Water use <= PCDF Version	cate: ype: ype: disclosure: Parameter: 125 litres/person/	62, Mansfield Road, LON England Thames valley 0376892178 01 May 2014 21 May 2014 New dwelling design sta Non marketed sale Unknown No related party Calculated 414.05 day: True 355				
Property descrip	otion:					
Dwelling type: Detachment: Year Completed Floor Location Basement floor Floor 1 Living area: Front of dwellin	n:	House Detached 2014 Floor area: 28.26 m ² 28.26 m ² 19 m ² (fraction 0.336) South West	2.	rey height 4 m 4 m	:	
Opening types:	3					
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3	Source: Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer	Type: Solid Windows Windows Windows Windows Windows Roof Windows Roof Windows Roof Windows	Glazing: double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed		Argon: No No No No No No No No	Frame: PVC-U PVC-U PVC-U PVC-U
Name:	Gap:	Frame Facto	-	U-value:	Area:	No. of Openings:
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3	mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8 0.8 0.8 0.7 0.7 0.7	0 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.	2.5 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29	1 1 1 2 1 1 1 1 2
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW	Type-Name:	Location: G P LG P LG P LG P G G P	Orient: North East North East North West South West North West		Width: 0.795 0.35 0.815 1.604 1 1.605	Height: 1.984 0.768 1.551 2.1 1.6 2

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

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	t <u>s</u>						
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 Element	S						
Party Elements							

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges: 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 0 Number of open flues: 0 Number of fans: Number of passive stacks: 0 Number of sides sheltered: 0 3.2 Pressure test: 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 Time and temperature zone control Main heating Control: Control code: 2110 Secondary heating system: None Water heating: From main heating system

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

Others:

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

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Softwa	a Num are Vei	sion:		Versio	on: 1.0.0.20	
A 1 1	CO Manafia					: 62 Mar	isfield R	oad			
Address :	62, Mansfie	Id Road, I	LONDO	N, NVS	3 2HU						
1. Overall dwelling dime				Aro	a(m²)			ight(m)		Volume(m ³)	
Basement						(1a) x		<u>2.4</u>	(2a) =	67.82	(3a)
Ground floor				2	8.26	(1b) x	2	2.4	(2b) =	67.82	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e) [.]	+(1n) 5	6.52	(4)	L		1		J
Dwelling volume				L		(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	135.65	(5)
2. Ventilation rate:											1
2. Vontilation fato.	main heating		condary eating	y	other		total			m ³ per hour	
Number of chimneys		+	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	_ + _	0	ī + Ē	0] = [0	×2	20 =	0	(6b)
Number of intermittent fa	ans					Ī	0	x ′	0 =	0	(7a)
Number of passive vents	5					Γ	0	x ^	0 =	0	(7b)
Number of flueless gas f	ires					Ē	0	x 4	40 =	0	(7c)
								_	Air ch	hanges per hou	ır
Infiltration due to chimne	7						0		÷ (5) =	0	(8)
If a pressurisation test has I Number of storeys in t			l, proceed	l to (17), d	otherwise o	continue fr	om (9) to ((16)			
Additional infiltration		»)						[(9)·	1]x0.1 =	0	(9) (10)
Structural infiltration: 0).25 for steel or	timber fr	ame or	0.35 fo	r masoni	ry constr	uction		-	0	(11)
if both types of wall are p deducting areas of openi			onding to	the great	er wall are	a (after					-
If suspended wooden	0 // 1		d) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, en	nter 0.05, else e	enter 0								0	(13)
Percentage of window	s and doors dr	aught stri	pped							0	(14)
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	, q50, expresse	d in cubi	c metres	s per ho	our per s	quare m	etre of e	nvelope	area	3.2	(17)
If based on air permeabi										0.16	(18)
Air permeability value applie		on test has l	been don	e or a deg	gree air pe	rmeability	is being us	sed		r	٦
Number of sides sheltere Shelter factor	θQ				(20) = 1 -	[0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18) x (20) =				0.16	(21)
Infiltration rate modified	for monthly wir	id speed									-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Tabl	e 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	

Wind Factor (22a)m = (22)m ÷	4									
(22a)m= 1.27 1.25 1.23	1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltration rate (allow)	ng for cho	ltor and win		(210) X	(220)m					
Adjusted infiltration rate (allowing 0.2 0.2 0.2 0.2	<u> </u>	0.17 0.15		0.15	0.16	0.17	0.18	0.19		
Calculate effective air change				0.10	0.10	0.11	0.10	0.10		
If mechanical ventilation:									0	.5 (23a)
If exhaust air heat pump using App		, , ,) = (23a)			0	.5 (23b)
If balanced with heat recovery: effic	-	-								6.5 (23c)
a) If balanced mechanical ve		1		1	ŕ	r í	, -	, ,	÷100]	
(24a)m= 0.32 0.32 0.31	0.29	0.29 0.27		0.27	0.28	0.29	0.3	0.31		(24a)
b) If balanced mechanical ve	· · · ·			1	ŕ		,		l	(0.41)
(24b)m= 0 0 0	0	0 0	0	0	0	0	0	0		(24b)
c) If whole house extract ver if (22b)m < 0.5 x (23b), t		• •				5 v (23h)			
(24c)m = 0 0 0				$\frac{1}{0} = (221)$	0	0	0	0		(24c)
d) If natural ventilation or wh						Ŭ	•	•		(=)
if $(22b)m = 1$, then $(24d)$		•				0.5]				
(24d)m= 0 0 0	0	0 0	0	0	0	0	0	0		(24d)
Effective air change rate - er	nter (24a) o	or (24b) or (24c) or (24	ld) in boy	(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:									
3. Heat losses and heat loss ELEMENT Gross			Area	U-valu	ue	AXU		k-value))	A X k
	oarameter: Openings m²	s Net	Area . ,m²	U-valu W/m2		A X U (W/ł	<)	k-value kJ/m²-ł		A X k kJ/K
ELEMENT Gross	Openings	s Net					<)			
ELEMENT Gross area (m²)	Openings	s Net	x ,m ²	W/m2	K =	(VV/I	<)			kJ/K
ELEMENT Gross area (m²) Doors	Openings	s Net	x ,m ² 58 X 27 X	W/m2 2.5	0.04] =	(W/ł 3.95	<)			kJ/K (26)
ELEMENT Gross area (m²) Doors Windows Type 1	Openings	s Net	x ,m ² 58 x 27 x ¹ 26 x ¹	W/m2 2.5 /[1/(1.4)+	K 0.04] = 0.04] =	(W/ł 3.95 0.36	<) 			kJ/K (26) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2	Openings	s Net	x,m ² 58 x 27 x ¹ 26 x ¹ 37 x ¹	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+	K 0.04] = [0.04] = [0.04] = [(W/H 3.95 0.36 1.67	<) 			kJ/K (26) (27) (27)
ELEMENT Gross area (m²) Doors Windows Type 1 Windows Type 2 Windows Type 3	Openings	s Net	x,m ² 58 x 27 x ¹ 26 x ¹ 37 x ¹ .6 x ¹	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W/H 3.95 0.36 1.67 4.47				kJ/K (26) (27) (27) (27)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4	Openings	s Net 1 0 1 3 1 3	x,m ² 58 27 27 x ¹ 26 x ¹ 37 x ¹ .6 x ¹ 21 x ¹	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W/k 3.95 0.36 1.67 4.47 2.12				kJ/K (26) (27) (27) (27) (27)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5	Openings	s Net 1 0 1 3 0	x,m ² 58 27 26 x1 26 x1 37 x1 37 x1 26 x1 21 x1 27 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W/k 3.95 0.36 1.67 4.47 2.12 4.26				kJ/K (26) (27) (27) (27) (27) (27)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6	Openings	s Net 1 0 1 3 0 2	x,m ² 58 27 26 x1 26 x1 37 x1 6 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W/k 3.95 0.36 1.67 4.47 2.12 4.26 0.36				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1	Openings	s Net 1 0 1 3 0 2 0	x,m ² 58 27 26 x1 26 x1 37 x1 6 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 x1 26 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W/k 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2	Openings	s Net 1 0 1 3 0 2 0 0 0	x,m ² 58 27 26 x1 26 x1 37 x1 6 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 x1 26 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) +	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3	Openings	s Net 1 0 1 3 0 2 0 0 2 0 0 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	x,m ² 58 27 27 26 x1 26 x1 37 x1 6 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 21 x1 20 x1 x1 21 x1 21 x1 21 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 27 x1 26 x1 x1 21 x1 21 x1 21 x1 21 x1 21 x1 22 x1 x1 21 x1 22 x1 29 x1 29 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) + /[1/(1.4) +	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 0.406		kJ/m²-ŀ		kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3Floor	Openings m ²	s Net 1 0 1 3 0 2 0 0 2 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1	x,m ² 58 27 26 x1 26 x1 26 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 26 x1 27 x1 26 x1 26 x1 27 x1 26 x1 26 x1 27 x1 26 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 21 x1 21 x1 27 x1 29 x1 29 x1 29 x1 26 x1 29 x1 29 x1 20 x1 29 x1 20 x1 29 x1 29 x1 20 x1 29 x1 20 x1 29 x1 20 x1 29 x1 20 x1 29 x1 20 x1 20 x1 20 x1 20 x1 29 x1 20 x1 20 x1 20 x1 29 x1 20 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) + /[1/(1.4) + /[1/(1.4) +	$\begin{array}{c} 0.04\\ 0.04\\ =\\$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 0.406 2.826		kJ/m²-ł		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (27b)
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3FloorWalls Type 145.48	Openings m ²	s Net 1 0 1 3 0 2 0 0 2 0 0 2 4 5 6	x,m ² 58 27 26 x1 26 x1 26 x1 37 x1 26 x1 27 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 26 x1 x1 27 x1 26 x1 x1 27 x1 26 x1 x1 27 x1 26 x1 x1 27 x1 27 x1 26 x1 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 27 x1 29 x1 29 x1 29 x1 26 x1 29 x1 29 x1 28 x1 29 x1 29 x1 26 x1 29 x1 29 x1 28 x1 29 x1 28 x1 29 x1 28 x1 28 x1 29 x1 28 x1 28 x1 29 x1 28 x1 28 x1 29 x1 28 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) + /[1/(1.4) + 0.1 0.1	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 0.406 2.826 4.55		kJ/m²-ł 110 190		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (2
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3FloorWalls Type145.48Walls Type211.89	Openings m ²	s Net 1 0 1 3 0 1 3 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	x,m ² 58 27 26 x1 26 x1 26 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 26 x1 27 x1 29 x1 28 x1 29 x1 29 x1 29 x1 29 x1 29 x1 29 x1 29 x1 28 x1 28 x1 29 x1 28 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) + /[1/(1.4) + 0.1 0.1	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 0.406 2.826 4.55 0.7		kJ/m²-ł 110 190		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (2
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3FloorWalls Type145.48Walls Type348.58Walls Type412.7	Openings m ² 0 4.9 3.2 5.06	s Net 1 0 1 3 0 1 3 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 0 2 0 0 0 0 0 1 1 0 0 0 1 1 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	x,m ² 58 27 26 x1 26 x1 26 x1 37 x1 26 x1 27 x1 27 x1 27 x1 20 x1 27 x1 20 x1 27 x1 20 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) +	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 0.406 2.826 4.55 0.7 4.54 0.76		kJ/m²-ł 110 190 190		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (2
ELEMENTGross area (m²)DoorsWindows Type 1Windows Type 2Windows Type 3Windows Type 4Windows Type 5Windows Type 5Windows Type 6Rooflights Type 1Rooflights Type 2Rooflights Type 3FloorWalls Type145.48Walls Type348.58Walls Type412.7	Openings m ²	s Net 1 0 1 3 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	x,m ² 58 27 26 x1 26 x1 26 x1 37 x1 26 x1 27 x1 27 x1 27 x1 20 x1 27 x1 20 x1 27 x1 20 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 2.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4) + /[1/(1.4) + /[1/(1.4) + 0.1 0.1 0.1	$\begin{array}{c} 0.04\\$	(W// 3.95 0.36 1.67 4.47 2.12 4.26 0.36 3.15 0.406 2.826 4.55 0.7 4.54		kJ/m²-ł 110 190 190 190		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (2

Building Regulation Minimum Compliance

Total area o	f elements	s, m²			177.7	6							(31)
* for windows a ** include the a						lated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat	loss, W/K	= S (A x	U)				(26)(30)) + (32) =				40.14	(33)
Heat capaci	ty Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	23402.32	(34)
Thermal ma	iss parame	eter (TMF	- = Cm -	÷ TFA) ir	ו kJ/m²K			= (34)	÷ (4) =			414.05	(35)
For design ass can be used in				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal brid	dges : S (L	. x Y) cal	culated	using Ap	pendix	K						26.66	(36)
if details of the		are not kn	nown (36) =	= 0.15 x (3	:1)								_
Total fabric									(36) =			66.8	(37)
Ventilation h	- 1	1	<u> </u>	Í		<u> </u>	<u> </u>		= 0.33 × (r			
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		()
(38)m= 14.3	9 14.21	14.03	13.14	12.96	12.06	12.06	11.88	12.42	12.96	13.32	13.68		(38)
Heat transfe	er coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 81.2	2 81.02	80.84	79.94	79.76	78.87	78.87	78.69	79.23	79.76	80.12	80.48		_
Heat loss pa	arameter (H	HLP), W	/m²K						Average = = (39)m ÷		12 /12=	79.9	(39)
(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 c		· ·							_				
Jar		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 he	eating ene	rgy requ	irem <mark>ent:</mark>								kWh/ye	ear:	
Assumed or	ccupancy,	N								1.	88		(42)
	3.9, N = 1	+ 1.76 x	: [1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (TFA -13.				
if TFA £ 1 Annual aver	,	otor upor	no in litre	o por de	w∖/d ov	orogo -		1.26					(40)
Reduce the an									se target o		5.89		(43)
not more that 1	125 litres per	person pei	r day (all w	ater use, l	hot and co	ld)							
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag	ge in litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 86.7	8 83.62	80.47	77.31	74.16	71	71	74.16	77.31	80.47	83.62	86.78		
									Total = Su	· · · ·		946.68	(44)
Energy content	t of hot water	used - cal	culated me	onthly = 4.	. <u> </u>	i	JTM / 3600) KWh/mor I	nth (see Ta	ables 1b, 1 1			
(45)m= 128.6	69 112.55	116.15	101.26	97.16	83.84	77.69	89.15	90.22	105.14	114.77	124.63		_
lf instantaneou	s water heati	ing at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1241.25	(45)
(46)m= 19.3 Water storage		17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.22	18.69		(46)
Storage volu	-) includir	ng any se	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community	y heating a	and no ta	ank in dw	velling, e	enter 110) litres in	(47)			·			
Otherwise if	no stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water storage	-		_		<i></i>								
a) If manufa				or is kno	wn (kWl	n/day):					0		(48)
Temperatur	e factor fro	m Table	2b								0		(49)

Building Regulation Minimum Compliance

b) If m Hot wa If comr	nanufact ater stora munity h	urer's de age loss	factor fi ee secti	cylinder rom Tab	ear loss facte le 2 (kWl		known:	(48) x (49)) =			0		(50) (51) (52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Enera	/ lost fro	m water	· storage	. kWh/v	ear			(47) x (51)) x (52) x (53) =		0		(54)
0.		(54) in (5	•	, ,								0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m			i .	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	-	•	÷	-	m = (56)m	-	-	-	-	-	-	÷	ix H	()
-		i			· · ·		·- ·	i .	· · ·		-	· · ·	1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	•	nnual) fro									0		(58)
	-				month (. ,	. ,						
	· · · ·	r	r	r	here is s		r	<u> </u>	<u> </u>		,		1	()
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (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 h	eat requ	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)r	n
(62)m=		151.04	157.15	139.39		118.86	113.87	126.94	128.34	146.15	156.01	168.85		(62)
Solar DH	I IIII IIIII IIIII IIIII IIIIIIIIII IIII	calculated	using App	endix G o	r Appendix	H (negativ	ve quantity	v) (enter '0	if no sola	r contributi	on to wate	er heating)	1	
					NWHRS	-								
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
	from w	ater hea	ter					<u>. </u>					1	
(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		
(01)										ater heater			1714.47	(64)
Hoot a	oino fro	multor	hooting	k\//b/m	onth 0 21	5 / IO 95	v (45)m							
-					onth 0.2	-			_]	(65)
								I				52.5		(00)
	. ,			. ,	only if c	ylinder is	s in the d	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a):									
Metabo	olic gain	s (Table	<u>5), Wat</u>	ts									1	
	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)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso 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)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookin	ng gains	(calcula	ted in A	, ppendix	L, equat	ion L15	or L15a), also se	e 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)
			(Table (L		L	L	L				I	
(70)m=		15 gains	(Table :	10	10	10	10	10	10	10	10	10		(70)
							10		10	10	10	10]	(10)
		· · · · · · · · · · · · · · · · · · ·	· · ·	i	es) (Tab	,						1	1	
(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	l	(71)

Water heating gains (Table 5)

SAP WorkSheet: New dwelling design stage

(72)(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 (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)mTotal internal gains = (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. FF Gains Orientation: Access Factor Area Flux a Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x (75) 0.54 x 0.27 x 11.28 х 0.77 х 0.8 = 0.91 Northeast 0.9x (75)0.54 x 1.26 х 11.28 Х 0.77 х 0.8 = 4.26 Northeast 0.9x 0.54 0.27 х 11.28 х 0.77 х 0.8 0.91 (75)х = Northeast 0.9x 0.54 0.27 22.97 X 0.77 х = 1.86 (75)х Х 0.8 Northeast 0.9x х х (75)0.54 X 1.26 х 22.97 0.77 0.8 _ 8.66 Northeast 0.9x (75)0.54 х 0.27 х 22.97 х 0.77 х 0.8 = 1.86 Northeast 0.9x (75)0.54 Х 0.27 х 41.38 х 0.77 х 0.8 3.34 Northeast 0.9x (75)0.54 х 1.26 х 41.38 х 0.77 х 0.8 = 15.61 Northeast 0.9x 0.54 0.27 x 41.38 0.77 0.8 3.34 (75)Х Northeast 0.9x (75)0.54 х 0.27 х х х 0.8 5.49 67.96 0.77 Northeast 0.9x 0.54 х 1.26 X 0.77 х 25.63 (75) 67.96 0.8 = Northeast 0.9x 0.54 0.8 5.49 (75) x 0.27 67.96 x 0.77 х = Northeast 0.9x 0.54 0.27 х 91.35 0.77 х 7.38 (75)X 0.8 = Northeast 0.9x (75) 0.54 91.35 0.77 х 34 46 х 1.26 0.8 = Northeast 0.9x (75) 0.54 0.27 91.35 x 0.77 х 0.8 7.38 х Х = Northeast 0.9x (75) x 0.54 X 0.27 х 97.38 0.77 х 0.8 = 7.87 Northeast 0.9x (75) x х 0.54 х 1.26 х 97.38 0.77 0.8 = 36.73 Northeast 0.9x (75)0.54 x 0.27 x 97.38 х 0.77 x 0.8 = 7.87 Northeast 0.9x (75)0.54 0.27 x 91.1 х 0.77 x 0.8 = 7.36 X Northeast 0.9x (75)0.54 X 1.26 x 91.1 х 0.77 x 0.8 = 34.36 Northeast 0.9x 0.54 0.27 x 91.1 х 0.77 х 0.8 = 7.36 (75)х Northeast 0.9x 0.54 0.27 72.63 х 0.77 x 0.8 = 5.87 (75) x Х Northeast 0.9x 0.54 x 72.63 х 0.77 х = 27.4 (75)х 1.26 0.8 Northeast 0.9x 0.27 72.63 0.77 x 0.8 (75)0.54 Х х х = 5.87 Northeast 0.9x (75) 0.54 Х 0.27 50.42 х 0.77 х 0.8 _ 4.08 Northeast 0.9x (75) 0.54 Х 1.26 50.42 х 0.77 х 0.8 = 19.02 Northeast 0.9x х х (75) 0.54 Х Х 50.42 4.08 0.27 0.77 0.8 Northeast 0.9x (75) 0.54 0.27 Х 28.07 х 0.77 x 0.8 = 2.27 Northeast 0.9x (75) 0.54 28.07 х 0.8 10.59 X 1.26 х 0.77 х = Northeast 0.9x х х х (75) 0.54 х 0.27 28 07 0.8 2 27 0.77 Northeast 0.9 (75)0.54 0.27 х 14.2 х 0.77 х 0.8 1.15 X = Northeast 0.9x 0.54 1.26 14.2 0.77 0.8 5.36 (75)х x x X

Building Regulation Minimum Compliance

SAP WorkSheet: New dwelling design stage

Northeast 0.9x	0.54	x	0.27) ×	14.2	×	0.77	x	0.8	=	1.15	(75)
Northeast 0.9x	0.54	x	0.27	x	9.21	×	0.77	x	0.8	=	0.74	(75)
Northeast 0.9x	0.54	x	1.26	x	9.21	×	0.77	x	0.8	=	3.48	(75)
Northeast 0.9x	0.54	x	0.27	x	9.21	×	0.77	x	0.8	=	0.74	(75)
Southwest _{0.9x}	0.54	x	1.6	x	36.79	İ	0.77	x	0.8	=	35.25	(79)
Southwest _{0.9x}	0.54	x	1.6	x	62.67	İ	0.77	x	0.8	=	60.04	(79)
Southwest0.9x	0.54	x	1.6	x	85.75	İ	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)
Southwest0.9x	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	×	0.77	x	0.8	=	22.07	(81)
Northwest 0.9x	0.54	x	3.37	x	41.38	×	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	×	0.77	x	0.8	=	68.56	(81)
Northwest 0.9x	0.54	x	3.21	×	67.96	×	0.77	x	0.8	=	65.31	(81)
Northwest 0.9x	0.54	×	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	×	0.77	x	0.8	=	98.25	(81)
Northwest 0.9x	0.54	x	3.21	x	97.38	×	0.77	x	0.8	=	93.59	(81)
Northwest 0.9x	0.54	x	3.37	x	91.1	×	0.77	x	0.8	=	91.91	(81)
Northwest 0.9x	0.54	×	3.21	×	91.1	×	0.77	x	0.8	=	87.55	(81)
Northwest 0.9x	0.54	x	3.37	×	72.63	×	0.77	x	0.8	=	73.27	(81)
Northwest 0.9x	0.54	x	3.21	x	72.63	×	0.77	x	0.8	=	69.79	(81)
Northwest 0.9x	0.54	x	3.37	x	50.42	×	0.77	x	0.8	=	50.87	(81)
Northwest 0.9x	0.54	x	3.21	×	50.42	×	0.77	x	0.8	=	48.45	(81)
Northwest 0.9x	0.54	x	3.37	x	28.07	×	0.77	x	0.8	=	28.32	(81)
Northwest 0.9x	0.54	X	3.21	X	28.07	×	0.77	X	0.8	=	26.97	(81)
Northwest 0.9x	0.54	X	3.37	X	14.2	×	0.77	X	0.8	=	14.32	(81)
Northwest 0.9x	0.54	X	3.21	×	14.2	×	0.77	x	0.8	=	13.64	(81)
Northwest 0.9x	0.54	X	3.37	×	9.21	×	0.77	x	0.8	=	9.3	(81)
Northwest 0.9x	0.54	X	3.21	×	9.21	×	0.77	x	0.8	=	8.85	(81)
Rooflights 0.9x	1	X	2.25	×	26	×	0.77	x	0.7	=	28.38	(82)

Rooflights 0.9x 1	×	0.29	x	26	x	0.77	×	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	×	0.7	=	7.6	(82)
Rooflights 0.9x 1	×	0.29	x	54	x	0.77	×	0.7	=	15.19	(82)
Rooflights 0.9x 1	×	2.25	x	96	x	0.77	×	0.7	=	104.78	(82)
Rooflights 0.9x 1	×	0.29	x	96	x	0.77	×	0.7	=	13.51	(82)
Rooflights 0.9x 1	×	0.29	x	96	x	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	×	2.25	x	150	x	0.77	×	0.7	=	163.72	(82)
Rooflights 0.9x 1	×	0.29	x	150	x	0.77	×	0.7	=	21.1	(82)
Rooflights 0.9x 1	×	0.29	x	150	x	0.77	×	0.7	=	42.2	(82)
Rooflights 0.9x 1	×	2.25	x	192	x	0.77	×	0.7	=	209.56	(82)
Rooflights 0.9x 1	×	0.29	x	192	x	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	×	0.29	x	192	×	0.77	- X	0.7	=	54.02	(82)
Rooflights 0.9x 1	×	2.25	x	200	x	0.77	×	0.7	=	218.29	(82)
Rooflights 0.9x 1	× ٦	0.29	x	200	x	0.77	- ×	0.7	=	28.14	(82)
Rooflights 0.9x 1	× ٦	0.29	x	200	x	0.77	×	0.7	=	56.27	(82)
Rooflights 0.9x	۲ ×	2.25	l x	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights 0.9x 1	٦ ×	0.29	j x	189	x	0.77	x	0.7		26.59	(82)
Rooflights 0.9x 1	۲×	0.29	x	189	i 🖈	0.77	x	0.7	=	53.18	(82)
Rooflights 0.9x 1	۲×	2.25	j x	157	x	0.77	x	0.7	=	171.36	(82)
Rooflights 0.9x 1	ī .	0.29	x	157	x	0.77	x	0.7	- 1	22.09	(82)
Rooflights 0.9x 1	٦ ×	0.29	j x	157	x	0.77	x	0.7	=	44.17	(82)
Rooflights 0.9x	ا× ٦	2.25	x	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights 0.9x 1	٦ _×	0.29) x	115	x	0.77	×	0.7	=	16.18	(82)
Rooflights 0.9x 1	×	0.29	x	115	x	0.77	×	0.7	=	32.36	(82)
Rooflights 0.9x 1	۲ × آ	2.25	x	66	x	0.77	- ×	0.7	=	72.04	(82)
Rooflights 0.9x 1	×	0.29] ×	66	x	0.77	- ×	0.7	=	9.28	(82)
Rooflights 0.9x 1	x	0.29	x	66	x	0.77	×	0.7	=	18.57	(82)
Rooflights 0.9x 1	× ٦	2.25] x	33	x	0.77	- ×	0.7	=	36.02	(82)
Rooflights 0.9x 1	× ٦	0.29] x	33	x	0.77	ا × آ	0.7	=	4.64	(82)
Rooflights 0.9x 1	×	0.29	x	33	x	0.77	- ×	0.7	=	9.28	(82)
Rooflights 0.9x 1	۲ × آ	2.25) x	21	x	0.77	- ×	0.7	=	22.92	(82)
Rooflights 0.9x 1	۲ ×	0.29] x	21	x l	0.77	- ×	0.7	=	2.95	(82)
Rooflights 0.9x 1	۲ × ۲	0.29) x	21	x	0.77	- ×	0.7	=	5.91	(82)
			1		1						
Solar gains in watts, calcu	ulated	for each mon	th		(83)m	n = Sum(74)m	.(82)m				
(83)m= 102.91 199.39 33	31.26	499.3 633.7	7 6	60.21 623.73	519	.83 389.5	236.66	127.78	85.07		(83)
Total gains – internal and	solar	(84)m = (73)r	n + (83)m, watts							
(84)m= 552.57 645.14 70	60.22	902.52 1010.8	35 10	013.54 963.28	866	.59 751.09	624.17	544.1	523.12		(84)
7. Mean internal tempera	ature ((heating sease	on)								
Temperature during hea	ting p	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
			,	T							

Sep

Aug

Oct

Nov

Dec

Mar

Feb

Jan

Utilisation factor for gains for living area, h1,m (see Table 9a)

Apr

May

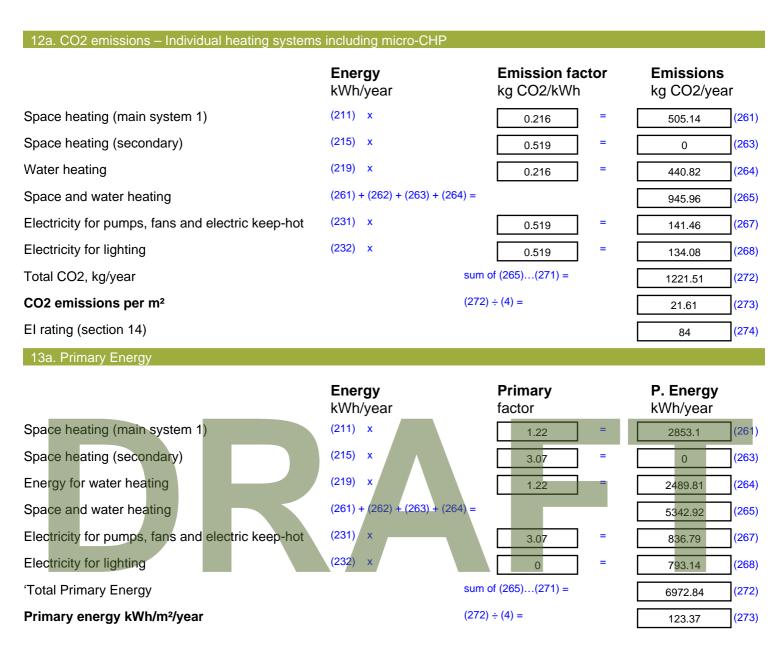
Jun

Jul

(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	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 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)
	erature				n rest of			able 9, Tl	և h2 (°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)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina.	h2,m (se	e 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	interna	l temper	ı ature in	the rest	of dwelli	na T2 (f	nllow ste	eps 3 to 7	r in Tabl	e 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)
											g area ÷ (4	4) =	0.34	(91)
Maara	interne		atura /fa		ala dura	llinger) fl	Δ Τ 4	. (4 . 41	A) TO					`
(92)m=	19.35	19.5	19.73	19.99	20.1	20.13	20.13	+ (1 – fL 20.13	A) X 12	19.94	19.6	19.33		(92)
								4e, whe			10.0	10.00		(02)
(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)
. ,		ting requ			20.1	20.10	20.10	20.10	20.11	10.01	10.0	10.00		
					re obtair	ed at st	on 11 of	Table 9	n so tha	t Ti m=(76)m an	d re-calc	ulate	
				using Ta					5, 50 tha	(II,III–(rojin an		ulato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, 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)
Usefu	Il gains,	hmGm	, W = (9	4)m x (84	4)m	r								
(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)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 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	e for mea	an interr	al tempe	erature,	 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	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	499.41	365.31	250.51	81.27	12.49	0	0	0	0	122.69	332.7	517.53		
I								Tota	l per year	(kWh/year	.) = Sum(9	8)15,912 =	2181.92	(98)
Space	e heatin	a require	ement in	kWh/m ²	/vear							[38.6	(99)
					•	vetome i	ncluding	micro-C	עםי					
	e heatir		its – inu	iviuuai fi	eating s	ysterns i	nciuuing	f micro-c	, ir)					
-		-	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systerr	ו, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space				alculate									·····/	
	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 (20	(4)] + (21	L 0)m } x	100 ± (2	(06)	Į							(211)
、— · · ///	535.28	391.54	268.5	87.1	13.39	0	0	0	0	131.51	356.59	554.7		()
			I	I	l	I	I		l (kWh/yea				2338.61	(211)
														1 ° °

Space heating fuel (secondary), kWh/month

Space heating fuel (secondary),									
$= \{[(98)m \times (201)] + (214)m \} \times 10^{-10}$	<u> </u>				-		_	I	
(215)m= 0 0 0	0 0	0 0	0	0	0	0	0		
			Tota	l (kWh/yea	ar) =5um(2	215) _{15,1012}	=	0	(215)
Water heating	atad abaya)								
Output from water heater (calcula 172.91 151.04 157.15 1		8.86 113.87	126.94	128.34	146.15	156.01	168.85		
Efficiency of water heater	I							80.2	(216)
(217)m= 87.47 87.09 86.12 8	83.65 80.97 80	0.2 80.2	80.2	80.2	84.51	86.81	87.59		(217)
Fuel for water heating, kWh/mont		•							
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 197.69 173.43 182.48 100		8.2 141.99	158.28	160.03	172.92	179.71	192.78		
	I I		Tota	l = Sum(21	19a) ₁₁₂ =		<u> </u>	2040.83	(219)
Annual totals					k	Wh/year		kWh/year	
Space heating fuel used, main sy	vstem 1					-		2338.61	
Water heating fuel used								2040.83	Ī
Electricity for pumps, fans and ele	ectric keep-hot								-
mechanical ventilation - balance	ed, extract or positi	ive input fror	n outside)			107.57		(230a)
central heating pump:							120		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kW	/h/year		sum	of (230a).	(230g) =			272.57	(231)
Electricity for lighting									_
Electricity for lighting								2 58.35	(232)
10a. Fuel costs - individual heati	ing systems:							258.35	(232)
	ing systems:	E. Al			Englin				(232)
	in <mark>g systems:</mark>	Fuel kWh/year			Fuel P			Fuel Cost	(232)
10a. Fuel costs - individual heati	in <mark>g systems:</mark>	Fuel kWh/year (211) x			(Table	12)	x 0.01 =	Fuel Cost £/year	
	ing systems:	kWh/year				12) 8	x 0.01 = x 0.01 =	Fuel Cost	(232) (240) (241)
10a. Fuel costs - individual heati Space heating - main system 1	ing systems:	kWh/year (211) x			(Table	12) 8		Fuel Cost £/year 81.3836](240)
10a. Fuel costs - individual heati Space heating - main system 1 Space heating - main system 2	ing systems:	kWh/year (211) x (213) x			(Table 3.4	12) 8 19	x 0.01 =	Fuel Cost £/year 81.3836 0	(240) (241)
10a. Fuel costs - individual heati Space heating - main system 1 Space heating - main system 2 Space heating - secondary		kWh/year (211) x (213) x (215) x			(Table 3.4 0 13. ⁻	12) 8 19 8	x 0.01 = x 0.01 =	Fuel Cost £/year 81.3836 0	(240) (241) (242)
10a. Fuel costs - individual heati Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-ho (if off-peak tariff, list each of (230a)	ot	kWh/year (211) x (213) x (215) x (219) (231) rately as app	licable a	nd apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 8 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95	(240) (241) (242) (247) (247) (249)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hoc (if off-peak tariff, list each of (230a) Energy for lighting	ot a) to (230g) separ	kWh/year (211) x (213) x (213) x (215) x (219) (231)	licable at	nd apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 81.3836 0 0 71.02 35.95	(240) (241) (242) (247)
10a. Fuel costs - individual heati Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-ho (if off-peak tariff, list each of (230a)	ot a) to (230g) separ	kWh/year (211) x (213) x (215) x (219) (231) rately as app	licable a	nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95 Fable 12a	(240) (241) (242) (247) (247) (249)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hoc (if off-peak tariff, list each of (230a) Energy for lighting	ot a) to (230g) separ de 12)	kWh/year (211) x (213) x (213) x (215) x (219) (231) rately as app (232)	licable at	nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95 Table 12a 34.08	(240) (241) (242) (247) (247) (249) (250)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-ho (if off-peak tariff, list each of (2304 Energy for lighting Additional standing charges (Tab Appendix Q items: repeat lines (2 Total energy cost	ot a) to (230g) separ de 12) 253) and (254) as to (245)(247)	kWh/year (211) x (213) x (213) x (215) x (219) (231) rately as app (232)		nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95 Table 12a 34.08	(240) (241) (242) (247) (247) (249) (250)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hoc (if off-peak tariff, list each of (230a Energy for lighting Additional standing charges (Tab Appendix Q items: repeat lines (2	ot a) to (230g) separ de 12) 253) and (254) as to (245)(247)	kWh/year (211) x (213) x (213) x (215) x (219) (231) rately as app (232)		nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-ho (if off-peak tariff, list each of (2304 Energy for lighting Additional standing charges (Tab Appendix Q items: repeat lines (2 Total energy cost	ot a) to (230g) separ de 12) 253) and (254) as to (245)(247)	kWh/year (211) x (213) x (213) x (215) x (219) (231) rately as app (232)		nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 71.02 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251)
10a. Fuel costs - individual heat Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hoc (if off-peak tariff, list each of (2304) Energy for lighting Additional standing charges (Tabl Appendix Q items: repeat lines (2) Total energy cost 11a. SAP rating - individual heat	ot a) to (230g) separ de 12) 253) and (254) as a (245)(247) ting systems	kWh/year (211) x (213) x (213) x (215) x (219) (231) rately as app (232)	=	nd apply	(Table 3.4 0 13. ⁻ 3.4 13. ⁻ fuel prio	12) 8 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = ding to 7	Fuel Cost £/year 81.3836 0 0 0 71.02 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251) (255)



Regulations Compliance Report

Approved Documer Printed on 21 May		i, England assessed by Stro	oma FSAP 2012 program, Ve	rsion: 1.0.0.20	
Project Information					
Assessed By:	()		Building Type:	Detached Hous	se .
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area:	56.52m²	
Site Reference :	62 mansfield Road	ł	Plot Reference:	Code 4 WWR 1	Thermal Improver
Address :	62, Mansfield Roa	d, LONDON, NW3 2HU			
Client Details:					
Name:					
Address :					
-	s items included w te report of regulat	ithin the SAP calculations ions compliance.).		
1a TER and DER					
Fuel for main heatin	ng system: Mains ga	as			
Fuel factor: 1.00 (m	e ,				
•	xide Emission Rate		23.84 kg/m ²		01/
Dwelling Carbon Di 1b TFEE and DFE	ioxide Emission Rat	e (DEK)	20.11 kg/m ²		OK
	gy Efficiency (TFEE		69.60 kWh/m²		
	ergy Efficiency (DFE		61.00 kWh/m ²		ОК
Element		Average	Highest		
External w	vall	0.10 (max. 0.30)	0.10 (max. 0.70)	_	ОК
Floor		0.10 (max. 0.25)	0.10 (max. 0.70)		ОК
Roof		0.12 (max. 0.20)	0.12 (max. 0.35)		OK
Openings 2a Thermal bridg		1.26 (max. 2.00)	1\80 (max. 3.30)		OK
2a Thermal bridg		sing user-specified y-value	of 0.45		
3 Air permeability		Sing user-specified y-value	01 0.15		
	bility at 50 pascals		1.50 (design va 10.0	lue)	ок
4 Heating efficier	ncy				
Main Heating	g system:	Database: (rev 355, produ Boiler systems with radiat Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi) Efficiency 89.4 % SEDBU Minimum 88.0 %	tors or underfloor heating - m	ains gas	ОК
Secondary h	neating system:	None			

Regulations Compliance Report

Cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls Hot water controls:	Time and temperature zo No cylinder	ne control	ОК
Boiler interlock:	Yes		ОК
Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
Mechanical ventilation			
Continuous supply and extra	ict system		
Specific fan power:		0.52	
Maximum		1.5	OK
MVHR efficiency:		90%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	alley):		OK
sed 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 Wes		3.2m²,	
Windows facing: North West		3.21m²,	
Windows facing: North East		0.27m²,	
Roof windows facing: Horizo		2.25m ²	
Roof windows facing: Horizo		0.29m²	
Roof windows facing: Horizo	ntal	0.58m²	
Ventilation rate:		5.00	
Blinds/curtains:		None	
		Closed 100% of daylight he	ours
Key features			

Air permeablility	1.5 m³/m²h
Roofs U-value	0.12 W/m ² K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K

Property Details	: Code 4 WWR Thermal	Improvements				
Address: Located in: Region: UPRN: Date of asses Date of certifi Assessment ty Transaction ty Tenure type: Related party Thermal Mass Water use <= PCDF Version	icate: ype: ype: disclosure: S Parameter: = 125 litres/person/	62, Mansfield Road, LON England Thames valley 0376892178 01 May 2014 21 May 2014 New dwelling design star Non marketed sale Unknown No related party Calculated 414.05 day: True 355				
Property descrip	otion:					
Dwelling type: Detachment: Year Completed	d:	House Detached 2014				
Floor Location		Floor area:		rey height	:	
Basement floor Floor 1		28.26 m² 28.26 m²		4 m 4 m		
Living area: Front of dwellin	ng faces:	19 m ² (fraction 0.336) South West		+		
Opening types:	.9 .00001					
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3	Source: Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer	Type: Solid Windows Windows Windows Windows Windows Roof Windows Roof Windows Roof Windows	Glazing: double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed		Argon: No No No No No No No No	Frame: PVC-U PVC-U PVC-U PVC-U
Name:	Gap:	Frame Facto	or: g-value:	U-value:	Area:	No. of Openings:
G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR	mm 6mm 6mm 6mm 6mm	0 0.8 0.8 0.8 0.8	0 0.77 0.77 0.77 0.77	1.8 1.2 1.2 1.2 1.2	1.58 0.27 1.26 3.37 1.6	1 1 1 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 RL 2	6mm 6mm	0.7 0.7	0.77 0.77	1.2 1.2	2.25 0.29	1
RL 3	6mm	0.7	0.77	1.2	0.29	2
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW	Type-Name:	Location: G P LG P LG P LG P G G P	Orient: North East North East North East North West South West North West		Width: 0.795 0.35 0.815 1.604 1 1.605	Height: 1.984 0.768 1.551 2.1 1.6 2

G P NE RL 1 RL 2 RL 3		Ro	P pof 1 pof 1 pof 2	North East Horizontal Horizontal Horizontal		0.35 1.5 0.565 0.565	0.768 1.5 0.518 0.518				
Overshading:		Average	e or unknown								
Opaque Elements:											
Type: G <u>External Elements</u> LG LG P G	ross area: 45.48 11.892 48.581	Openings: 0 4.9 3.2	Net area: 45.48 6.99 45.38	U-value: 0.1 0.1 0.1	Ru value: 0 0 0	0 False 0 False 0 False					
G P Roof 1 Roof 2 ground <u>Internal Elements</u> <u>Party Elements</u>	12.703 27.04 3.8 28.26	5.06 2.54 0.58	7.64 24.5 3.22	0.1 0.12 0.12 0.1	0 0 0	False	190 9 9 110				
Thermal bridges:											
Thermal bridges: Ventilation: Pressure test: Ventilation: Number of chimney Number of open flue Number of fans: Number of passive s Number of sides she Pressure test: Main heating system	es: stacks: eltered:	Yes (As Balance Number Ductwo Approve 0 0 0 0 0 0 1.5	designed) ed with heat recov r of wet rooms: K rk: Insulation, rig ed Installation Sc	(itchen + 3 jid heme: True							
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											
Main heating Control	:		nterlock: Yes								
Main heating Contro	bl:		nd temperature zo code: 2110	one control							
Secondary heating sy	/stem:										
Secondary heating s	system:	None									
Water heating: Water heating:		From m	ain heating syste	em							

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:
In Smoke Control Area:
Conservatory:
Low energy lights:
Terrain type:
EPC language:
Wind turbine:
Photovoltaics:
Assess Zero Carbon Home:

Standard Tariff Yes No conservatory 100% Dense urban English No None No

					User D	etails:						
Assessor Name: Software Name:	Stroma Number: Stroma FSAP 2012 Software Version: Version Property Address: Code 4 WWR Thermal Improvem											
Address :	62,	Mansfie	ld Road,									
1. Overall dwelling dim	nension	S:										
					Area	a(m²)		Av. He	ight(m)		Volume(m ³)	·
Basement					2	8.26	(1a) x	2	2.4	(2a) =	67.82	(3a)
Ground floor					2	8.26	(1b) x	2	2.4	(2b) =	67.82	(3b)
Total floor area TFA = ((1a)+(1b)+(1c)+((1d)+(1e)+(1r	n) 5	6.52	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	135.65	(5)
2. Ventilation rate:												_
		main neating		econdar eating	у	other		total			m ³ per hou	
Number of chimneys	Ĺ	0] + [0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	Γ	0	+	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent	fans						- Ē	0	x ′	10 =	0	(7a)
Number of passive ven	ts						Γ	0	x ′	10 =	0	(7b)
Number of flueless gas	fires						Γ	0	X 4	40 =	0	(7c)
										Air ch	anges per ho	ur
Infiltration due to chimn	eys, flu	es and fa	ans = (6	a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has				ed, procee	d to (17), d	otherwise	continue fr	om (9) to ((16)			-
Number of storeys in Additional infiltration	the dw	elling (ne	6)						[(0)	11-0.4	0	(9)
Structural infiltration:	0 25 for	· staal ar	timbor f	frame or	0 35 fo	mason	w constr	uction	[(9)	-1]x0.1 =	0	(10) (11)
if both types of wall are							•	uction			0	
deducting areas of open				a d) a r 0	1 (222)	a) alaa	ontor O					
If suspended wooder If no draught lobby, e				ea) or U.	1 (seale	ea), eise	enter U				0	(12)
Percentage of window				rinned							0	(13)
Window infiltration			augintot	nppou		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value	e, q50, e	expresse	d in cub	ic metre	s per ho	our per s	quare m	etre of e	envelope	area	1.5	(17)
If based on air permeat	oility val	ue, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) =	(16)				0.08	(18)
Air permeability value app		ressurisatio	on test has	s been dor	e or a deg	gree air pe	rmeability	is being u	sed			-
Number of sides shelte Shelter factor	red					(20) – 1 -	[0.075 x (1	9)1 -			0	(19)
Infiltration rate incorport	atina sh	elter fac	tor			(21) = (18		[0]] =			1	(20)
Infiltration rate modified	-			I		<u>,-</u> ., = (10	, (=0) =				0.08	(21)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s							1 - 71		L		I	
(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 (2	2a)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 infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	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 effect		-	rate for t	he appli	cable ca	se	-	-	-	-				
If exhaust air he			endix N (2	3h) = (23a	a) x Emv (e	equation (N	N5)) othe	rwise (23h	(23a)			0.		(23a)
If balanced with		• • •		, ,	, ,				<i>,)</i> = (200)			0.		(23b)
a) If balance		-	-	-					2h)m + (23h) v [1 – (23c)	76 - 1001	.5	(23c)
(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 balance	d mech	ı anical ve	I entilation	without	i heat rec	L Coverv (N	I //V) (24b	m = (2)	1 2b)m + (1 23b)				
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole h	ouse ex	tract ver	ntilation of	n positiv	i ve input v	ventilatio	n from o	utside		<u> </u>				
, if (22b)m				•	•				.5 × (23b)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural														
if (22b)m		r í	,	,	r È	<u> </u>		r Ó	-					(0.4-1)
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effective air			1	· · ·	, <u> </u>	<u> </u>		<u> </u>		0.0	0.04			(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	s and he	eat l <mark>oss</mark>	paramete	ər:						_				
ELEMENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·ł		A X kJ/K	
Doors					1.58		1.8		2.844	<u> </u>				(26)
Windows Type	1				0.27		/[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		/[1/(1.2)+	0.04] =	3.68					(27)
Windows Type	6				0.27		/[1/(1.2)+	0.04] =	0.31	=				(27)
Rooflights Type	e 1				2.25	— .	/[1/(1.2) +	0.04] =	2.7	=				(27b)
Rooflights Type	e 2				0.29	= .	/[1/(1.2) +	0.04] =	0.348	=				(27b)
Rooflights Type	e 3				0.29		/[1/(1.2) +	0.04] =	0.348					(27b)
Floor					28.26		0.1		2.826	= ,	110		3108.6	(28)
Walls Type1	45.4	18	0		45.48		0.1		4.55		190	\dashv	8641.2	(29)
Walls Type2	11.8		4.9		6.99	_	0.1		0.7		190	\dashv	1328.48	(29)
Walls Type3	48.5		3.2		45.38		0.1		4.54		190	= -	8622.39	(29)
Walls Type4	12.		5.06		7.64		0.1		0.76		190	= =	1452.17	(29)
Roof Type1	27.0		2.54		24.5		0.12		2.94		9		220.5	(30)
Roof Type2	3.8		0.58		3.22		0.12		0.39		9		28.98	(30)
	1 0.0	· · · · · · · · · · · · · · · · · · ·				1			0.00	1 1	5	1 1		12.17

Option A Thermal Improvements

Total area of elements	s, m²			177.7	6							(31)
* for windows and roof wind					lated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	3.2	
** include the areas on both			ls and par	titions		(26) (20)	(22) -				36.38	—
Fabric heat loss, $W/K = S (A \times U)$ (26)(30) + (32) =Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) =												(33)
	. ,			L 1/m 21/					2) + (32a).	(32e) =	23402.32	(34)
Thermal mass parame						a a la a la sta		\div (4) =	TMD in T	bla 1f	414.05	(35)
For design assessments wi can be used instead of a de												
Thermal bridges : S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.15 x (31)												
	g are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) -			63.04	(37)
Total fabric heat loss $(33) + (36) =$ Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$												(37)
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 coefficie	I				I	I	(39)m	= (37) + (3	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		
									Sum(39)1		71.97	(39)
Heat loss parameter (HLP), W	/m²K						= (39)m ÷				
(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		
Number of days in mo	onth (Tob	lo 1a)					/	Average =	Sum(40)1.	12 /12=	1.27	(40)
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 end		irement:								k\N/b/ve	ar.	
4. Water heating ene	erg <mark>y requ</mark>	irement:								kWh/ye	ear:	
Assumed occupancy,	N			240 × (T	- 12.0)012 x (TEA 12		kWh/ye 88	ear:	(42)
	N			349 x (TF	- FA -13.9)2)] + 0.(0013 x (⁻	ГFA -13.			ear:	(42)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w	N + 1.76 x ater usag	: [1 - exp ge in litre	(-0.0003 es per da	ay Vd,av	erage =	(25 x N)	+ 36		9) 78		ear:	(42)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average	N + 1.76 x ater usag hot water	:[1 - exp ge in litre usage by s	(-0.0003 es per da 5% if the d	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9) 78	88	ear:	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	N + 1.76 x ater usag bot water person per	:[1 - exp ge in litre usage by s r day (all w	(-0.0003 es per da 5% if the o rater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 7	.89	ear:	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average	N + 1.76 x ater usag hot water person per Mar	:[1 - exp ge in litre ^{usage by s} r day (all w Apr	(-0.0003 es per da 5% if the d vater use, f May	ay Vd,av Iwelling is hot and co Jun	erage = designed i ld) Jul	(25 x N) to achieve Aug	+ 36		9) 78	88	ear:	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per	N + 1.76 x ater usag hot water person per Mar	:[1 - exp ge in litre ^{usage by s} r day (all w Apr	(-0.0003 es per da 5% if the d vater use, f May	ay Vd,av Iwelling is hot and co Jun	erage = designed i ld) Jul	(25 x N) to achieve Aug	+ 36 a water us	se target o	9) 7	.89	ear:	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	N + 1.76 x ater usag hot water person per Mar Mar	t [1 - exp ge in litre usage by t r day (all w Apr ach month	(-0.0003 es per da 5% if the d vater use, f May Vd,m = fa	ay Vd,av Iwelling is hot and co Jun ctor from	erage = designed i ld) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep 77.31	Se target o Oct 80.47	9) 78 Nov	88 .89 Dec 86.78	946.68	
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	N + 1.76 x ater usage hot water person per Mar Mar ar day for ea 80.47	E [1 - exp ge in litre usage by s r day (all w Apr ach month 77.31	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 74.16	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed i ld) Jul Table 1c x 71	(25 x N) to achieve Aug (43) 74.16	+ 36 a water us Sep 77.31	Se target o Oct 80.47 Total = Su	9) 78 7 Nov 83.62 m(44) ₁₁₂ =	88 .89 Dec 86.78		(43)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62	N + 1.76 x ater usage hot water person per Mar Mar ar day for ea 80.47	E [1 - exp ge in litre usage by s r day (all w Apr ach month 77.31	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 74.16	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed i ld) Jul Table 1c x 71	(25 x N) to achieve Aug (43) 74.16	+ 36 a water us Sep 77.31	Se target o Oct 80.47 Total = Su	9) 78 7 Nov 83.62 m(44) ₁₁₂ =	88 .89 Dec 86.78		(43)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55	N + 1.76 x ater usage hot water person per Mar r day for ea 80.47 r used - cal	t [1 - exp ge in litre usage by a r day (all w Apr ach month 77.31 culated mot 101.26	(-0.0003 es per da 5% if the d vater use, l May Vd,m = fa 74.16 0nthly = 4. 97.16	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84	erage = designed i ld) Table 1c x 71 $m \times nm \times D$ 77.69	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15	+ 36 a water us Sep 77.31 0 kWh/mor 90.22	Oct Oct 80.47 Total = Su nth (see Ta 105.14	9) 78 7 Nov 83.62 m(44)112 ables 1b, 1	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63		(43)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA \pounds 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat	N + 1.76 x ater usage hot water person per Mar may for ea 80.47 r used - cal 116.15	E [1 - exp ge in litre usage by 3 r day (all w Apr ach month 77.31 culated mo 101.26 f of use (no	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 74.16 pothly = 4. 97.16 phot water	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84	erage = designed i ld) Table 1c x 71 m x nm x D 77.69 enter 0 in	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46)	+ 36 a water us Sep 77.31) kWh/mor 90.22) to (61)	Oct Oct 80.47 Total = Su 105.14 Total = Su	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63	946.68	(43) (44) (45)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA \pounds 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat (46)m= 19.3 16.88	N + 1.76 x ater usage hot water person per Mar r day for ea 80.47 r used - cal	t [1 - exp ge in litre usage by a r day (all w Apr ach month 77.31 culated mot 101.26	(-0.0003 es per da 5% if the d vater use, l May Vd,m = fa 74.16 0nthly = 4. 97.16	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84	erage = designed i ld) Table 1c x 71 $m \times nm \times D$ 77.69	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15	+ 36 a water us Sep 77.31 0 kWh/mor 90.22	Oct Oct 80.47 Total = Su nth (see Ta 105.14	9) 78 7 83.62 m(44) ₁₁₂ = ables 1b, 1 114.77	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63	946.68	(43)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA \pounds 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat	N + 1.76 x ater usage hot water person per Mar Mar r day for ea 80.47 r used - cal 116.15 ing at point 17.42	E [1 - exp ge in litre usage by s r day (all w Apr ach month 77.31 rculated mo 101.26 r of use (no 15.19	(-0.0003) es per da 5% if the of vater use, I May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57	ay Vd,av Iwelling is hot and co Jun ctor from 71 190 x Vd,r 83.84 storage), 12.58	erage = designed i ld) Table 1c x 71 $m \times nm \times D$ 77.69 enter 0 in 11.65	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37	+ 36 a water us Sep 77.31 b kWh/mor 90.22) to (61) 13.53	Se target o Oct 80.47 Total = Su 105.14 Total = Su 15.77	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63	946.68	(43) (44) (45)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat (46)m= 19.3 16.88 Water storage loss:	N + 1.76 x ater usage hot water person per Mar r day for ea 80.47 r used - cal 116.15 ing at point 17.42	E [1 - exp ge in litre usage by 8 r day (all w Apr ach month 77.31 culated mod 101.26 cof use (not 15.19	(-0.0003) es per da 5% if the d vater use, l May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W	ay Vd,av Iwelling is hot and co Jun ctor from 71 190 x Vd,r 83.84 storage), 12.58 /WHRS	erage = designed i ld) Jul Table 1c x 71 $m \times nm \times D$ 77.69 enter 0 in 11.65 storage	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa	+ 36 a water us Sep 77.31 b kWh/mor 90.22) to (61) 13.53	Se target o Oct 80.47 Total = Su 105.14 Total = Su 15.77	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat (46)m= 19.3 16.88 Water storage loss: Storage volume (litres) If community heating a Otherwise if no stored	N + 1.76 x ater usage hot water person per Mar Mar Mar 80.47 r used - cal 116.15 ing at point 17.42) includir and no ta	E [1 - exp ge in litre usage by s r day (all w Apr ach month 77.31 roulated mon 101.26 t of use (not 15.19 ng any so ank in dw	(-0.0003 es per da 5% if the of vater use, I May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 plar or W yelling, e	ay Vd,av Iwelling is hot and co Jun ctor from 1 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110	erage = designed i ld) Table 1c x 71 $n \times nm \times D$ 77.69 enter 0 in 11.65 storage) litres in	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 0 kWh/mor 90.22) to (61) 13.53 ame vess	Se target o Oct 80.47 Total = Su 105.14 Total = Su 15.77 Sel	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot we Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat (46)m= 19.3 16.88 Water storage loss: Storage volume (litres) If community heating a Otherwise if no stored Water storage loss:	N + 1.76 x ater usage hot water person per Mar maximum Mar (116.15 ing at point 17.42) includir and no tai	E [1 - exp ge in litre usage by 8 r day (all w Apr ach month 77.31 roulated month 101.26 r of use (not 15.19 ng any so ank in dw er (this in	(-0.0003 es per da 5% if the of vater use, if May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W velling, e acludes i	ay Vd,av Iwelling is hot and co Jun ctor from 71 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110 nstantar	erage = designed i ld) Jul Table 1c x 71 $m \times nm \times D$ enter 0 in 11.65 storage litres in neous co	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 0 kWh/mor 90.22) to (61) 13.53 ame vess	Se target o Oct 80.47 Total = Su 105.14 Total = Su 15.77 Sel	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69 0	946.68	(43) (44) (45) (46) (47)
Assumed occupancy, if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 86.78 83.62 Energy content of hot water (45)m= 128.69 112.55 If instantaneous water heat (46)m= 19.3 16.88 Water storage loss: Storage volume (litres) If community heating a Otherwise if no stored	N + 1.76 x ater usage hot water person per Mar may for ea 80.47 r used - cal 116.15 ing at point 17.42) includir and no tal hot water cal	(11 - exp ge in litre usage by s day (all w Apr ach month 77.31 culated mod 101.26 tof use (not 15.19 ng any so ank in dw er (this in oss facto	(-0.0003 es per da 5% if the of vater use, if May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W velling, e acludes i	ay Vd,av Iwelling is hot and co Jun ctor from 71 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110 nstantar	erage = designed i ld) Jul Table 1c x 71 $m \times nm \times D$ enter 0 in 11.65 storage litres in neous co	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 0 kWh/mor 90.22) to (61) 13.53 ame vess	Se target o Oct 80.47 Total = Su 105.14 Total = Su 15.77 Sel	9) 78 78 78 78 78 78 78 78 78 78	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)

Option A Thermal Improvements

		m water	-	•				(48) x (49)) =			0		(50)
'		urer's de		•								0	l	(51)
	f community heating see section 4.3													(31)
Volume factor from Table 2a													(52)	
													(53)	
Energy	Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$													(54)
		(54) in (5	-	, ,								0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	-	s dedicate	-	-	-	-	-	0), else (5	-	-	-	m Append	l ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	om Table	3							0		(58)
	•	loss cal	,			59)m = ((58) ÷ 36	65 × (41)	m					
	•	factor fi			•	,	· ·	• • •		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) – 36	55 x (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 h	eat reg	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 x ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=		151.04	157.15		134.95	118.86	113.87	126.94	128.34	146.15	156.01	168.85		(62)
Solar DI		calculated		endix G or	Appendix	I H (negativ	L ve quantity	I (enter '0	' if no sola	r contributi	ion to wate	I er heating)		
		I lines if				-						5,		
、 (63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHR	5 -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 w	ater hea	ter											
(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		
(0.)						00	00110			ater heater			1333.02	(64)
Heata	aine fro	m water	heating	k\//h/m	onth 0.2	5 ′ [0 85	v (45)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	+ (39)m	1	(65)
											-		t in -	(00)
	. ,			. ,	•	sylinder is	s in the d	aweiling	or not w	ater is ir	om com	munity h	leating	
5. Int	ternal ga	ains (see	e l'able 5	and 5a):									
Metab		s (Table											I	
(22)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(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)
0	<u> </u>	(calcula	· · · ·	opendix	· ·	i	,.		1			1	l .	
(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)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 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)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a), also se	e 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 fa	ns gains	(Table 5	5a)										
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)	•		•		•			
(71)m=	<u> </u>	-75.27	-75.27	-75.27	-75.27	, -75.27	-75.27	-75.27	-75.27	-75.27	-75.27	-75.27		(71)
	L												I	

Water heating gains (Table 5)

Water	heating	gains (T	able 5)					-						
(72)m=	72.37	70.01	65.69	60	56.12	5	60.88 46.88	52.	54 54.9	60.77	67.32	70.56		(72)
Total i	nternal	gains =					(66)m + (67)n	n + (68	3)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m=	449.66	445.75	428.96	403.22	377.08	3	53.33 339.55	346	.76 361.59	387.5	6 416.32	438.06		(73)
6. So	lar gains	S:												
-			-			and	associated equa	ations	to convert to th	ne applio		ion.		
Orienta		Access F Fable 6d	actor	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	11.28	×	0.77	x	0.8	=	4.26	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	11.28	x	0.77	x	0.8	=	0.91	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	22.97	x	0.77	x	0.8	=	1.86	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	22.97	x	0.77	×	0.8	=	8.66	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	22.97	x	0.77	×	0.8	=	1.86	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	41.38	x	0.77	x	0.8	=	3.34	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	41.38	x	0.77	x	0.8	=	15.61	(75)
Northea	ast <mark>0.9</mark> x	0.54	x	0.2	27	x	41.38	×	0.77	x	0.8		3.34	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	67.96	x	0.77	x	0.8		5.49	(75)
Northea	ast <mark>0.9x</mark>	0.54	×	1.2	26	х	67.96] ×	0.77	x	0.8	=	25.63	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	67.96] x	0.77	x	0.8	=	5.49	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	91.35		0.77	x	0.8	=	7.38	(75)
Northea	ast <mark>0.9x</mark>	0.54	×	1.2	26	x	91.35	x	0.77	x	0.8	=	34.46	(75)
Northea	ast 0.9x	0.54	x	0.2	27	x	91.35	x	0.77	x	0.8	=	7.38	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	97.38	x	0.77	x	0.8	=	7.87	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	97.38	x	0.77	×	0.8	=	36.73	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	97.38	x	0.77	×	0.8	=	7.87	(75)
Northea	ast <mark>0.9x</mark>	0.54	X	0.2	27	x	91.1	x	0.77	X	0.8	=	7.36	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	91.1	x	0.77	x	0.8	=	34.36	(75)
Northea	L	0.54	X	0.2	27	x	91.1	x	0.77	x	0.8	=	7.36	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	72.63	x	0.77	x	0.8	=	27.4	(75)
	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	72.63	x	0.77	x	0.8	=	5.87	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	50.42	×	0.77	x	0.8	=	4.08	(75)
Northea	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	50.42	x	0.77	x	0.8	=	19.02	(75)
	ast <mark>0.9x</mark>	0.54	x	0.2	27	x	50.42	x	0.77	x	0.8	=	4.08	(75)
Northea	L	0.54	x	0.2	27	x	28.07	x	0.77	x	0.8	=	2.27	(75)
	ast <mark>0.9x</mark>	0.54	x	1.2	26	x	28.07	×	0.77	x	0.8	=	10.59	(75)
Northea		0.54	x	0.2	27	x	28.07	×	0.77	x	0.8	=	2.27	(75)
Northea	L	0.54	x	0.2	27	x	14.2	×	0.77	×	0.8	=	1.15	(75)
Northea	ast <u>0.9</u> x	0.54	x	1.2	26	x	14.2	x	0.77	x	0.8	=	5.36	(75)

Northeast 0.9x	0.54) ×	0.27	x	14.2	×	0.77	x	0.8	=	1.15	(75)
L Northeast 0.9x	0.54] x	0.27	x	9.21	l 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	ĺ	0.77	x	0.8	=	35.25	(79)
Southwest _{0.9x}	0.54	×	1.6	x	62.67	ĺ	0.77	x	0.8	=	60.04	(79)
Southwest0.9x	0.54	x	1.6	x	85.75	ĺ	0.77	x	0.8	=	82.15	(79)
Southwest _{0.9x}	0.54	x	1.6	x	106.25	ĺ	0.77	x	0.8	=	101.79	(79)
Southwest _{0.9x}	0.54	x	1.6	x	119.01	İ	0.77	x	0.8	=	114.01	(79)
Southwest0.9x	0.54	×	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	×	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	×	3.21	X	11.28	x	0.77	×	0.8	=	10.84	(81)
Northwest 0.9x	0.54	x	3.37	x	22.97	x	0.77	×	0.8	=	23.17	(81)
Northwest 0.9x	0.54	x	3.21	x	22.97	×	0.77	x	0.8	=	22.07	(81)
Northwest 0.9x	0.54	x	3.37	×	41.38	×	0.77	x	0.8	=	41.75	(81)
Northwest 0.9x	0.54	×	3.21	x	41.38	х	0.77	x	0.8	=	39.76	(81)
Northwest 0.9x	0.54	×	3.37	x	67.96	×	0.77	x	0.8	=	68.56	(81)
Northwest 0.9x	0.54	x	3.21	x	67.96	×	0.77	x	0.8	=	65.31	(81)
Northwest 0.9x	0.54	x	3.37	x	91.35	×	0.77	x	0.8	=	92.16	(81)
Northwest 0.9x	0.54	x	3.21	x	91.35	×	0.77	x	0.8	=	87.78	(81)
Northwest 0.9x	0.54	×	3.37	x	97.38	×	0.77	x	0.8	=	98.25	(81)
Northwest 0.9x	0.54	x	3.21	x	97.38	×	0.77	x	0.8	=	93.59	(81)
Northwest 0.9x	0.54	×	3.37	x	91.1	×	0.77	x	0.8	=	91.91	(81)
Northwest 0.9x	0.54	×	3.21	x	91.1	×	0.77	x	0.8	=	87.55	(81)
Northwest 0.9x	0.54	x	3.37	x	72.63	×	0.77	X	0.8	=	73.27	(81)
Northwest 0.9x	0.54	×	3.21	x	72.63	×	0.77	x	0.8	=	69.79	(81)
Northwest 0.9x	0.54	×	3.37	x	50.42	×	0.77	X	0.8	=	50.87	(81)
Northwest 0.9x	0.54	X	3.21	x	50.42	×	0.77	x	0.8	=	48.45	(81)
Northwest 0.9x	0.54	×	3.37	x	28.07	×	0.77	X	0.8	=	28.32	(81)
Northwest 0.9x	0.54	x	3.21	x	28.07	×	0.77	X	0.8	=	26.97	(81)
Northwest 0.9x	0.54	×	3.37	x	14.2	×	0.77	x	0.8	=	14.32	(81)
Northwest 0.9x	0.54	×	3.21	x	14.2	×	0.77	x	0.8	=	13.64	(81)
Northwest 0.9x	0.54	×	3.37	x	9.21	×	0.77	x	0.8	=	9.3	(81)
Northwest 0.9x	0.54	×	3.21	x	9.21	×	0.77	x	0.8	=	8.85	(81)
Rooflights 0.9x	1	x	2.25	x	26	×	0.77	x	0.7	=	28.38	(82)

Rooflights 0.9x 1	×	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	×	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	×	0.29	x	96	x	0.77	×	0.7	=	13.51	(82)
Rooflights 0.9x 1	x	0.29	×	96	x	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	x	2.25	x	150	x	0.77	×	0.7	=	163.72	(82)
Rooflights 0.9x 1	×	0.29	x	150	x	0.77	×	0.7	=	21.1	(82)
Rooflights 0.9x 1	×	0.29	×	150	x	0.77	×	0.7	=	42.2	(82)
Rooflights 0.9x 1	x	2.25	x	192	x	0.77	×	0.7	=	209.56	(82)
Rooflights 0.9x 1	×	0.29	×	192	x	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	×	0.29	×	192	x	0.77	×	0.7	=	54.02	(82)
Rooflights 0.9x 1	x	2.25	X	200	x	0.77	×	0.7	=	218.29	(82)
Rooflights 0.9x 1	×	0.29] ×	200] ×	0.77	×	0.7	=	28.14	(82)
Rooflights 0.9x 1	x	0.29] ×	200] x	0.77	×	0.7	=	56.27	(82)
Rooflights 0.9x 1	×	2.25	×	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights 0.9x 1	ا× ٦	0.29] x	189] x	0.77	x	0.7	=	26.59	(82)
Rooflights 0.9x 1	×	0.29	x	189	ī 🔊	0.77	x	0.7	=	53.18	(82)
Rooflights 0.9x 1	×	2.25	x	157	1 x	0.77	x	0.7	=	171.36	(82)
Rooflights 0.9x 1	×	0.29	x	157	x	0.77	x	0.7	=	22.09	(82)
Rooflights 0.9x 1	x	0.29] x	157	×	0.77	x	0.7	=	44.17	(82)
Rooflights 0.9x	×	2.25	×	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights 0.9x 1	×	0.29	×	115	x	0.77	×	0.7	=	16.18	(82)
Rooflights 0.9x 1	×	0.29	×	115	x	0.77	×	0.7	=	32.36	(82)
Rooflights 0.9x 1	x	2.25] ×	66] x	0.77	×	0.7	=	72.04	(82)
Rooflights 0.9x 1	×	0.29	x	66	_ x	0.77	×	0.7	=	9.28	(82)
Rooflights 0.9x 1	×	0.29	×	66	x	0.77	×	0.7	=	18.57	(82)
Rooflights 0.9x 1	×	2.25] ×	33	x	0.77	×	0.7	=	36.02	(82)
Rooflights 0.9x 1	x	0.29	×	33	x	0.77	- x	0.7	=	4.64	(82)
Rooflights 0.9x 1	x	0.29] ×	33	x	0.77	×	0.7	=	9.28	(82)
Rooflights 0.9x 1	×	2.25] ×	21	x	0.77	- x	0.7	=	22.92	(82)
Rooflights 0.9x 1	x	0.29	×	21	x	0.77	- x	0.7	=	2.95	(82)
Rooflights 0.9x 1	x	0.29	×	21	x	0.77	×	0.7	=	5.91	(82)
			-		-		_				
Solar gains in watts, calcu	lated	for each mon	th		(83)m	n = Sum(74)m	(82)m			-	
	1.26	499.3 633.7		60.21 623.73	519	.83 389.5	236.66	6 127.78	85.07		(83)
Total gains – internal and		. , ,	`	i	1				1	1	
(84)m= 552.57 645.14 76	0.22	902.52 1010.8	35 10	963.28	866	.59 751.09	624.17	7 544.1	523.12	J	(84)
7. Mean internal tempera	ature	(heating sease	on)								
Temperature during hea	ting p	eriods in the li	ving	area from Tal	ble 9	, Th1 (°C)				21	(85)
											_

Sep

Aug

Oct

Nov

Dec

Mar

Feb

Jan

Utilisation factor for gains for living area, h1,m (see Table 9a)

Apr

May

Jun

Jul

(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	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 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)
Temp	erature	during h	neating p	beriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°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)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e 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	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 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)
									f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × 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	adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	e 4e, whe	ere appro	opriate				
(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)
		ting requ												
				mperatui using Ta		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g			Iviay	Jun	Jui	<u> Aug</u>	Jeh		NOV	Dec		
(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)
	l dains.			4)m x (84										
(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)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 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	e for mea	an interr	nal tempe	erature,	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	e heatin	g require	ement fo	or each n	nonth, k	Nh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	414.26	292.35	182.94	47.59	5.27	0	0	0	0	84.02	269.93	435.57		_
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	1731.93	(98)
Space	e heatin	g require	ement ir	ı kWh/m²	²/year								30.64	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)			-		
Spac	e heatir	ng:												
Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	า, %					İ	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (o	alculate	d above)	•		· · · · ·		· · · · · · · · · · · · · · · · · · ·	·······		
	414.26	292.35	182.94	47.59	5.27	0	0	0	0	84.02	269.93	435.57		
(211)m	n = {[(98)m x (20	94)] + (2	10)m } x	100 ÷ (2	.06)								(211)
	444.01	313.35	196.08	51	5.65	0	0	0	0	90.06	289.31	466.85		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15.10}	=	1856.3	(211)

Space heating fuel (secondary), kWh/month

Space neating fuel (se												
$= \{ [(98)m \times (201)] + (214) \} $	<u> </u>			0				0	0		l	
(215)m= 0 0	0	0	0	0	0		0 al (kWh/yea	0	0	0		(215)
						1018			10) _{15,1012}	2	0	(215)
Water heating Output_from water heater	ar (calci	ulated al	nove)									
	119.08	108.02	105.8	94.79	93.48	102.25	102.95	114.79	119.73	127.88		
Efficiency of water heater	er							-	-		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, k $(219)m = (64)m \times 100$					•					•		
	138.42	130.08	131.22	118.19	116.55	127.5	128.37	136.36	137.72	145.67		
						Tota	l = Sum(2)	19a) ₁₁₂ =		-	1589.37	(219)
Annual totals								k	Wh/year	·	kWh/yea	r
Space heating fuel used	d, main	system	1								1856.3	
Water heating fuel used	1										1589.37	
Electricity for pumps, fai	ns and	electric l	keep-hot	:								
mechanical ventilation	- balan	ced, ext	ract or p	ositive ii	nput fror	n outside	e			107.57		(230a)
central heating pump:										120		(230 <mark>c</mark>)
boiler with a fan-assiste	ed flue									45		(230e)
Total electricity for the a	above, k	Wh/yea	r			sum	of (230a).	<mark>(2</mark> 30g) =			272.57	(231)
Electricity for lighting											258.35	(232)
	dual he	ating sy	stems:								258.35	(232)
Electricity for lighting 10a. Fuel costs - indivi	dual he	ating sy	stems:	_								(232)
	d <mark>ual h</mark> e	atin <mark>g sy</mark>	<mark>stem</mark> s:	Fu kW				Fuel P			Fuel Cost	(232)
10a. Fuel costs - indivi		ating sy	stems:	kW	/h/year			(Table	12)	x 0.01 =	Fuel Cost £/year	_
10a. Fuel costs - indivi Space heating - main sy	ystem 1		sten:s:	kW (21	/h/year 1) x			(Table	12) 8	x 0.01 =	Fuel Cost £/year 64.5994	(240)
10a. Fuel costs - indivi Space heating - main sy Space heating - main sy	ystem 1 ystem 2		stems:	kW (21* (21:	/h/year 1) x 3) x			(Table 3.4	12) 8	x 0.01 =	Fuel Cost £/year 64.5994 0	(240)
10a. Fuel costs - indivi Space heating - main sy Space heating - main sy Space heating - second	ystem 1 ystem 2 lary		stems:	kW (21 ² (21) (21)	/h/year 1) x 3) x 5) x			(Table 3.4 0 13.	12) 8 19	x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0	(240) (241) (242)
10a. Fuel costs - indivi Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe	ystem 1 ystem 2 lary er fuel)		stems:	kW (21 (21) (21) (21)	1) x 3) x 5) x			(Table 3.4 0 13. 3.4	12) 8 19 8	x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31	(240) (241) (242) (247)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric	ystem 1 ystem 2 lary er fuel) c keep-	hot		kW (21) (21) (21) (21) (23)	<pre>/h/year 1) x 3) x 5) x 9) 1)</pre>			(Table 3.4 0 13. 3.4 13.	12) 8 19 8 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95	(240) (241) (242)
10a. Fuel costs - indivi Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe	ystem 1 ystem 2 lary er fuel) c keep-	hot		kW (21) (21) (21) (21) (23)	/h/year 1) x 3) x 5) x 9) 1) y as app	licable a	Ind apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95	(240) (241) (242) (247)
10a. Fuel costs - individual Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list eac	ystem 1 ystem 2 lary er fuel) c keep- ch of (23	hot 30a) to (;		kW (21 (21; (21; (21; (23) (23)	/h/year 1) x 3) x 5) x 9) 1) y as app	licable a	Ind apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a	(240) (241) (242) (247) (249)
10a. Fuel costs - individual Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list each Energy for lighting Additional standing char	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta	hot 30a) to (: able 12)	230g) se	kW (21) (21) (21) (21) (23) (23)	/h/year 1) x 3) x 5) x 9) 1) y as app 2)	licable a	Ind apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08	(240) (241) (242) (247) (249) (250)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list eac Energy for lighting Additional standing char Appendix Q items: reper	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta	hot 30a) to (: able 12)	230g) se nd (254)	kW (21) (21) (21) (21) (23) eparately (23) as need	/h/year 1) x 3) x 5) x 9) 1) y as app 2) ded		nd apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list eac Energy for lighting Additional standing char Appendix Q items: repeat Total energy cost	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta at lines	hot 30a) to (: able 12) (253) ar	230g) se nd (254) (245)(:	kW (21) (21) (21) (21) (23) eparately (23) as need	/h/year 1) x 3) x 5) x 9) 1) y as app 2)		and apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08	(240) (241) (242) (247) (249) (250)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list each Energy for lighting Additional standing char Appendix Q items: reper Total energy cost 11a. SAP rating - individ	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta at lines idual he	hot 30a) to (: able 12) (253) ar eating sy	230g) se nd (254) (245)(:	kW (21) (21) (21) (21) (23) eparately (23) as need	/h/year 1) x 3) x 5) x 9) 1) y as app 2) ded		and apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list each Energy for lighting Additional standing char Appendix Q items: reper Total energy cost 11a. SAP rating - individe Energy cost deflator (Tar	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta at lines idual he	hot 30a) to (: able 12) (253) ar eating sy	230g) se nd (254) (245)(: rstems	kW (21) (21) (21) (23) eparately (23) as need (247) + (25)	/h/year 1) x 3) x 5) x 9) 1) y as app ded 50)(254)	=	Ind apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08 120	(240) (241) (242) (247) (249) (250) (251)
10a. Fuel costs - individ Space heating - main sy Space heating - main sy Space heating - second Water heating cost (othe Pumps, fans and electric (if off-peak tariff, list each Energy for lighting Additional standing char Appendix Q items: reper Total energy cost 11a. SAP rating - individ	ystem 1 ystem 2 lary er fuel) c keep- ch of (23 rges (Ta at lines idual he able 12)	hot 30a) to (: able 12) (253) ar eating sy	230g) se nd (254) (245)(: rstems	kW (21) (21) (21) (23) eparately (23) as need (247) + (25)	/h/year 1) x 3) x 5) x 9) 1) y as app 2) ded	=	Ind apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 64.5994 0 0 55.31 35.95 Table 12a 34.08 120 309.94	(240) (241) (242) (247) (249) (250) (251) (255)

12a. CO2 emissions – Individual heating systems	s 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	5	sum of (265)(271) =	1019.81 (272)
CO2 emissions per m ²	((272) ÷ (4) =	18.04 (273)
El rating (section 14)			87 (274)
13a. Primary Energy			
13a. Primary Energy	Energy kWh/year	Primary factor	P. Energy kWh/year
13a. Primary Energy Space heating (main system 1)			0,
	kWh/year	factor	kWh/year
Space heating (main system 1)	kWh/year (211) x	factor	kWh/year 2264.69 (261)
Space heating (main system 1) Space heating (secondary)	kWh/year (211) x (215) x	factor 1.22 = 3.07 = 1.22 =	kWh/year 2264.69 (261) 0 (263)
Space heating (main system 1) Space heating (secondary) Energy for water heating	kWh/year (211) x (215) x (219) x	factor 1.22 = 3.07 = 1.22 =	kWh/year 2264.69 (261) 0 (263) 1939.04 (264)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	factor 1.22 = 3.07 = 1.22 =	kWh/year 2264.69 (261) 0 (263) 1939.04 (264) 4203.73 (265)
Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	factor 1.22 = 3.07 = 1.22 = 3.07 =	kWh/year 2264.69 (261) 0 (263) 1939.04 (264) 4203.73 (265) 836.79 (267)

Regulations Compliance Report

Approved Document L1A, 2013 Edition Printed on 21 May 2014 at 12:31:51	on, England assessed by Strom	a FSAP 2012 program, Ver	rsion: 1.0.0.20
Project Information:			
Assessed By: ()		Building Type:	Detached House
Dwelling Details:			
NEW DWELLING DESIGN STAGE		Total Floor Area: 5	6.52m²
Site Reference : 62 mansfield Roa	ad	Plot Reference:	Code 4 with PV
Address : 62, Mansfield Ro	ad, LONDON, NW3 2HU		
Client Details:			
Name:			
Address :			
This report covers items included It is not a complete report of regula			
1a TER and DER			
Fuel for main heating system: Mains Fuel factor: 1.00 (mains gas)	-	23.93 kg/m²	
Target Carbon Dioxide Emission Rate Dwelling Carbon Dioxide Emission Rate		17.59 kg/m²	ОК
1b TFEE and DFEE		11100 (kg,111	
Target Fabric Energy Efficiency (TFE	E)	70.00 kWh/m ²	
Dwelling Fabric Energy Efficiency (DI	FEE)	67.20 kWh/m ²	
			OK
2 Fabric U-values			
Element External wall	Averáge 0.12 (max. 0.30)	Highest 0.12 (max. 0.70)	ок
Floor	0.10 (max. 0.25)	0.12 (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			
	using user-specified y-value of	0.15	
3 Air permeability		/	
Air permeability at 50 pascals Maximum		3.00 (design valı 10.0	ue) OK
4 Heating efficiency			
Main Heating system:	Database: (rev 355, product	: index 015282):	
	Boiler systems with radiator Brand name: Worcester Model: Greenstar CDi Model qualifier: 27 CDi (Combi) Efficiency 89.4 % SEDBUK2 Minimum 88.0 %		ains gas OK
Secondary heating system:	None		



Regulations Compliance Report

Cylinder insulation Hot water Storage:	No cylinder		
Controls			
Space heating controls	Time and temperature zo	ne control	ОК
Hot water controls:	No cylinder		UN
Boiler interlock:	Yes		ок
Low energy lights	100		UN
Percentage of fixed lights with	h low-eneray fittinas	100.0%	
Minimum		75.0%	ОК
Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:	-	0.52	
Maximum		1.5	OK
MVHR efficiency:		90%	
Minimum		70%	ОК
Summertime temperature			
Overheating risk (Thames va	lley):		ОК
sed on:			
Overshading:		Average or unknown	
Windows facing: North East		0.27m²,	
Windows facing: North East		1.26m²,	
Windows facing: North West		3.37m ²	
Windows facing: South West		3.2m²,	
Windows facing: North West		3.21m ²	
Windows facing: North East		0.27m ²	
Roof windows facing: Horizo	ntal	2.25m ²	
Roof windows facing: Horizo	ntal	0.29m ²	
Roof windows facing: Horizo		0.58m ²	
Ventilation rate:		5.00	
Blinds/curtains:		None	
		Closed 100% of daylight h	
Key features			
Air permeablility		3.0 m ³ /m ² h	

3.0 m³/m²h 0.1 W/m²K 0.12 W/m²K 0.1 W/m²K

Property Details:	Code 4 with PV					
Address: Located in: Region: UPRN: Date of assessr Date of certific. Assessment typ Transaction typ Tenure type: Related party of Thermal Mass F Water use <= T PCDF Version:	ate: be: be: lisclosure:	62, Mansfield Road, LON England Thames valley 0376892178 01 May 2014 21 May 2014 New dwelling design stag Non marketed sale Unknown No related party Calculated 414.05 day: True 355				
Property description	on:					
Dwelling type: Detachment: Year Completed: Floor Location: Basement floor Floor 1		House Detached 2014 Floor area: 28.26 m ² 28.26 m ²	2.	rey height 36 m 52 m	:	
Living area:		19 m ² (fraction 0.336)				
Front of dwelling	faces:	South West				
Opening types:						
Name: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW G P NE RL 1 RL 2 RL 3	Source: Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer	Type: Solid Windows Windows Windows Windows Windows Roof Windows Roof Windows Roof Windows	Glazing: double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed double-glazed		Argon: No No No No No No No	Frame: PVC-U PVC-U PVC-U PVC-U
Name:	Gap:	Frame Facto	-	U-value:	Area:	No. of Openings:
G NE FD LG P NE 1	mm 6mm	0 0.8	0 0.77	2.5 1.4	1.58 0.27	1 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 G P NW	6mm 6mm	0.8 0.8	0.77 0.77	1.4 1.4	1.6 3.21	2 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: G NE FD LG P NE 1 LG P NE 2 LG P NW G SW K/LR G P NW	Type-Name:	Location: G P LG P LG P LG P G G P	Orient: North East North East North East North West South West North West		Width: 0.795 0.35 0.815 1.604 1 1.605	Height: 1.984 0.768 1.551 2.1 1.6 2

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
Average or	unknown

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	t <u>s</u>						
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 Element	S						
Party Elements							

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges: Ventilation Pressure test: Yes (As designed) Balanced with heat recovery Ventilation: Number of wet rooms: Kitchen + 3 Ductwork: Insulation, rigid Approved Installation Scheme: True 0 Number of chimneys: 0 Number of open flues: 0 Number of fans: Number of passive stacks: 0 Number of sides sheltered: 0 3 Pressure test: 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 Time and temperature zone control Main heating Control: Control code: 2110 Secondary heating system: None

From main heating system

Water heating:

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

Others:

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

Assess Zero Carbon Home:

					User D	etails:						
Assessor Name: Software Name:	Stro	oma FS	AP 201			Strom Softwa Address	are Ve		/	Versio	on: 1.0.0.20	
Address :	62,	Mansfiel	ld Road,									
1. Overall dwelling dim	nensions	8:										
					Area	a(m²)		Av. He	ight(m)	_	Volume(m ³)	
Basement					2	8.26	(1a) x	2	.36	(2a) =	66.69	(3a)
Ground floor					2	8.26	(1b) x	2	.52	(2b) =	71.22	(3b)
Total floor area TFA = ((1a)+(1b)+(1c)+((1d)+(1e)+(1r	n) 5	6.52	(4)			•		-
Dwelling volume							(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	137.91	(5)
2. Ventilation rate:												
		nain eating		econdar eating	у	other		total			m ³ per hour	
Number of chimneys	Ľ	0	"ז + ר	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	Г	0	<u>-</u>] + [0		0		0	x 2	20 =	0	(6b)
Number of intermittent	fans							0	x 1	0 =	0	(7a)
Number of passive ven	ts						Г	0	x 1	0 =	0	(7b)
Number of flueless gas	fires							0	× 4	40 =	0	(7c)
										Air ch	nanges per ho	ur
Infiltration due to chimn	eys, flue	es and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	0	Η.	÷ (5) =	0	(8)
If a pressurisation test has	been car	ried out or	is intende	d, procee	d to (17), d	otherwise o	continue fr	rom (9) to (_
Number of storeys in	the dwe	elling (ns	5)								0	(9)
Additional infiltration									[(9)-	1]x0.1 =	0	(10)
Structural infiltration: if both types of wall are							•	ruction			0	(11)
deducting areas of ope				oonang te	the grout		a faitor					
If suspended wooder				ed) or 0	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e											0	(13)
Percentage of window	ws and o	doors dr	aught st	ripped		0.05 10.0		001			0	(14)
Window infiltration Infiltration rate						0.25 - [0.2]		100] = 12) + (13) -	+ (15) -		0	(15)
Air permeability value	a 050 e	vnresse	d in cub	ic metre						area	0	(16) (17)
If based on air permeat	•	•			•	•	•		invelope	arca	3 0.15	(18)
Air permeability value app	-							is being u	sed		0.10	
Number of sides shelte	red										0	(19)
Shelter factor						(20) = 1 -	[0.075 x (1	19)] =			1	(20)
Infiltration rate incorpor	-					(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified					• •	<u>.</u>			i		1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind s	· .			<u> </u>						. –	1	
(22)m= 5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	

Wind F	actor (22	2a)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		
Adjuste	ed infiltra	tion rat	e (allow	ing for sh	elter ar	nd wind s	speed) =	: (21a) x (2	2a)m					
Colouit	0.19	0.19	0.18	0.16 rate for t	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
	echanical		-		ne appi	icaple ca	150						0.5	j (23a)
lf exh	aust air hea	at pump	using App	endix N, (2	3b) = (23	a) × Fmv (e	equation (I	N5)) , otherwi	ise (23b	o) = (23a)			0.5	
lf bala	anced with	heat reco	overy: effi	ciency in %	allowing	for in-use f	actor (fron	n Table 4h) =					76.	5 (23c)
a) If	balanced	d mech	anical v	entilation	with he	at recov	ery (MV	HR) (24a)r	m = (2	2b)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	d mech	anical v	entilation	without	heat red	covery (I	MV) (24b)r	n = (2	2b)m + (23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from ou c) = (22b)		.5 × (23t	D)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from lof 0.5 + [(22t		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effe	ctive air o	change	rate - e	nter (24a) or (24	b) or (24	c) or (24	ld) 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. He	at losses	and he	eat loss	paramete										
		and he Gros		paramete Openin		Net Ar	ea	U-value		AXU		k-value	e la la la la la la la la la la la la la	AXk
3. He ELEN			ss		gs	Net Ar A ,r		U-value W/m2K		A X U (W/		k-value kJ/m²-ł		A X k kJ/K
		Gros	ss	Openin	gs		m ²	W/m2K 2.5] =					
ELEN Doors		Gros area	ss	Openin	gs	A ,r	m ²	W/m2K] =	(VV/				kJ/K
ELEN Doors Windov	1ENT	Gros area	ss	Openin	gs	A ,r	m ² x	W/m2K 2.5	.04] =	(W/ 3.95				kJ/K (26)
ELEN Doors Window Window	MENT ws Type	Gros area 1 2	ss	Openin	gs	A ,r 1.58 0.27	m ² x x 1 x ¹	W/m2K 2.5 /[1/(1.4)+ 0.	= .04] = .04] =	(W/ 3.95 0.36				kJ/K (26) (27)
ELEN Doors Windov Windov Windov	MENT ws Type ws Type	Gros area 1 2 3	ss	Openin	gs	A ,r 1.58 0.27 1.26	m ² x x1	W/m2K 2.5 /[1/(1.4)+ 0. /[1/(1.4)+ 0.	.04] = .04] = .04] =	(W/ 3.95 0.36 1.67				kJ/K (26) (27) (27)
ELEN Doors Window Window Window	NENT ws Type ws Type ws Type	Gros area 1 2 3 4	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37	m ² x x ¹ x ¹ x ¹ x ¹	W/m2K 2.5 /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0.	04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47				kJ/K (26) (27) (27) (27)
ELEN Doors Window Window Window Window	MENT ws Type ws Type ws Type ws Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6	m ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹	W/m2K 2.5 /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0.	04] = 04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47 2.12				kJ/K (26) (27) (27) (27) (27)
ELEN Doors Windov Windov Windov Windov	NENT ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3 4 5 6	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21	m ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2K 2.5 /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0. /[1/(1.4)+ 0.	04] = 04] = 04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26				kJ/K (26) (27) (27) (27) (27) (27)
ELEN Doors Window Window Window Window Window Rooflig	NENT ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3 4 5 6 6	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27	m ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹	W/m2K 2.5 /[1/(1.4)+ 0. /[1/(1.4)+ 0.	04] = 04] = 04] = 04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36	к)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEN Doors Window Window Window Window Rooflig Rooflig	MENT ws Type ws Type ws Type ws Type ws Type ws Type ghts Type	Gros area 1 2 3 4 5 6 6 2 1 2 2	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25	m ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0)	04] = 04] = 04] = 04] = 04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7	к)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEN Doors Window Window Window Window Rooflig Rooflig	MENT ws Type ws Type ws Type ws Type ws Type ghts Type ghts Type	Gros area 1 2 3 4 5 6 6 2 1 2 2	ss	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29	m ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0) /[1/(1.2)+0.0)	04] = 04] = 04] = 04] = 04] = 04] = 04] = 04] =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348	k)		<	kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b)
ELEN Doors Window Window Window Window Rooflig Rooflig	MENT ws Type ws Type ws Type ws Type ws Type ghts Type ghts Type ghts Type	Gros area 1 2 3 4 5 6 6 2 1 2 2	ss (m²)	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29	m ² X X X X X X X X X X X X X X X X X X X	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0) /[1/(1.2)+0.0] /[1/(1.2)+0.0]	0.04 = 0.04	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348 0.348	k)	kJ/m²-ŀ		kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (27b)
ELEN Doors Window Window Window Window Rooflig Rooflig Rooflig Floor	MENT ws Type ws Type ws Type ws Type ws Type ghts Type ghts Type ghts Type	Gros area 1 2 3 4 5 6 6 1 2 2 3	ss (m²)	Openin	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 28.26	m ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0] /[1/(1.2)+0.0] /[1/(1.2)+0.0] 0.1	0.04 = 0.04 =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348 0.348 2.826	k)	kJ/m²-ł		kJ/K (26) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (27b) (27b) (27b)
ELEN Doors Window Window Window Window Rooflig Rooflig Floor Walls	MENT ws Type ws Type ws Type ws Type ws Type yhts Type yhts Type yhts Type Type1 Type2	Gros area 1 2 3 4 5 6 6 9 1 2 2 3 2 3	ss (m²)	Openin m	gs	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 0.29 28.26 45.46	m ² X X X X X X X X X X X X X X X X X X X	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0] /[1/(1.2)+0.0] /[1/(1.2)+0.0] 0.1 0.12	04] = 04] = 04] = 04] = 04] = 04] = 04] = 04] = 04] = 1 = 04] = 1 = 04] = 1 = 04] = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348 0.348 2.826 5.46	k)	kJ/m²-ł 110 190		kJ/K (26) (27) (27) (27) (27) (27) (27b) (
ELEN Doors Window Window Window Window Rooflig Rooflig Rooflig Floor Walls	MENT ws Type ws Type ws Type ws Type ws Type ws Type yhts Type yhts Type yhts Type ths Type yhts Type yhts Type yhts Type	Gros area 1 2 3 4 5 6 6 2 2 3 2 3 4 5.4 2 2 3	5S (m ²) 18 39 58	Openin m 0 4.9	gs 2	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 0.29 28.26 45.48 6.99	m ² x ¹ x ² x ² x ³ x	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0) /[1/(1.2)+0.0] /[1/(1.2)+0.0] 0.1 0.12 0.12	04 = 0	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348 0.348 2.826 5.46 0.84	k)	kJ/m²-ł 110 190		kJ/K (26) (27) (27) (27) (27) (27) (27) (27b)(27b) (27
ELEN Doors Window Window Window Window Rooflig Rooflig Rooflig Floor Walls	MENT ws Type ws Type ws Type ws Type ws Type ws Type yhts Type yhts Type ths Type fype1 Type2 Type3 Type4	Gros area 1 2 3 4 5 6 6 2 2 3 3 4 5.4 6 2 3 3 4 5.4 2 3 3	48 39 58 7	Openin m 0 4.9 3.2	gs 2	A ,r 1.58 0.27 1.26 3.37 1.6 3.21 0.27 2.25 0.29 0.29 2.826 45.48 6.99 45.38	m ² x x1 x1 x1 x1 x1 x1 x1	W/m2K 2.5 /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.4)+0. /[1/(1.2)+0.0 /[1/(1.2)+0.0 /[1/(1.2)+0.0 0.1 0.12 0.12 0.12 0.12	0.04 = 0.04 =	(W/ 3.95 0.36 1.67 4.47 2.12 4.26 0.36 2.7 0.348 0.348 2.826 5.46 0.84 5.45	k)	kJ/m²-ł 110 190 190		kJ/K (26) (27) (27) (27) (27) (27) (27b) (

Option B with PV

Total area of ele	ements	, m²			177.7	6							(31)
* for windows and r ** include the areas						ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
Fabric heat loss							(26)(30)	+ (32) =				41.13	(33)
Heat capacity C	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	23402.32	(34)
Thermal mass p	parame	ter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			414.05	(35)
For design assessr can be used instea				constructi	ion are noi	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge	s : S (L	x Y) cal	culated u	using Ap	pendix l	<						26.66	(36)
if details of thermal		are not kn	own (36) =	= 0.15 x (3	1)			(22)	(0.0)				
Total fabric hea		loulotod	lmonthl						(36) =	25) m v (5)		67.8	(37)
Ventilation heat			· · · · ·	, 	lun	1.1	A.1.0		= 0.33 × (
(38)m= 14.05	Feb 13.88	Mar 13.71	Apr 12.86	May 12.68	Jun 11.83	Jul 11.83	Aug 11.66	Sep 12.17	Oct 12.68	Nov 13.02	Dec 13.37		(38)
			12.00	12.00	11.00	11.00	11.00				10.01		()
Heat transfer co	81.68	1t, VV/K 81.51	80.65	80.48	79.63	79.63	79.46	(39)m 79.97	= (37) + (3 80.48	80.82	81.16		
(59)11- 01.04	01.00	01.51	00.00	00.40	79.05	79.05	73.40		Average =			80.61	(39)
Heat loss parar	neter (H	HLP), W/	/m²K						= (39)m ÷				`
(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		· ·	,	Mari	lun			Con	Oct	Nov	Dee		
(41)m= 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
	20		50		50	51	51	50	51	50	51		()
1 Motor booti			iromonti										
4. Water heati	ng ener	g <mark>y requ</mark> i	irem <mark>ent:</mark>						-		kWh/ye	ear:	
Assumed occup if TFA > 13.9	pancy, N , N = 1	N			349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		kWh/ye	ear:	(42)
Assumed occup if TFA > 13.9 if TFA £ 13.9	pancy, N , N = 1 , N = 1	N + 1.76 x	[1 - exp	(-0.0003					TFA -13.	9)	88	ear:	
Assumed occup if TFA > 13.9	pancy, N , N = 1 , N = 1 e hot wa	N + 1.76 x ater usag	[1 - exp ge in litre	(-0.0003 es per da	ay Vd,av	erage =	(25 x N)	+ 36		9) 78		ear:	(42) (43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average	pancy, N , N = 1 , N = 1 e hot wa <i>average</i>	N + 1.76 x ater usag <i>hot water</i>	[1 - exp ge in litre usage by	(-0.0003 es per da 5% if the o	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9) 78	88	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 lin Jan	pancy, N , N = 1 , N = 1 e hot wa average litres per p Feb	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by s r day (all w Apr	(-0.0003 es per da 5% if the o vater use, I May	ay Vd,av Iwelling is hot and co Jun	erage = designed i ld) Jul	(25 x N) to achieve Aug	+ 36		9) 78	88	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 lin Jan Hot water usage in	pancy, N , N = 1 , N = 1 e hot wa average litres per p Feb litres per	N + 1.76 x hot water person per Mar day for ea	[1 - exp ge in litre usage by s r day (all w Apr ach month	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa	ay Vd,av Iwelling is hot and co Jun ctor from T	erage = designed i ld) Jul Fable 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	se target o	9) 78 Nov	.89 Dec	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 lin Jan	pancy, N , N = 1 , N = 1 e hot wa average litres per p Feb	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by s r day (all w Apr	(-0.0003 es per da 5% if the o vater use, I May	ay Vd,av Iwelling is hot and co Jun	erage = designed i ld) Jul	(25 x N) to achieve Aug	+ 36 a water us Sep 77.31	Oct 80.47	9) 78 Nov 83.62	88 .89 Dec 86.78		(43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 lin Jan Hot water usage in	pancy, N , N = 1 , N = 1 e hot wa average litres per p Feb litres per 83.62	N + 1.76 x ater usag hot water person per Mar day for ea 80.47	[1 - exp ge in litre usage by s day (all w Apr ach month 77.31	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 74.16	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed i ld) Jul Fable 1c x 71	(25 x N) to achieve Aug (43) 74.16	+ 36 a water us Sep 77.31	Oct 80.47	9) 78 7 Nov 83.62 m(44) ₁₁₂ =	88 .89 Dec 86.78	946.68	
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 li Jan Hot water usage in (44)m= 86.78 Energy content of h	pancy, N , N = 1 , N = 1 e hot water litres per p Feb litres per 83.62	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - cal	[1 - exp ge in litre usage by s day (all w Apr ach month 77.31	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 74.16 onthly = 4.	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r	erage = designed i ld) Jul Fable 1c x 71	(25 x N) to achieve Aug (43) 74.16 DTm / 3600	+ 36 a water us Sep 77.31 kWh/mor	Oct Oct 80.47 Total = Sun oth (see Ta	9) 78 Nov 83.62 m(44)112 subles 1b, 1	88 .89 Dec 86.78		(43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 li Jan Hot water usage in (44)m= 86.78 Energy content of h	pancy, N , N = 1 , N = 1 e hot wa average litres per p Feb litres per 83.62	N + 1.76 x ater usag hot water person per Mar day for ea 80.47	[1 - exp ge in litre usage by s day (all w Apr ach month 77.31	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 74.16	ay Vd,av Iwelling is hot and co Jun ctor from 7	erage = designed i ld) Table 1c x 71 n x nm x E	(25 x N) to achieve Aug (43) 74.16	+ 36 a water us Sep 77.31 kWh/mor 90.22	Oct 80.47	9) 78 Nov 83.62 m(44) ₁₁₂ = ables 1b, 1 114.77	88 .89 Dec 86.78 c, 1d) 124.63		(43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 li Jan Hot water usage in (44)m= 86.78 Energy content of h	pancy, N , N = 1 , N = 1 e hot water litres per p Feb litres per 83.62 hot water 112.55	N + 1.76 x hot water person per Mar day for ea 80.47 used - calo 116.15	[1 - exp ge in litre usage by a day (all w Apr ach month 77.31 culated mo	(-0.0003 es per da 5% if the a vater use, I May Vd,m = fa 74.16 0nthly = 4. 97.16	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84	erage = designed i ld) Jul Table 1c x 71 n x nm x L 77.69	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15	+ 36 a water us Sep 77.31 kWh/mor 90.22	Oct Oct 80.47 Total = Sun oth (see Ta 105.14	9) 78 Nov 83.62 m(44) ₁₁₂ = ables 1b, 1 114.77	88 .89 Dec 86.78 c, 1d) 124.63	946.68	(43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 l Jan Hot water usage in (44)m= 86.78 Energy content of h (45)m= 128.69	pancy, N , N = 1 , N = 1 e hot water litres per p Feb litres per 83.62 hot water 112.55 ater heatin 16.88	N + 1.76 x hot water person per Mar day for ea 80.47 used - calo 116.15	[1 - exp ge in litre usage by a day (all w Apr ach month 77.31 culated mo	(-0.0003 es per da 5% if the a vater use, I May Vd,m = fa 74.16 0nthly = 4. 97.16	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84	erage = designed i ld) Jul Table 1c x 71 n x nm x L 77.69	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15	+ 36 a water us Sep 77.31 kWh/mor 90.22	Se target ofOct80.47Total = SunTotal = Sun105.14	9) 78 Nov 83.62 m(44) ₁₁₂ = ables 1b, 1 114.77	88 .89 Dec 86.78 c, 1d) 124.63	946.68	(43)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 l Jan Hot water usage in (44)m= 86.78 Energy content of h (45)m= 128.69 If instantaneous wat (46)m= 19.3	pancy, N , N = 1 , N = 1 e hot water litres per p Feb litres per 83.62 hot water 112.55 ater heatin 16.88 OSS:	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - calo 116.15 ng at point 17.42	[1 - exp ge in litre usage by a day (all w Apr ach month 77.31 culated mo 101.26 f of use (no 15.19	(-0.0003) es per da 5% if the o vater use, I May Vd,m = fac 74.16 onthly = 4. 97.16 o hot water 14.57	ay Vd,av Iwelling is hot and co Jun ctor from 1 71 190 x Vd,r 83.84 storage), 12.58	erage = designed i ld) Table 1c x 71 n x nm x D 77.69 enter 0 in 11.65	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46, 13.37	+ 36 a water us Sep 77.31 90.22 90.22 0 to (61) 13.53	Se target ofOct80.47Total = Sun105.14Total = Sun105.14Total = Sun15.77	9) 78 Nov 83.62 m(44) ₁₁₂ = bbles 1b, 1 114.77 m(45) ₁₁₂ = 17.22	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63	946.68	(43) (44) (45)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 If Uan Hot water usage in (44)m= 86.78 Energy content of P (45)m= 128.69 If instantaneous wat (46)m= 19.3 Water storage I	pancy, N , N = 1 , N = 1 e hot water litres per p litres per B3.62 hot water 112.55 ater heatin 16.88 loss: e (litres)	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - calo 116.15 ing at point 17.42	[1 - exp ge in litre usage by a day (all w Apr ach month 77.31 culated mo 101.26 f of use (no 15.19	(-0.0003) es per da 5% if the o vater use, I May Vd,m = fac 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W	ay Vd,av Iwelling is hot and co Jun ctor from T 71 190 x Vd,r 83.84 storage), 12.58 /WHRS	erage = designed i ld) Jul Fable 1c x 71 $n \times nm \times D$ 77.69 enter 0 in 11.65 storage	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46, 13.37 within sa	+ 36 a water us Sep 77.31 90.22 90.22 0 to (61) 13.53	Se target ofOct80.47Total = Sun105.14Total = Sun105.14Total = Sun15.77	9) 78 Nov 83.62 m(44) ₁₁₂ = bbles 1b, 1 114.77 m(45) ₁₁₂ = 17.22	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 If Jan Hot water usage in (44)m= 86.78 Energy content of h (45)m= 128.69 If instantaneous wat (46)m= 19.3 Water storage T Storage volume If community he Otherwise if no	pancy, N = 1 , N = 1 e hot water litres per p litres per p 83.62 hot water 112.55 ater heatin 16.88 loss: e (litres) eating a stored	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - calo 116.15 ng at point 17.42 includin nd no ta	[1 - exp ge in litre usage by s day (all w Apr ach month 77.31 culated mo 101.26 f of use (no 15.19 ng any so ank in dw	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W velling, e	ay Vd,av Iwelling is hot and co Jun ctor from T 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110	erage = designed i Id) Table 1c x 71 $n \times nm \times D$ 77.69 enter 0 in 11.65 storage litres in	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 90.22 9 to (61) 13.53 ame vess	Se target of Oct 80.47 Total = Sum 105.14 Total = Sum 105.77 sel	9) 78 Nov 83.62 m(44) ₁₁₂ = 1000 1000 1000 1000 1000 1000 1000 100	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 line I Jan Hot water usage in (44)m= 86.78 Energy content of h (45)m= 128.69 If instantaneous wat (46)m= 19.3 Water storage I Storage volume If community he Otherwise if no Water storage I	pancy, N , N = 1 , N = 1 e hot water litres per p Feb litres per 83.62 hot water 112.55 ater heatin 16.88 loss: e (litres) eating a stored loss:	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - cal 116.15 ng at point 17.42 includin nd no ta hot wate	[1 - exp ge in litre usage by a day (all w Apr ach month 77.31 culated mo 101.26 f of use (no 15.19 ng any so ank in dw er (this in	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W velling, e ocludes i	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110 nstantar	erage = designed i ld) Jul Table 1c x 71 $n \times nm \times L$ 77.69 enter 0 in 11.65 storage litres in neous co	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 90.22 9 to (61) 13.53 ame vess	Se target of Oct 80.47 Total = Sum 105.14 Total = Sum 105.77 sel	9) 78 Nov 83.62 m(44) ₁₁₂ = 1000 1000 1000 1000 1000 1000 1000 100	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69 0	946.68	(43) (44) (45) (46) (47)
Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 If Jan Hot water usage in (44)m= 86.78 Energy content of h (45)m= 128.69 If instantaneous wat (46)m= 19.3 Water storage T Storage volume If community he Otherwise if no	pancy, N = 1 , N = 1 e hot water litres per p litres per p Feb litres per 83.62 hot water 112.55 ater heatin 16.88 loss: e (litres) eating a stored loss: urer's de	N + 1.76 x ater usag hot water person per Mar day for ea 80.47 used - cald 116.15 ng at point 17.42 includin nd no ta hot wate	[1 - exp ge in litre usage by s day (all w Apr ach month 77.31 culated mo 101.26 f of use (no 15.19 ng any so ank in dw er (this in oss facto	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 74.16 onthly = 4. 97.16 o hot water 14.57 olar or W velling, e ocludes i	ay Vd,av Iwelling is hot and co Jun ctor from 7 71 190 x Vd,r 83.84 storage), 12.58 /WHRS nter 110 nstantar	erage = designed i ld) Jul Table 1c x 71 $n \times nm \times L$ 77.69 enter 0 in 11.65 storage litres in neous co	(25 x N) to achieve Aug (43) 74.16 07m / 3600 89.15 boxes (46) 13.37 within sa (47)	+ 36 a water us Sep 77.31 90.22 9 to (61) 13.53 ame vess	Se target of Oct 80.47 Total = Sum 105.14 Total = Sum 105.77 sel	9) 78 Nov 83.62 m(44) ₁₁₂ = ables 1b, 1 114.77 m(45) ₁₁₂ = 17.22 47)	88 .89 Dec 86.78 <i>c, 1d)</i> 124.63 18.69	946.68	(43) (44) (45) (46)

b) If m	nanufact	urer's de	eclared of	e, kWh/ye cylinder l rom Tabl	oss fact		known:	(48) x (49) =		L	0	(50) (51)
		-	ee secti		,		<i>,</i>					•	
Volum	e factor	from Ta	ble 2a									0	(52)
Tempe	erature f	actor fro	m Table	2b								0	(53)
Energy	y lost fro	m water	⁻ storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0	(54)
Enter	(50) or ((54) in (5	55)									0	(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	×Н
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)
			l	I Toble								0	(58)
Primar	y circuit	loss cal	culated	om Table for each le H5 if t	month (,	. ,	• •		r thermo		0	(00)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 x (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 h	neat requ	uired for	water h	eating ca	alculated	for eac	h 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)
	-W input of	calculated	using App	endix G or	· Appendix	H (negati	l ve quantity	I (enter '0	if no sola	r contribut	ion to wate	er heating)	
				and/or V		-							
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
	t from w	ater hea	ter					<u> </u>					
(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	
								Out	out from w	ater heate	r (annual)₁	12	1714.47 (64)
Heat g	ains fro	m water	heating.	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	1
-			-	43.2		_			-				(65)
inclu	ude (57)	m in calo	ulation	of (65)m	onlv if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity he	eating
	. ,			5 and 5a	-	,		U				,	5
			e 5), Wat										
Metab	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)
Liahtin	a aains	(calcula	ted in Ar	pendix	L. equat	ion L9 o	r L9a). a	lso see '	rable 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)
Applia	nces da	ins (calc	ulated in	Append	l dix L. ea	uation L	13 or L1	i 3a), also	see Ta	ble 5			
	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)
				ı ppendix					1		I		
(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)
			(Table {				1	I	<u> </u>	1	1	<u> </u>	
(70)m=	10	13 gains	10	10	10	10	10	10	10	10	10	10	(70)
				tive valu									(-)
(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)
(, ,),,,=	10.21	10.21	1 0.21	, , , , , , , , , , , , , , , , , , , ,	10.21	10.21	, , , , , , , , , , , , , , , , , , , ,	1 ' 5.21	10.21	, , , , , , , , , , , , , , , , , , , ,	10.21	, 0.21	(71)

Water heating	gains (Ta	able 5)														
(72)m= 72.37	70.01	65.69	60	56.12	5	50.88	46.88	52.	54 54	.9	60.77	67.32	70.56			(72)
Total interna	l gains =					(66)	m + (67)m	+ (68	B)m + (69)	m + (70	0)m +	(71)m + (72)	m	-		
(73)m= 449.66	445.75	428.96	403.22	377.08	3	53.33	339.55	346	.76 361	.59	387.5	416.32	438.06			(73)
6. Solar gain	s:			•	1				_							
Solar gains are	calculated ι	ising sola	r flux from	Table 6a	and	associa	ated equa	tions	to convert	to the	applic	able orientati	ion.			
Orientation:		actor	Area	l		Flux			_ g_	0		FF		Gains		
	Table 6d		m²			Tab	ole 6a		Table	60	_	Table 6c		(W))	_
Northeast 0.9x	0.54	x	0.:	27	x	1	1.28	x	0.77	7	x	0.8	=	0.	.91	(75)
Northeast 0.9x	0.54	x	1.:	26	x	1	1.28	x	0.77	7	x	0.8	=	4.	.26	(75)
Northeast 0.9x	0.54	x	0.:	27	x	1	1.28	x	0.77	7	x	0.8	=	0.	.91	(75)
Northeast 0.9x	0.54	x	0.:	27	x	2	2.97	x	0.77	7	x	0.8	=	1.	.86	(75)
Northeast 0.9x	0.54	x	1.:	26	x	2	2.97	x	0.77	7	x	0.8	=	8.	.66	(75)
Northeast 0.9x	0.54	x	0.:	27	x	2	2.97	x	0.77	7	x	0.8	=	1.	.86	(75)
Northeast 0.9x	0.54	x	0.	27	x	4	1.38	x	0.77	7	x	0.8	=	3.	.34	(75)
Northeast 0.9x	0.54	x	1.:	26	x	4	1.38	x	0.77	7	x	0.8	=	15	5.61	(75)
Northeast 0.9x	0.54	x	0.	27	x	4	1.38	x	0.77	7	x	0.8		3.	.34	(75)
Northeast 0.9x	0.54	×	-0.	27	х	6	7.96	x	0.77	7	x	0.8	=	5.	.49	(75)
Northeast 0.9x	0.54	×	1.	26	х	6	7.96	×	0.77	7	x	0.8	=	25	5.63	(75)
Northeast 0.9x	0.54	x	0.2	27	x	6	7.96	x	0.77	7	x	0.8	=	5.	.49	(75)
Northeast 0.9x	0.54	x	0.	27	x	9	1.35	×	0.7	7	x	0.8	=	7.	.38	(75)
Northeast 0.9x	0.54	x	1.:	26	x	9	1.35	x	0.77	7	x	0.8	=	34	.46	(75)
Northeast 0.9x	0.54	x	0.:	27	х	9	1.35	x	0.77	7	x	0.8	=	7.	.38	(75)
Northeast 0.9x	0.54	x	0.	27	x	9.	7.38	x	0.77	7	x	0.8	=	7.	.87	(75)
Northeast 0.9x	0.54	x	1.:	26	x	9	7.38	x	0.77	7	x	0.8	=	36	6.73	(75)
Northeast 0.9x	0.54	x	0.	27	x	9	7.38	x	0.77	7	x	0.8	=	7.	.87	(75)
Northeast 0.9x	0.54	x	0.	27	x	9	1.1	x	0.77	7	x	0.8	=	7.	.36	(75)
Northeast 0.9x	0.54	x	1.:	26	x	g	1.1	x	0.77	7	x	0.8	=	34	.36	(75)
Northeast 0.9x	0.54	x	0.	27	x	9	1.1	x	0.77	7	x	0.8	=	7.	.36	(75)
Northeast 0.9x	0.54	x	0.	27	x	7	2.63	x	0.77	7	x	0.8	=	5.	.87	(75)
Northeast 0.9x	0.54	x	1.:	26	x	7:	2.63	x	0.77	7	x	0.8	=	2	7.4	(75)
Northeast 0.9x	0.54	x	0.	27	x	7:	2.63	x	0.77	7	x	0.8	=	5.	.87	(75)
Northeast 0.9x	0.54	x	0.	27	x	5	0.42	x	0.77	7	x	0.8	=	4.	.08	(75)
Northeast 0.9x	0.54	x	1.:	26	x	5	0.42	x	0.77	7	x	0.8	=	19	.02	(75)
Northeast 0.9x	0.54	x	0.:	27	x	5	0.42	x	0.77	7	x	0.8	=	4.	.08	(75)
Northeast 0.9x	0.54	x	0.2	27	x	2	8.07	x	0.77	7	x	0.8	=	2.	.27	(75)
Northeast 0.9x	0.54	x	1.:	26	x	2	8.07	x	0.77	7	x	0.8	=	10).59	(75)
Northeast 0.9x	0.54	x	0.:	27	x	2	8.07	x	0.77	7	x	0.8	=	2.	.27	(75)
Northeast 0.9x	0.54	x	0.2	27	x	1	4.2	x	0.77	7	x	0.8	=	1.	.15	(75)
Northeast 0.9x	0.54	x	1.:	26	x	1	4.2	x	0.77	7	x	0.8	=	5.	.36	(75)

Northeast 0.9x	0.54) ×	0.27	x	14.2	×	0.77	x	0.8	=	1.15	(75)
L Northeast 0.9x	0.54] x	0.27	x	9.21	l 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	ĺ	0.77	x	0.8	=	35.25	(79)
Southwest _{0.9x}	0.54	×	1.6	x	62.67	ĺ	0.77	x	0.8	=	60.04	(79)
Southwest0.9x	0.54	x	1.6	x	85.75	ĺ	0.77	x	0.8	=	82.15	(79)
Southwest _{0.9x}	0.54	x	1.6	x	106.25	ĺ	0.77	x	0.8	=	101.79	(79)
Southwest _{0.9x}	0.54	x	1.6	x	119.01	İ	0.77	x	0.8	=	114.01	(79)
Southwest0.9x	0.54	×	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	×	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	×	3.21	X	11.28	x	0.77	×	0.8	=	10.84	(81)
Northwest 0.9x	0.54	x	3.37	x	22.97	x	0.77	×	0.8	=	23.17	(81)
Northwest 0.9x	0.54	x	3.21	x	22.97	×	0.77	x	0.8	=	22.07	(81)
Northwest 0.9x	0.54	x	3.37	×	41.38	×	0.77	x	0.8	=	41.75	(81)
Northwest 0.9x	0.54	×	3.21	x	41.38	х	0.77	x	0.8	=	39.76	(81)
Northwest 0.9x	0.54	×	3.37	x	67.96	×	0.77	x	0.8	=	68.56	(81)
Northwest 0.9x	0.54	x	3.21	x	67.96	×	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	×	0.77	x	0.8	=	87.78	(81)
Northwest 0.9x	0.54	×	3.37	x	97.38	×	0.77	x	0.8	=	98.25	(81)
Northwest 0.9x	0.54	x	3.21	x	97.38	×	0.77	x	0.8	=	93.59	(81)
Northwest 0.9x	0.54	×	3.37	x	91.1	×	0.77	x	0.8	=	91.91	(81)
Northwest 0.9x	0.54	×	3.21	x	91.1	×	0.77	x	0.8	=	87.55	(81)
Northwest 0.9x	0.54	x	3.37	x	72.63	×	0.77	X	0.8	=	73.27	(81)
Northwest 0.9x	0.54	×	3.21	x	72.63	×	0.77	x	0.8	=	69.79	(81)
Northwest 0.9x	0.54	×	3.37	x	50.42	×	0.77	X	0.8	=	50.87	(81)
Northwest 0.9x	0.54	X	3.21	x	50.42	×	0.77	x	0.8	=	48.45	(81)
Northwest 0.9x	0.54	×	3.37	x	28.07	×	0.77	X	0.8	=	28.32	(81)
Northwest 0.9x	0.54	x	3.21	x	28.07	×	0.77	X	0.8	=	26.97	(81)
Northwest 0.9x	0.54	×	3.37	x	14.2	×	0.77	x	0.8	=	14.32	(81)
Northwest 0.9x	0.54	×	3.21	x	14.2	×	0.77	x	0.8	=	13.64	(81)
Northwest 0.9x	0.54	×	3.37	x	9.21	×	0.77	x	0.8	=	9.3	(81)
Northwest 0.9x	0.54	×	3.21	x	9.21	×	0.77	x	0.8	=	8.85	(81)
Rooflights 0.9x	1	x	2.25	x	26	×	0.77	x	0.7	=	28.38	(82)

Rooflights 0.9x 1	×	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	×	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	×	0.7	=	13.51	(82)
Rooflights 0.9x 1	x	0.29	×	96	×	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	x	2.25	x	150	x	0.77	×	0.7	=	163.72	(82)
Rooflights 0.9x 1	×	0.29	x	150	x	0.77	×	0.7	=	21.1	(82)
Rooflights 0.9x 1	×	0.29	×	150	x	0.77	×	0.7	=	42.2	(82)
Rooflights 0.9x 1	x	2.25	x	192	x	0.77	×	0.7	=	209.56	(82)
Rooflights 0.9x 1	×	0.29	×	192	x	0.77	×	0.7	=	27.01	(82)
Rooflights 0.9x 1	×	0.29	×	192	x	0.77	×	0.7	=	54.02	(82)
Rooflights 0.9x 1	x	2.25	X	200	x	0.77	×	0.7	=	218.29	(82)
Rooflights 0.9x 1	×	0.29] ×	200] ×	0.77	×	0.7	=	28.14	(82)
Rooflights 0.9x 1	x	0.29] ×	200] x	0.77	×	0.7	=	56.27	(82)
Rooflights 0.9x 1	×	2.25	×	189	x	0.77	x	0.7	=	206.29	(82)
Rooflights 0.9x 1	ا× ٦	0.29] x	189] x	0.77	x	0.7	=	26.59	(82)
Rooflights 0.9x 1	×	0.29	x	189	ī 🔊	0.77	x	0.7	=	53.18	(82)
Rooflights 0.9x 1	×	2.25	x	157] x	0.77	x	0.7	=	171.36	(82)
Rooflights 0.9x 1	×	0.29	x	157	x	0.77	x	0.7	=	22.09	(82)
Rooflights 0.9x 1	x	0.29] x	157	×	0.77	x	0.7	=	44.17	(82)
Rooflights 0.9x	×	2.25	×	115	x	0.77	x	0.7	=	125.52	(82)
Rooflights 0.9x 1	×	0.29	×	115	x	0.77	×	0.7	=	16.18	(82)
Rooflights 0.9x 1	×	0.29	×	115	x	0.77	×	0.7	=	32.36	(82)
Rooflights 0.9x 1	x	2.25] ×	66] x	0.77	×	0.7	=	72.04	(82)
Rooflights 0.9x 1	×	0.29	x	66	_ x	0.77	×	0.7	=	9.28	(82)
Rooflights 0.9x 1	×	0.29	×	66	x	0.77	×	0.7	=	18.57	(82)
Rooflights 0.9x 1	×	2.25] ×	33	x	0.77	×	0.7	=	36.02	(82)
Rooflights 0.9x 1	x	0.29	×	33	x	0.77	- x	0.7	=	4.64	(82)
Rooflights 0.9x 1	x	0.29] ×	33	x	0.77	×	0.7	=	9.28	(82)
Rooflights 0.9x 1	×	2.25] ×	21	x	0.77	- x	0.7	=	22.92	(82)
Rooflights 0.9x 1	x	0.29	×	21	x	0.77	- x	0.7	=	2.95	(82)
Rooflights 0.9x 1	x	0.29	×	21	x	0.77	×	0.7	=	5.91	(82)
			-		-		_				
Solar gains in watts, calcu	lated	for each mon	th		(83)m	n = Sum(74)m	(82)m			-	
	1.26	499.3 633.7		60.21 623.73	519	.83 389.5	236.66	6 127.78	85.07		(83)
Total gains – internal and		. , ,	`	i	1				1	1	
(84)m= 552.57 645.14 76	0.22	902.52 1010.8	35 10	963.28	866	.59 751.09	624.17	7 544.1	523.12	J	(84)
7. Mean internal tempera	ature	(heating sease	on)								
Temperature during hea	ting p	eriods in the li	ving	area from Tal	ble 9	, Th1 (°C)				21	(85)
											_

Sep

Aug

Oct

Nov

Dec

Mar

Feb

Jan

Utilisation factor for gains for living area, h1,m (see Table 9a)

Apr

May

Jun

Jul

(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	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 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)
Temp	erature	durina h	neating p	eriods ir	n rest of	dwellina	from Ta	able 9, Ti	h2 (°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)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e 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	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 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)
l									f	iLA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fL	Δ) ¥ T2			I		
(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)
	adjustn	nent to t	L he mear	interna	l temper	i ature fro	n Table	4e, whe	ere appro	opriate				
(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. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	_
the ut			<u> </u>	using Ta	i				0		NI.	D		
Litilion	Jan	Feb tor for g	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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)
				4)m x (84										
(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)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 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			r	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			L	
(97)m=		1190.82		893.8	675.37	439.38	280.23	295.65	480.19	750.41	1008.67	1226.39]	(97)
•		<u> </u>	i	1	· · ·	i	i	24 x [(97]	í Ó	<u> </u>	<i>′</i>			
(98)m=	505.75	370.9	255.96	84.63	13.4	0	0	0	0	126.34	338.1	524.24		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2219.33	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								39.27	(99)
9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-			la sur la							1		
				econdar		mentary	system		(004)				0	(201)
				nain syst				(202) = 1 -					1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space	e heatin	g require	ement (c	alculate	d above))								
	505.75	370.9	255.96	84.63	13.4	0	0	0	0	126.34	338.1	524.24		
(211)m	ı = {[(98)m x (20	4)] + (2′	l0)m } x	100 ÷ (2	06)							1	(211)
	542.07	397.54	274.34	90.71	14.36	0	0	0	0	135.41	362.38	561.89		_
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2378.7	(211)

Space heating fuel (secondary), kWh/month

Space heating fuel (secondary), kWh/mc								
$= \{ [(98)m \times (201)] + (214)m \} \times 100 \div (208) $ $(215)m = 0 \qquad 0 \qquad 0 \qquad 0$	3) 0 0	0 0	0	0	0	0		
	0 0		al (kWh/yea	÷	-	-	0	(215)
Water heating					715,101	2	0	(210)
Output from water heater (calculated abov	/e)							
	34.95 118.86	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 8	1.02 80.2	80.2 80.2	80.2	84.59	86.85	87.61		(217)
Fuel for water heating, kWh/month $(210)m = (64)m \times 100 \div (217)m$								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 197.63 173.37 182.37 166.45 1	66.57 148.2	141.99 158.28	160.03	172.78	179.63	192.73		
		Tot	al = Sum(2	19a) ₁₁₂ =			2040.02	(219)
Annual totals				k	Wh/yea	r	kWh/yea	ur
Space heating fuel used, main system 1							2378.7	
Water heating fuel used							2040.02	
Electricity for pumps, fans and electric kee	ep-hot							
mechanical ventilation - balanced, extract	t or positive i	nput from outsid	е			109.36		(230a)
central heating pump:						120		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sun	n of (230a).	(230g) =			274.36	(231)
Electricity for lighting							258.35	(232)
Electricity for lighting Electricity generated by PVs								
Electricity generated by PVs	ms:			1			258.35 -690.9	(232) (233)
							-690.9	(233)
Electricity generated by PVs	Fu			Fuel P (Table			-690.9 Fuel Cost	(233)
Electricity generated by PVs 10a. Fuel costs - individual heating syste	Fu kV	lel Vh/year 1) x		(Table	12)	× 0.01 =	-690.9 Fuel Cost £/year	(233)
Electricity generated by PVs 10a. Fuel costs - individual heating syste Space heating - main system 1	Fu kW (21	/h/year		(Table	12) .8	x 0.01 = x 0.01 =	-690.9 Fuel Cost £/year 82.7787	(233)
Electricity generated by PVs 10a. Fuel costs - individual heating syste	Fu kW (21 (21)	Vh/year 1) x		(Table 3.4	12) ⁸		-690.9 Fuel Cost £/year 82.7787 0	(233) (240) (241)
Electricity generated by PVs 10a. Fuel costs - individual heating syste Space heating - main system 1 Space heating - main system 2 Space heating - secondary	Fu kW (21 (21)	Vh/year 1) x 3) x 5) x		(Table 3.4 0 13.	12) 8 19	x 0.01 =	-690.9 Fuel Cost £/year 82.7787 0 0	(233) (240) (241) (242)
Electricity generated by PVs 10a. Fuel costs - individual heating syste Space heating - main system 1 Space heating - main system 2	Fu kW (21 (21)	Vh/year 1) x 3) x 5) x 9)		(Table 3.4	12) 8 19 8	x 0.01 = x 0.01 =	-690.9 Fuel Cost £/year 82.7787 0	(233) (240) (241)
Electricity generated by PVs 10a. Fuel costs - individual heating system Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot	Fu kW (21 (21) (21) (21) (23)	Vh/year 1) x 3) x 5) x 9) 1)	and apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 8 19	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	-690.9 Fuel Cost £/year 82.7787 0 0 70.99 36.19	(233) (240) (241) (242) (247)
Electricity generated by PVs 10a. Fuel costs - individual heating system Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel)	Fu kW (21 (21) (21) (21) (23)	Vh/year 1) x 3) x 5) x 9) 1) y as applicable a	and apply	(Table 3.4 0 13. 3.4 13.	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	-690.9 Fuel Cost £/year 82.7787 0 0 70.99 36.19	(233) (240) (241) (242) (247)
Electricity generated by PVs 10a. Fuel costs - individual heating system Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230	Fu kW (21 (21) (21) (21) (23) (23) (23)	Vh/year 1) x 3) x 5) x 9) 1) y as applicable a	and apply	(Table 3.4 0 13. 3.4 13. / fuel priv	12) 8 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to 7	690.9 Fuel Cost £/year 82.7787 0 70.99 36.19 able 12a	(233) (240) (241) (242) (247) (249)
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Electricity generated by PVs 10a. Fuel costs - individual heating system Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230a) Energy for lighting	Fu KW (21 (21) (21) (23) Og) separately (23)	Vh/year 1) x 3) x 5) x 9) 1) y as applicable a e of (233) to (235) x)	and apply	(Table 3.4 0 13. 3.4 13. 7 fuel pri 13.	12) 8 19 19 19 10 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to 7 x 0.01 =	-690.9 Fuel Cost £/year 82.7787 0 0 70.99 36.19 able 12a 34.08 120	(233) (240) (241) (242) (247) (249) (250) (250) (251)
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Electricity generated by PVs 10a. Fuel costs - individual heating system Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (230 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and Total energy cost	Fu kW (21 (21) (21) (21) (23) Og) separately (23) Og) separately (23) (254) as need (254) as need	Vh/year 1) x 3) x 5) x 9) 1) y as applicable a 2) e of (233) to (235) x) ded	and apply	(Table 3.4 0 13. 3.4 13. 7 fuel pri 13.	12) 8 19 19 19 10 19 10 10 10 10 10 10 10 10 10 10 10 10 10	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to 7 x 0.01 =	690.9 Fuel Cost £/year 82.7787 0 70.99 36.19 able 12a 34.08 120 -91.13	(233) (240) (241) (242) (247) (249) (249) (250) (251) (252)

Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =		1.05 (257)
SAP rating (Section 12)			85.4 (258)
12a. CO2 emissions – Individual heating sys	stems including micro-C	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-h	not (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 m ²		(272) ÷ (4) =	15.43 (273)
El rating (section 14) 13a. Primary Energy	Energy kWh/year	Primary factor	88 (274) 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-h	not (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.

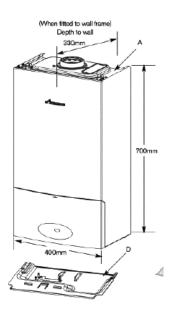


Figure 12 Typical Boiler dimension. Allow 300mm for flue above boiler.

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.

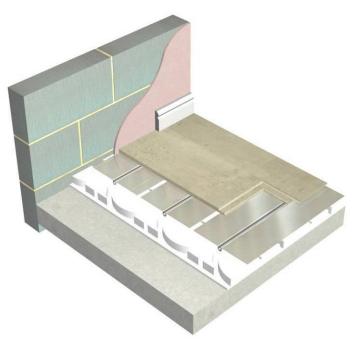


Figure 13 Brio Board System from Knauf/Warmafloor.

Typical Design Parameters will be as follows:-

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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 Corridor	21°c 21°c	+/- 2	Thermostat within towel rail 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		8I/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	4I/s	

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

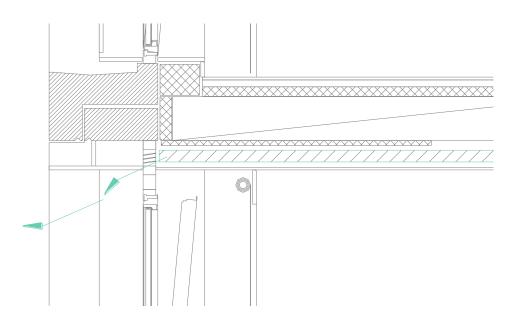


Figure 15 An example of a ventilation grill above a window detail

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:

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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.

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

Reduction of CO2 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.

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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

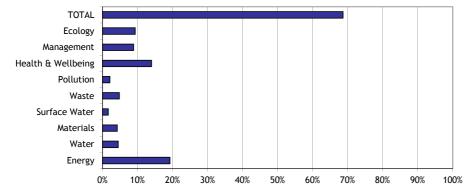
breglobal

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:	

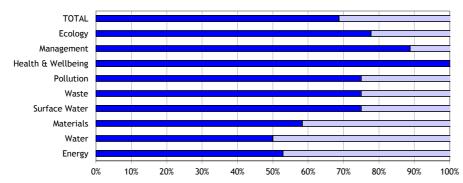
PREDICTED RATING - CODE LEVEL: 4

Mandatory Re	quirements:	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.

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CATEGORY	1 ENERGY	Overall Level: 4		Overall Score	68.71		Evidence Required
% of Section	on Credits Predicted:	52.90		Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if
Contributi	on to Overall % Score:	19.25 points		16.4 of 31 Credits	Level 4		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				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		
		e predicted number of credits? 4. et CO ₂ emissions achieved?		4.1 of 10 Credits	Level 4		
Ene 2 Fabric Energy Efficiency	(kWh/m ² /yr) of the d 5 and 6. The Code predicted score. Enter the predicted s Apartment OR End terrac OR Staggered What is th	s, Mid-terrace O e, Semi and Detached O Mid terrace © e predicted number of credits? 3.	de levels culate a	3.3 of 9 Credits	-		SAP code Compliance document
Ene 3 Energy Display Devices	Device is installed mo consumption. Select whether the E None Spec Primary Ho OR Electricity	eating only O		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 O	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 <u>only</u> 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	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 O OR 10% of demand or greater O 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*	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 OR	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		Evidence Required
_	n Credits Predicted: 50.00	Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if
Contributi	on to Overall Score: 4.50 points	3 of 6 Credits	Level 4		required.)
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 \bigcirc OR \leq less than 120 litres/ person/ day \bigcirc OR \leq less than 100 litres/ person/ day \bigcirc OR \leq less than 105 litres/ person/ day \bigcirc OR \leq less than 90 litres/ person/ day \bigcirc OR \leq less than 80 litres/ person/ day \bigcirc		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 O OR Outdoor space with collection system O OR Outdoor space without collection system •		-	There is no rainwater collection system.	

	Y 3 MATERIALS	Overall Level: 4	Overall Score	-		Evidence Required
-	on Credits Predicted: 5 on to Overall Score: 4		Credits 14 of 24 Credits	Level All Levels	Assumptions Made	(The below cells can be formatted by assessors if required.)
Mat 1 Environm- ental Impact of Materials	elements must achieve <u>Tradable</u> <u>Credits:</u> Point Green Guide Rating of Calculator can be used t Mandatory Requirement	At least three of the five key building a Green Guide 2008 Rating of A+ to D. s are awarded on a scale based on the the specifications. The Code Materials o predict a potential score.			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.
	Enter the predicted scor		10 of 15 Credits	All Levels		
Mat 2 Responsible Sourcing of Materials - Basic Building Elements	elements are responsibl can be used to predict a Enter the predicted Scor	•	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	elements are responsibl can be used to predict a Enter the predicted Scor	•	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 SURFAC	CE WATER RUN-OFF Overall Le	vel: 4	Overall Score	68.71		Evidence Required
% of Sectio	n Credits I	Predicted: 75.00%		Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if
Contributio		all Score: 1.65 points		3 of 4 Credits	All Levels		required.)
Sur 1 Management of Surface Water Run-off from developments	Mandator no great developm rainwater reduced criteria. local drai used to ir protecting Manda	y <u>Requirement</u> : Peak rate of run-off into ver er for the developed site than it was eent site and that the additional predic r discharge caused by the new developm as far as possible in accordance with t Desiging the drainage system to be able inage system failure. <u>Tradable Credits</u> : W mprove water quality of the rainwater dis g the quality of the receiving waters. atory Requirement	for the pre- ted volume of ent is entirely he assessment to cope with here SUDS are charged or for	1 of 2 Credits		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	low flood appropria property the techn Select OR OR	re awarded where developments are loca d risk or where in areas of medium or l ate measures are taken to prevent da and its contents in accordance with the C nical guide. t the annual probability of flooding (from PPS25*) Zone 1 - Low Zone 2 - Medium Zone 3 - High t the apropriate option(s) Low risk of flooding from FRA** All measures of protection	nigh flood risk amage to the ode criteria in O O are	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.
	-	demonstrated in FRA Ground floor level and access routes are mm above design flood level Policy Statement 25 - Planning and Flood Risk od Risk Assessment	600 □				

% of Section Credits Predicted: 75.00% Credits Level Assumptions Made (The below cell Contribution to Overall Score: 4.80 points 6 of 8 Credits All Levels All Levels	cells can be formatted by assessors if
Contribution to Overall Score: 4.80 points 6 of 8 Credits All Levels	
	required.)
	ge detailed documentary evidence is
	ed. Architect to specify location on
his development compties with the waste plan drawings, a	s, and size of main bins for council
recyclable from BS 5906. Tradable Credits are awarded for adequate collection. Prov	ovide details of council recycling
	struction photographic evidence.
waste 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	
0 of 2 Credits	
Internal storage (capacity 60 litres)	
Local Authority collection Scheme	
Post Collection sorting	
Internal storage (capacity 30 litres)	
Pre-collection sorting	
Internal storage (3 separate bins, capacity 30 litres)	
External Storage, no Local Authority collection scheme	
3 separate internal storage bins	
(capacity 30 litres)	
AND	
Houses	
External Storage(capacity 180 litres) O of 4 Credits	
Flats	
Private recycling operator	
3 or greater types of waste collected	

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	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.

CATEGOR	Y 6 POLLU	TION Overall Level:	4	Overall Score	68.71		Evidence Required
_	% of Section Credits Predicted: 75.00%		Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if	
Contribut	ion to Over	all Score: 2.10 points		3 of 4 Credits	All Levels		required.)
Pol 1 Global Warming Potential (GWP) of Insulants	substance less than !	is awarded where <u>all</u> insulating materials s (in manufacture AND installation) that have 5. the most appropriate option All insulants have a GWP less than 5 Some insulants have a GWP of less than 5 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	NOx Emissions 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		thin the	2 of 3 Credits			Information provide in M&E and Architects specification documents.
	OR	Less than 40 mg/kWh	0				
	OR	Class 4 boiler	0				
	OR	Class 5 boiler	۲				
	OR	All space and hot water energy requirements are met by systems who do not produce NOx emissions					

% of Section	7 HEALTH & WELLBEING Overall Level: 4 on Credits Predicted: 100.00% on to Overall Score: 14.00 points	Overall Score Credits 12 of 12 Credits	Level	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
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 <u>Room</u> 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% Study*: Avg DF of at least 1.5% 80% of working plane in all above rooms receive direct light from the sky?	3 of 3 Credits	-	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	ł		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.
	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 Select a performance standard Select a performance standard Airborne: 3db higher; Impact: 3dB lower OR Airborne: 8db higher; Impact: 8dB lower OR 	4 of 4 Credits	-		

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 O		-	The design allows for a small 6.3m ² courtyard outside the living room.	Courtyard areas shown on plan drawings. Photographic evidence at construction stage.
Hea 4 Lifetime Homes	Mandatory Requirement: Lifetime Homes is mandatory when a dwelling is to achieve Code Level 6. Tradable credits: Credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Mandatory Requirement		No level		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 Overall Level: 4		Overall Score 68.71			Evidence Required	
% of Section Credits Predicted: 88.00%		Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if	
	ion to Overall Score: 8.88 points		8 of 9 Credits	All Levels		required.)
Man 1 Home User Guide	Credits are awarded where a simp dwelling covering information relu- home occupier, in accordance with Tick the topics covered by the Home U: Operational Issues? Site and Surroundings? Is available in alternative	evant to the 'non-technical' the Code requirements. ser Guide	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	Credits are awarded where there is				As a condition of the contractors employment.	Design stage specification clause or other confirmation
Considerate Constructors	with best practice site management Considerate Constructors Scheme or				Specification clause or other confirmation of commitment from the contractor or developer to	of commitment from the contractor or developer to comply with the Considerate Constructors Scheme and
Scheme	nationally recognised scheme.				comply with the Considerate Constructors Scheme and	achieve formal certification under the scheme with
	Select the appropriate scheme and sco	re			achieve formal certification under the scheme. Target	either a pass score or a score of 32 points and above
					32 to 40 points	AND Confirmation that registration with the Considerate
	No scheme used	0				Constructor Scheme has taken place no later than the
	Considerate Constructors	•				commencement of the construction phase
	OR Best Practice	0				
	OR Significantly Beyond Best	Practice 🔘	2 of 2 Credits	-		
	Alternative Scheme*					
	OR Mandatory + 50% optional OR Mandatory + 80% optional	•				
	* In the first instance, contact a Code S considering to use an alternative schem					
Man 3	Credits are awarded where there is				As condition of the employment of the contractor, will	Design stage completed copy of Checklist Man 3
Construction Site Impacts	to operate site management procedures on site as following: Tick the impacts that will be addressed				provide details of the monitoring of energy and water use on the site. The contractor will be required to	(signed and dated) detailing the procedures that will be employed to minimise construction site impacts.
	Monitor, report and applicable, for:	<u>set targets, where</u>			adopt best practise for reducing dust and water pollution from the site.	Construction stage: Documentary evidence demonstrating that the procedures detailed in Checklist Man 3* have been achieved.
	- CO ₂ / energy use from site	e activities 🗸				* Checklist Man 3 can be completed on a site wide
	- CO ₂ / energy use from site	e related transport 🔽				basis with monthly reviews.
	- water consumption from	site activities 🗸				
	Adopt best practice polic	cies in respect of:	1 of 2 Credits	-		
	- air (dust) pollution from	site activities				
	water (ground and surfac	e) pollution on site				
	<u>80% of site timber</u> is rec responsibly sourced	claimed, re-used or				

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			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
	Credit not sought OR Secured by Design Section 2 Compliance	2 of 2 Credits	-		

CATEGORY	9 ECOLOGY	Overall Level: 4	Overall Score	68.71		Evidence Required
% of Section Credits Predicted: 77.00%		Credits	Level	Assumptions Made	(The below cells can be formatted by assessors if	
Contribution to Overall Score: 9.33 points		7 of 9 Credits	All Levels		required.)	
Eco 1 Ecological Value of Site	Select the appropriat Credit not OR Land has e	sought cological value	w value. ○ ○ ● ■ 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
	whole development site; c and can confirm or c) prod the construction zone is	etermined either a) by using Checklist Eco 1 or b) where an suitably qualified ecologist is uces an independent ecological report of the of low/ insignificant value; AND the re in undisturbed by the works.	appointed site, that			
Eco 2 Ecological Enhancement	ecological value of th Tick the appropriate Will a S appointed ecological AND Will all ke	boxes uitably Qualified Ecologist be to recommend appropriate features? [✓ 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	adequately protect fe Type and protection Site with f OR Site of low AND All* existin site works protected *If a suitably qualified ecol	eatures of ecological value? (v ecological value (as Eco 1)? (ng features potentially affected by s are maintained and adequately cogist has confirmed that a feature can be re- ralue or poor health conditions, as long all the	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 O Minor negative change: between -9 and -3 O OR Neutral: between -3 and +3 O Minor enhancement: between +3 and +9 O Major enhancement: greater than 9 O	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	Building dwellings on the site to their footprint is:			The site has been predicted to achieve the required foot print ratio for a two storey single dwelling.	Provide calculation of building footprint.