ENERGY & SUSTAINABILITY STATEMENT

(To Accompany Planning Application)

Site
LAND BETWEEN SOUTH MANSIONS AND GONDAR HOUSE, WEST HAMPSTEAD, LONDON NW6 1QF

Proposal
CONSTRUCTION OF FOUR DWELLINGS

Client
AN:X DEVELOPMENTS

20th MAY 2021
Ref. E1099-ESS-01

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1.0 INTRODUCTION

a) Doherty Energy Limited have been instructed by AN:X Developments to prepare an Energy and Sustainability Statement to support the submission of the planning application for the development at Land between Gondar House and South Mansions, West Hampstead, London NW6 1QF. This report must be read in conjunction with the application forms, certificates, detailed plans and other supporting documents submitted to the Local Authority as part of the application.

b) The Application is for the construction of four dwellings, consisting of two houses and two flats, in a single block.

c) The objectives of this Energy and Sustainability Statement are to outline the possible measures that can be incorporated into the development during detailed design, to make an appraisal of the carbon dioxide emissions of the proposed development, assess the potential fabric and building services efficiencies to reduce the carbon dioxide emission and to suggest the most appropriate means by which the development can contribute towards the aspiration of policy relating to reducing carbon dioxide emissions and energy consumption. It also investigates the water usage of the development with a view to reducing the water consumption of the dwellings.

d) The Assessment shall be carried out following the principles set out in the “Energy Hierarchy”. These principles can be summarised as follows:

- Be Lean –use less energy
- Be Clean – supply energy efficiently
- Be Green – use renewable energy

e) At this stage in the design of the development, the detailed Building Regulations construction information has not been prepared and therefore following detailed construction design, the energy calculations will be revisited to ensure the energy requirements and carbon dioxide emissions are up to date.

f) In order to demonstrate the carbon dioxide emissions, it is proposed to use the Standard Assessment Procedure (SAP) for the calculations to obtain initial baseline carbon dioxide emissions figures for the dwellings.

g) Further calculations will be used to demonstrate the potential carbon dioxide emission savings from the initial calculations by enhancements to the building fabric, plant and controls – BE LEAN. The suitability of supplying energy, both heat and power, through the use of a combined heat and power system shall be assessed – BE CLEAN. Finally, the carbon dioxide emission saving by the use of renewable energy shall be assessed through the outputs from the SAP calculation – BE GREEN.

2.0 POLICY CONTEXT

a) The London Borough of Camden and the Greater London Authority aim to tackle the causes of climate change in the borough and London as a whole by ensuring developments use less energy and assess the feasibility of decentralised energy and renewable energy technologies.

b) As any new development has the potential to increase carbon dioxide emissions and if local and national carbon dioxide reduction targets are to be met, it is crucial that planning policy limits carbon dioxide emissions from new development wherever possible.

c) The Camden Local Plan has policies with regard to sustainability and climate change, including Policy CC1 – Climate change mitigation and Policy CC2 – Adapting to climate change

d) Under Policy CC1 – Climate change mitigation, the Local Authority require all developments to help minimise their effects on climate change by encouraging them to meet the highest feasible environmental standards that are financially viable during the construction and occupation of the development.

e) The Policy CC1 states that Camden will:

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

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

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

d. support and encourage sensitive energy efficiency improvements to existing buildings;

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

f. expect all developments to optimise resource efficiency.

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

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

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

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

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

f) The London Borough of Camden's Sustainability Plan 'Green Action for Change' commits the Local Authority to seek low and where possible zero carbon buildings. New developments in Camden will be expected to be designed to minimise energy use and carbon dioxide emissions in operation through the application of the energy hierarchy. This is in line with the requirements of the London Plan.

g) The Great London Authority, through the London Plan, March 2021, will require developments to contribute towards London's ambitious target to become zero-carbon by 2050 by increasing energy efficiency, including through the use of smart technologies, and utilising low carbon energy sources.

h) The London Plan, March 2021, Policy SI 2 – Minimising greenhouse gas emissions, expects development proposals to be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the energy hierarchy:

- Be Lean – use less energy and manage demand during operation
- Be Clean – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

- Be Green – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- Be Seen – monitor, verify and report on energy performance

i) The Policy SI 2 sets a minimum on-site reduction of at least 35 per cent beyond Building Regulations for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures.

j) must be ring-fenced to implement project that deliver carbon reductions.

k) The Energy and Sustainability Statement follows the principles set out in the Energy Hierarchy and is broken down to provide the following details:

1. Estimated site-wide regulated carbon dioxide emissions and reductions (broken down for the domestic and non-domestic elements), expressed in tonnes per annum, after each stage of the energy hierarchy
2. A clear commitment to regulated carbon dioxide emissions savings compared to a Part L 2013 of the Building Regulations compliant development through energy demand reduction measures alone
3. Clear evidence that the risk of overheating has been mitigated through passive design
4. Evidence of investigation into existing or planned district heating networks that the development could be connected to, including relevant correspondence with local heat network operators
5. Commitment to a site heat network served by a single energy centre linking all apartments and non-domestic building uses, if appropriate for the development
6. Where applicable, investigations of the feasibility of installing CHP in the proposed development (if connection can't be made to an area wide network) before considering renewables
7. An initial feasibility test for renewable energy technologies and, where appropriate, commitment to further reduce carbon dioxide emissions through the use of onsite renewable energy generation

l) Developments are expected to achieve carbon reductions beyond Approved Document L from energy efficiency measures alone to reduce energy demand as far as possible. Residential development should achieve 10 per cent and non-residential development should achieve 15 per cent over Approved Document L.

m) The aim of the Energy and Sustainability Statement is to meet the carbon dioxide reduction targets on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, as per the requirements of The London Plan, any shortfall may be provided off-site or through a “cash in lieu” contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

n) Under The London Plan Policy SI 3 – Energy Infrastructure, the Mayor expects developments to investigate the use of heat networks, particularly for large scale developments. Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating systems. Where no heat network is not in existence yet, the development should be designed to allow for the cost effective connection at a later date. The heat network should achieve good practice design and specification standards.

o) Policy SI 4 – Managing Heat Risk, requires developments to minimise adverse impacts of the urban heat island through design, layout, orientation , materials and the incorporation of green infrastructure. Developments should demonstrate the potential for internal overheating and reliance on air conditioning systems can be minimised in accordance with the following cooling hierarchy:

1. reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2. minimise internal heat generation through energy efficient design
3. manage the heat within the building through exposed internal thermal mass and high ceilings
4. provide passive ventilation

5. provide mechanical ventilation
6. provide active cooling systems

p) The Policy SI 5 – Water Infrastructure, seeks to minimise the use of potable water supplies and promote improvements in the water supply infrastructure. Developments should minimise the use of mains potable water in line with the Optional Requirements of the Approved Document G of the Building Regulations by achieving water consumption of less than 105 litres per person per day, excluding an allowance of 5 litres for external water consumption.

3.0 SUSTAINABLE DESIGN AND CONSTRUCTION ASSESSMENT

a) The building fabric, the building services and the management of the building broadly determines its energy usage. The detailed design of a building is an iterative process, often requiring the involvement of different professional disciplines to establish the fundamental objectives of the design. An overall design philosophy in this respect has been established at an early stage.

b) As a result of central Government objectives, followed through at local level the general design philosophy for this site has a strong emphasis on sustainable design. This is not only in terms of the location and suitability of the site but also in relation to the way in which the building is constructed and will be used by its future occupants.

c) The first step in developing an integrated design is to establish the function of the buildings envelope and how it interacts with the usage patterns of the building and the technology used to condition the individual spaces.

d) Good fabric design can minimize the need for services. Where appropriate, designs should avoid simply excluding the environment, but should respond to factors like weather and occupancy and make good use of natural light, ventilation, solar gains and shading, where they are beneficial.

e) This section of the report will look at the ways in which energy is used within the proposed building and how the design can encourage efficient levels of energy consumption.

3.1 Management

a) Although improvements can be made to the fabric and services of a building, often the biggest impact on the day-to-day energy consumption is influenced by the way in which the building is managed. It is common to find well-designed buildings operating badly due to poor management. Conversely, poorly designed buildings can be optimised to their maximum efficiency through good management practices.

b) It is recommended that due consideration is given to the management strategy of the building. It is understood that the dwelling will be within private ownership. However, there is still an opportunity to provide for the most efficient management system and to encourage the future occupants to manage their homes efficiently.

c) This may include the use of movement sensor switched lighting systems, the installation of energy efficient electrical appliances, efficient lighting and fittings that do not permit the use of non-efficient lamps, tightly controlled heating and ventilation specific to the location within the dwelling, installation of efficient hot water systems and the provision of recycling facilities.

d) The EU energy efficiency labelling scheme rates products from A (the most efficient) to G (the least efficient). For refrigeration, the scale now extends to A++. The occupants of the dwelling shall be provided with information on the EU Energy Efficiency Labelling Scheme so that they are informed of the benefits of the scheme.

3.2 Ventilation

a) Natural ventilation is the most energy efficient form of ventilating any space. The proposed use and traditional architectural design of this building enables it to make best use of natural ventilation via openable windows.

b) Horizontal pivoted windows produce the most effective ventilation because of their inherent characteristic to develop large openings, where air will tend to enter at the lower level and exit via the top. They are easily adjustable to provide control and reduce the amount of energy required to run and maintain artificial ventilation systems. Normal casement windows can provide a degree of natural ventilation and with the layout of the dwelling; it is possible to obtain good cross ventilation.

c) Given the historical records for the British Isles, the weather permits a possible energy saving with the use of windows to provide cooling and ventilation. When the outside temperature ranges between 14 °C through to

24 °C, people are able to moderate the heat build-up in the space with the use of an openable window systems.

d) In addition to allowing direct and flexible control of heat through the use of openable windows they, also provide for the natural provision of fresh air to the occupants eliminating the need for artificially produced fresh air supply.

e) At other times of the year, mechanical ventilation with heat recovery can conserve energy in dwelling by recovering heat from the warm moist extracted air and transferring it to the incoming fresh air. This works both ways so if the outside temperature is higher than inside the exchanger helps to maintain a comfortable internal environment. The mechanical ventilation with heat recovery system ensures high air quality whilst maintaining a balance between extraction and supply.

3.3 Heating System

a) The method of heating for the dwelling is not yet finalised, however, it proposed method of heating for the dwelling will use of a highly efficient heat source, with weather compensation. It shall be appropriately designed to provide suitable conditions for the occupants and to offset the heat losses through the fabric of the dwelling.

b) The heating systems will be provided with time and temperature zone control to control the heating in the spaces.

c) Weather compensation will be used to help control the heating system. It uses an outdoor temperature sensor to adjust the system controls to compensate for changes in outdoor temperature automatically. As the weather gets colder the system works harder and produces more heat to the space. However, the weather warms up the system reduces the temperature of the heating system thereby reducing the energy consumption and carbon dioxide emissions.

d) Due to the high level of insulation standards required under the current building regulations and the associated heat gains of the building, the level of artificially produced heat required to the internal spaces is envisaged to be low.

3.4 Lighting (Natural / Artificial)

a) The proposed design makes best use of natural daylight to reduce the amount of electrical energy used to provide the minimum luminance for the required conditions. It is envisaged that all the habitable rooms within the dwelling are to be provided with natural light via windows. The number of windows proposed and the use of dimming controls on the lighting scheme where appropriate may assist in achieving the maximum reduction of electrical consumption.

b) The dwellings are orientated so that the large windows do not face south or are shaded, thus avoiding excessive solar gains during the summer.

c) When selecting luminaries, consideration should be given to their inherent local power consumption and luminance levels. This together with the use of energy saving lamps will reduce the consumption of energy through lighting to a minimum. It is suggested that a development of this kind could reduce the energy usage further by installing luminaries that only allow the use of energy saving lamps.

d) Any lighting in the external areas shall be fitted with automatic control systems, like passive infrared sensors, time switches or “dawn to dusk” day light sensors. These luminaires shall be fitted with low energy lamps.

3.5 Hot Water Systems

a) The hot water demand for the dwelling shall be generated using the efficient heating source and very well insulated hot water storage cylinders are to be provided.

b) The hot water system shall be designed to appropriate standards required by the current building regulations. This will ensure the minimum amount of heat loss from hot water pipe work by applying a high standard of thermal insulation and ensuring the correct circulation throughout the system.

c) Waste Water Heat Recovery Systems can be attached to the showers and are a proven and cost effective way to achieve energy savings and carbon emission reductions. They are either fitted around the waste pipe from a shower or bath, or in the shower tray itself, and recover heat from the drain water as it leaves the shower or bath. This recovered heat is used to preheat the cold water feed to the boiler and therefore reduces the amount of energy used by the boiler.

d) It is possible, with the ever-increasing demand on the limited supply of the natural resource of water, to suitably restrict the flow of water outlets. Flow restrictors can be installed on outlets where a reduced flow is acceptable, for example on showers and basins. This system allows for a uniform maximum flow to be provided regardless of natural water pressures throughout the dwelling.

3.6 Cold Water Systems

a) Cold water consumption can be kept to a minimum by the installation of a numbers of facilities.

b) Modern water efficient dual flush WC cisterns should be fitted as standard and as with the hot water system flow restrictors can be fitted to provide a uniform maximum flow rate throughout the dwelling.

c) Simple water butts can be provided in appropriate locations, allowing for the collection of rain water for the direct use on external landscaped areas. Water butts are the cheapest and easiest way of reducing the use of drinking water for this purpose. There are many products on the market ranging in price and size and some local authorities offer their own option at a subsidised price to the consumer.

d) It is not possible to estimate the total water saving from the installation and use of such a device as this is very much dependant on the landscaping design for the dwelling, the annual rain fall and the required usage of this water within the domestic setting. However, an average storage device can produce up to 5000 litres of usable rainwater per year.

3.7 Sustainable methods of construction

a) Sustainable methods of construction can range from the simplest of solutions, such as construction in locations with access to sustainable modes of transport to the more complex solutions including passive solar design and rainwater harvesting.

b) The following paragraphs will briefly discuss some of the additional options available for incorporation into the scheme at this early stage or later during the detailed design process.

3.8 Passive Solar Design

a) Passive solar gain can be experienced in both a positive and negative manner. South facing facades can often benefit from solar passive gain during the winter months but this is counteracted by the increased requirement for cooling during the summer.

b) In a scheme like that proposed, it is important to recognise where solar passive gains will be experienced and to design the scheme to enhance the effect during the winter and protect from it during the summer.

3.9 Building Envelope

a) All facades of the dwelling shall be designed to ensure that the minimum standards required by the Approved Document L of the Building Regulations are exceeded and that care shall be exercised to ensure flexibility and good shading systems are installed where necessary.

b) Any insulation that is used in this development shall have global warming potential of less than 5. This shall include not only the thermal insulation, but any acoustic insulation.

3.10 Enhanced Construction Details

a) The dwellings envelope shall be designed using the Enhanced Construction Details to limit recurring thermal bridging. This exceeds the requirement of the Building Regulations and helps lower the carbon emissions of the dwelling by reducing the heat losses by cold bridging.

3.11 Surface Water Drainage

a) Surface water drainage at the site will follow the Sustainable Drainage Systems (SuDS) management train.

b) The surface water will drain into the existing watercourse on site, with the permeable surfacing acting as an attenuation device for slowing and holding the surface water run-off.

3.12 Rainwater Harvesting

a) The harvesting and recycling of rainwater can considerably reduce mains water consumption for toilets and other uses that do not need a sanitized water supply.

b) However, the plant space requirement for treatment and storage is often difficult to incorporate into a scheme. It also requires additional public health and water system risers to be installed to serve the facilities able to utilise such a water supply. If this system were to be considered then early design allowances would be required.

c) An alternative option would be to install a water butt system as discussed above, that allows the collection of rainwater from the roof to be used in the amenity space provided.

3.13 Sustainable Material Choices

a) A high percentage of carbon dioxide emissions are generated by unsustainable modes of transport. This is not only made up of the use of the private car but is substantially increased by the use of road as the popular way of transporting materials and goods needed during the construction purposes.

b) Many opportunities are now available to Architects wishing to make more sustainable choices when specifying building materials. The consideration can include where the materials come from, its' travel distance, mode of transport, and the nature in which the material resource is manufactured and managed.

c) Throughout the design process consideration will be given to not only the quality of materials to be specified, but also to the quantities. Additional consideration will be given to building material selection that maximises the life expectancy of the building by selecting materials build-ups from the Green Guide to Specification published by the Building Research Establishment (BRE).

d) The proposed development will be constructed of materials with a low environmental impact, achieving a Green Guide rating of between A+ and D for all five elements of construction, as follows:

- Roof.
- External walls.
- Internal walls.
- Upper and ground floors.
- Windows.

e) Consideration will also be given to the use of materials and products manufactured in the UK and Europe. Once a contractor is appointed, the opportunities for the use of local suppliers for their supply chain will also be explored.

f) All timber, including that used in the construction processes, will be required to be legally sourced. The definition of legally sourced timber follows the UK Government's definition of legally sourced timber, according to the CPET 2nd Edition report on UK Government timber procurement policy.

3.14 Recycling Facilities

a) In order to encourage the homeowners to recycle household waste, the dwelling can be provided with recycling bins, both within the dwelling and in the external waste storage area.

b) The recycling bins could be in the form of three internal in a dedicated non obstructive location in the kitchen. The bins shall be in a variety of sizes and a total capacity of 30 litres and no individual bins shall have a capacity of less than 7 litres.

c) External bins shall be provided for the Local Authority collection scheme. These shall be located in a dedicated location.

4.0 ENERGY ASSESSMENT

4.1 Introduction

a) This section of the Energy and Sustainability Statement shall make an appraisal of the carbon dioxide emissions of the proposed development, assess the implications of fabric and building services enhancements, the various methods of generating and using renewable energy at source, and to suggest the most appropriate means by which the development can contribute towards the aspiration of policy relating to reducing energy consumption and renewable energy provision.

b) In order to assess the impact of the improved building envelope and the fixed building services, the initial Standard Assessment Procedure 2012 (SAP) Assessments have been carried out on the proposed dwellings as if they were constructed simply to comply with the requirements of the current Building Regulations. Further SAP calculations have been undertaken to demonstrate an improvement in the carbon emissions by incorporating better fabric constructions, better windows and doors, improved ventilation systems and efficient building services.

c) The energy assessment shall follow the principles set out in the London Plan, March 2021, Policy SI 2, which expects development proposals to make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- Be Lean –use less energy
- Be Clean – supply energy efficiently
- Be Green – use renewable energy
- Be Seen – modify, monitor and report

4.2 Baseline Carbon Dioxide Emissions

a) In order to assess the carbon dioxide emissions of the development, the delivered energy demand needs to be estimated. At this stage in the design of the dwellings, the detailed construction drawings have not been prepared and therefore detailed carbon emission calculations cannot be undertaken to produce the carbon dioxide emissions.

b) However, the carbon dioxide emission estimates can be based on initial stage SAP calculations.

c) Based on the current design and using construction information, the proposed dwelling complies with the current Building Regulations.

d) The building services information is based on standard building services to meet the requirements of the building regulations.

e) Table 1 below summarises the results from the SAP Worksheets that can be found in Appendix A.

Dwelling	Floor Area (m2)	Heating (kg/yr)	Water Heating (kg/yr)	Pumps & Fans (kg/yr)	Electricity for Lighting (kg/yr)	Total Emissions (kg/yr)	Dwelling CO2 Emission Rate
F1	65.3	775.6	488.2	38.9	152.1	1,454.8	22.29
F2	86.6	1,014.2	529.4	38.9	190.2	1,772.7	20.46
H1	149.5	1,519.4	560.7	38.9	261.5	2,380.4	15.92
H2	134.2	1,240.0	560.0	38.9	247.4	2,086.3	15.54

Dwelling	TER ($kg/m^2/yr$)	Area (m^2)	Emissions (kg/yr)
F1	22.29	65.3	1,454.8
F2	20.46	86.3	1,772.2
H1	15.92	149.5	2,380.4
H2	15.54	134.2	2,085.8

Development Carbon Dioxide Emissions (kg/yr)	**7,693.5**
Baseline Carbon Dioxide Emissions (kg/yr)	**7,694**

Table 1 – Baseline Carbon Dioxide Emissions

4.3 Improved Baseline Carbon Dioxide Emissions

a) Following the principles set out above, the design has been improved to use less energy and to lower the carbon dioxide emissions.

b) This has been achieved by improving the thermal performance of the various constructions, like the walls, roof, floors, windows, doors etc and incorporating mechanical ventilation heat recovery and improving the air tightness of the dwelling.

c) The floor U Values can be improved by incorporating insulation under the screed, or by using insulation blocks instead of concrete blocks between the beams. For the purposes of these calculations, the U Values of the current floor constructions have been calculated as 0.11-12 W/m^{2}K.

d) The wall U Values can be improved by improving the thermal performance of the insulation, either by increased thickness or lower thermal conductivity. For the purposes of these calculations, the U Values of the current wall constructions have been calculated as between 0.14 and 0.16 W/m^{2}K.

e) The roof areas offer excellent opportunity to enhance the insulation levels and for the purposes of these calculations, the U Value of 0.09-0.15 W/m^{2}K has been used.

f) The thermal performance of the windows can be improved by adding coatings to the panes or adding an inert gas to the cavities. For the purposes of these calculations, a U Value for the windows of 1.1 W/m^{2}K has been used, which uses double glazed planitherm glass, argon gas and warm edge spacer bars.

g) A composite front door can be used instead of a timber door. Modern composite doors have good thermal, fire, acoustic and security properties. These types of door can have U Values as low as 0.55 W/m^{2}K.

h) The air leakage rate for the dwelling can be improved. The maximum allowed under the current Building Regulations Approved Document

L1A:2013 is 10 $m^3/hr/m^2$ at 50 Pascal's. With carful detailing, this can be easily improved to 1.5 $m^3/hr/m^2$ at 50 Pascal's.

i) The use of manufacturers Construction Details in the development means that the thermal bridging coefficient can be greatly improved thus a lower γ Value can be used.

j) With regard to the heating, a highly efficient gas fired condensing boiler shall be provided in the dwelling to provide the heating and hot water. This provides excellent control for the dwelling occupants.

k) More efficient controls can be installed to control the heating, which can include weather compensation on the heating control and the use of time and temperature zone control will improve the efficiency of the heating system.

l) Instead of simply installing 75% of the light fittings as low energy efficient light fittings, as required by the current Building Regulations, 100% of the light fitting could be low energy fittings.

m) The use of natural lighting has been considered and although its use is not measured in the SAP calculations, it can help lower the energy use and therefore carbon dioxide emissions. This is carefully assessed against any unwanted solar overheating. Whilst a degree of solar gain can be beneficial for the occupants and helps lower the carbon dioxide emissions, it must be controlled to minimise the risk of solar overheating. The calculations show that there is only a slight to medium risk of overheating.

n) The development shall be designed to ensure that the Dwelling Emission Rates are better than the Target Emission Rates and the Fabric Energy Efficiency is better than the Target Fabric Energy Efficiency. These are the requirements from Criterion 1 of the current Building Regulations Approved Document L (2013).

o) By incorporating items like those stated above, the SAP calculations have been updated to demonstrate the effect of these improvements and the results are listed in Table 2 below.

p) Full details of the SAP calculations can be found in the Full SAP Calculations Printout in Appendix A.

Dwelling	Floor Area (m2)	Heating (kg/yr)	Water Heating (kg/yr)	Pumps & Fans (kg/yr)	Electricity for Lighting (kg/yr)	Total Emissions (kg/yr)	Dwelling Target CO2 Emission Rate
F1	65.3	430.7	481.5	144.2	152.0	1,208.4	18.51
F2	86.6	588.2	522.6	152.2	190.2	1,453.2	16.78
H1	149.5	761.3	554.4	345.6	261.5	1,922.8	12.86
H2	134.2	601.9	554.3	318.3	247.4	1,721.9	12.83

Dwelling	DER (kg/m2/yr)	Area (m2)	Emissions (kg/yr)
F1	18.51	65.3	1,208.4
F2	16.78	86.6	1,453.2
H1	12.86	149.5	1,922.8
H2	12.83	134.2	1,721.9
Total Carbon Dioxide Emissions (kg/yr)			**6,306.3**
Baseline Carbon Dioxide Emissions (kg/yr)			**6,306**
Percentage Improvement over current Building Regulations			**18.0 %**

Table 2 – Actual Carbon Dioxide Emissions

q) As demonstrated in Table 2 above, it can be seen that the improvements in the thermal performance and fixed building services, a reduction of 18.0% can be achieved in the carbon dioxide emissions of the development.

r) This exceeds the requirements of the London Plan to achieve a 10% improvement over Building Regulations for residential developments by fabric and energy efficiency measures.

4.4 Supplying Energy Efficiently – BE CLEAN

a) Following the principles set out in the Energy Hierarchy, which is implemented in the London Plan, the next step is to reduce the carbon dioxide emissions by supplying energy efficiently - BE CLEAN.

4.5 District Heat Network

a) The London Heat Map is an online tool that can help identify opportunities for the use of decentralised energy networks and systems for use in projects.

b) Using the Heat Map, there appears to be no district heating systems available or even proposed in the area within the next five years, so it would not be feasible to install plant for future connection to such a network at this time.

c) In line with the Greater London Authority's "Sustainable Design and Construction SPG" in published in April 2014, it is considered that no potential heat networks available in the foreseeable future.

4.6 Combined Heat and Power

a) Combined Heat and Power typically generates electricity on site as a by-product of generating heat. It uses fuel efficient energy technology that, unlike traditional forms of power generation, uses the by-product of the heat generation required for the development. Normally during power generation, the heat is discharged or wasted to atmosphere.

b) A typical CHP plant can increase the overall efficiency of the fuel use to more than 75%, compared to the traditional power supplies of 40%, which uses inefficient power stations and takes into account transmission and distribution losses.

c) The use of this development is residential and it will be built to exceed the current Building Regulations. The aim of these regulations is to minimise the base heating load and electrical loads. The site base heating and electrical loads is key to the sizing and operation of any CHP system.

d) Due to the high levels of insulation and energy efficiency measures that will be incorporated into this development, there is no year round heat load for the CHP plant and therefore, a CHP system would be considered not viable on this development. As such, if a CHP system were to be incorporated, it would not operate efficiently and therefore NOT BE CLEAN.

4.7 Renewable Technologies Considered – BE GREEN

a) Taking into account the requirements of planning policy set out by the London Borough of Camden and the London Plan, the final step in the "Energy Hierarchy" is to reduce the carbon dioxide emissions by the use of renewable technologies - BE GREEN.

b) The following renewable energy resources have been assessed for availability and appropriateness in relation to the site location, building occupancy and design.

- Combined Heat and Power
- Biomass Heating
- Biomass CHP
- Heat Pumps
- Solar Photovoltaics
- Domestic Solar Hot Water Systems
- Wind Power

c) A preliminary assessment has been carried out for each renewable energy technology and for those appearing viable a further detailed appraisal has been undertaken.

d) The preliminary study considered the site location and the type of building in the development and surroundings and produced a shortlist of renewable energy technologies that will be the subject of a further feasibility study.

e) Table 3 below provides a summary of the assessment.

4.8 Renewables Toolkit Assessment

Energy System	Description	Comment
Combined Heat and Power (CHP)	Combined Heat and Power systems use the waste heat from an engine to provide heating and hot water, while the engine drives an electricity generator. These systems uses gas or oil as the main fuel and therefore can not truly be considered as renewable technology however, it is recognised that they have a significant reduced impact on the environment compared to conventional fossil fueled systems.	As CHP systems produce roughly twice as much heat as they generate electricity, they are usually sized according to the base load heat demand of a building, to minimise heat that is wasted during part-load operations. Therefore, to be viable economically they require a large and constant demand for heat, which make their use in new energy efficient housing, with high insulation, not really suitable. The efficiency of small scale CHP is relatively low and is unlikely to result in CO_2 emission savings. Economic viability relies on 4000 hours running time, which is unlikely to be achieved in this scheme.
Combined Heat and Power		**Feasible – NO**
Biomass Heating	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating. Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets, although traditional logs are also used. Other forms of Biomass can be used, e.g. bio-diesel.	Wood pellet or wood chip fired or dual bio-diesel/gas-fired boilers could be considered. As this development consists of a new building, it offers the opportunity to accommodate such a system. The flues would have to be discharged to atmosphere above roof level and concerns raised by Environmental Health regarding the pollutants and particles, which would have to be addressed. Care need to be taken with the design of the flue to ensure particle discharge is not a concern to residents. The fuel storage silo/tank would have to be located external to the building, which is not available on this site. A suitable local fuel supplier is required to supply the site.
Biomass Heating		**Feasible – NO**

Energy System	Description	Comment
Biomass CHP	CHP as above, but with biomass as the fuel.	Whilst the Biomass CHP system may overcome the issue of the reduction in carbon dioxide emissions via true renewable sources, however, the lack of a year round base load is still a problem and therefore Biomass CHP is not feasible for this development.
Biomass CHP		**Feasible - NO**
Ground/Air Source Heat Pumps (GSHP / ASHP) - heating	The ground collector can be installed, either as a loop of pipe, in the piles or using a borehole and a compressor offer efficient heating of a space in winter, as the temperature of the ground (below approx 2m) remains almost constant all year. For air source, the external condensing unit can be located adjacent to the dwelling in a discreet location.	Ground and air source heat pumps are most efficient when supplying heat continuously and in areas where a mains gas supply is not available. In dwellings, GSHP and ASHP are capable of supplying the majority of the total space heating and pre heat for the hot water demand. This site does not appear to have external areas of sufficient size for the installation of ground loops for the collection of heat. Air source heat pumps are not considered feasible as there is no suitable location of the installation of the outdoor units that would not compromise the use of the dwelling amenity space, by either by generating noise, or cold draughts, or simply loss of space for quiet enjoyment.
Ground/Air Source Heat Pumps		**Feasible – NO**
Solar Photovoltaics (PV)	Building Integrated Photovoltaics (BIPV) or Roof mounted collectors provide noiseless, low maintenance, carbon free electricity.	There appears to be areas of roof that could be utilitised to install PV panels onto the scheme. These could be integrated into the roof finishes or mounted on frames on the roof and ideally orientated towards the south for optimal performance. Careful consideration must be given to the chosen roof finish to ensure compatibility.
Solar PhotoVoltaics		**Feasible – YES**
Solar Thermal Hot Water	Solar collectors for low temperature hot water systems require direct isolation, so the chosen location, orientation and tilt are critical.	This solution could be utilised to generate hot water using the energy from the sun. Due to the height of the building, it is considered that the losses in the system would reduce the efficiency and this type of system would not produce the required reduction in carbon emissions, especially when compared to other solutions.
Solar Thermal Hot Water		**Feasible – NO**

Energy System	Description	Comment
Wind Power	Most small (1-25kW) wind turbines can be mounted on buildings, but larger machines require foundations at ground level and suitable site location	It could be viable to install some form of wind turbines on this site, however due to surrounding buildings and the visual impact it is not considered to be the most sensitive system of providing energy via renewable resources in this location.
Wind Power		**Feasible – NO**

Table 3 – Renewable Technology Feasibility Assessment

a) From the above it has been established that there is only one potential way of providing energy via renewable sources appropriate for inclusion in this scheme, that being the use of solar photovoltaics.

b) Due to distribution loses and the efficiency of the system, solar thermal hot water is not being considered further at this stage as the reduction in carbon emissions would be less than a photovoltaic system.

c) CHP and Micro CHP are considered not feasible as the economic viability relies on at least 4,000 hours runtime which is unlikely to be achieved in this development.

d) Biomass systems have been considered unfeasible for this site due to particle discharge in a built up area, fuel handling and storage on a site with limited open space, required plant areas and the on going maintenance of the system.

e) Wind has been considered not viable for this site as there are a lot of the buildings and trees in the surrounding area which are likely to cause disruption to air flows.

4.9 Solar Photovoltaics

a) Photovoltaics (PV) is a technology that allows the production of electricity directly from sunlight. The term originates from “Photo” referring to light and “voltaic” referring to voltage. This type of technology has been developed for incorporation within building design to produce electricity for either direct consumption or re-sale to the National Grid.

b) PV panels come in modular panels which can be fitted on the top of roofs or incorporated in the finishes like slates or shingles to form integral part of the roof covering. PV cells can be incorporated into glass for atria walls and roofs or used in the cladding or rain screen on a building wall.

c) When planning to install PV panels, it is important to consider the inherent cost of installation in comparison to possible alternatives. The aesthetic impact of the PV panels also requires careful consideration.

d) Roof mounted PV panels should ideally face south-east to south-west at an elevation of about 30-40°. However, in the UK even if installed flat on a roof, they receive 90% of the energy of an optimum system.

e) PV installations are expressed in terms of the electrical output of the system, i.e. kilowatt peak (kWp). The Department of Trade and Industry estimate that an installation of 1kWp, could produce approximately 700-850 kWh/yr, which would require an area of between 8-20m^2, depending on the efficiencies and type of PV panel used.

f) It is also estimated that a gas heated, well insulated typical dwelling would use approximately 1,500kWh/year electricity for the lights and appliances, therefore the 1kWp system could save approximately 45% of a single dwellings electrical energy requirements.

g) Although often not unattractive, and possible to integrate into the building or roof cladding, PV systems are still considered likely to have visual implications, therefore careful sighting of the panels is required.

h) As this installation will be contained on the roof of the proposed dwellings, it involves no additional land use. With regard to noise and vibration, a PV system is completely silent in operation.

i) Care must be taken with the design and installation of PV systems as they need to meet standards for electrical safety.

j) Space has been identified on the south facing roofs of the dwellings that can be used for the installation of photovoltaic systems. The identified space could be used to install 15-No. panels. If 405Wp panels were installed on the roof finishes, a total output of 6.075kWp could be achieved.

k) In an attempt to maximise the carbon dioxide emissions reduction, additional space has been identified on the north facing roofs between the roof lights. As photovoltaic panels work with light, the north facing element will still generate electricity and reduce carbon dioxide emissions. However, the output will be reduced and this has been taken into account on the calculations.

Development incorporating Energy Efficiency Measures		Total Carbon Dioxide Emissions ($kgCO_2/yr$)	Percentage Reduction (%)
No Renewables		6,306	-
Reduction by including 15-No south facing 405Wp panels	2,756.6		
Reduction by including 9-No north facing 405Wp panels	1,102.4		
Total Reduction by the PV Systems		3,859	61.2%
Total Reduction over Building Regulations		5,246	68.2%

Table 4 – Photovoltaic Carbon Dioxide Emissions

l) As can be seen from Table 4 above, the incorporation of a photovoltaic system as described above, the development could reduce the carbon dioxide emissions by a further 61.2% and when combined with the fabric energy efficiency measures from in Table 2 above, a potential total reduction of 68.2% could be achieved.

m) From the above calculations, based on 405 watt panels, orientated towards the south and mounted on the roof finishes at a 10 degree pitch, it is calculated that 6-No. panels are required on the proposed dwellings roof.

n) These panels could be connected to the individual electric supply for each dwelling to be used in the dwelling or connected to ta landlords supply. Any surplus electricity can be exported to the National Grid.

o) It is estimated that this size of system, the development could generate 8,498 kWh of electricity in a year.

p) Further detailed calculations for the carbon dioxide emissions and the final system size and layout shall be carried out during detailed design.

4.10 Annual Carbon Dioxide Emission Reduction

a) Based on the initial SAP calculations for the dwellings, it has been calculated that the baseline carbon dioxide emissions figure is 7,693.5 $kgCO_2$/year.

b) In accordance with the Planning Policies set out by London Borough of Camden and the London Plan, this report has demonstrated a 18.0% improvement in carbon dioxide emissions by fabric and energy efficiencies.

c) A number of options have been considered and the potential carbon dioxide reductions calculated using the SAP calculations and a summary of the results is provided in Table 5 below.

	Total Carbon Dioxide Emissions ($kgCO_2$/yr)	Reduction in Carbon Dioxide Emissions (%)
Building Regulations Compliant Development	7,694	-
Development incorporating Energy Efficiency Measures	6,306	18.0%
Further Reduction in Carbon Dioxide Emissions by incorporating a Renewable Technology		
PV	3,859	61.2%
Percentage Improvement incorporating the fabric and energy efficiencies and incorporating the PV systems		**68.2 %**

Table 5 – Summary of Reduction in Carbon Dioxide Emissions

d) It has been demonstrated that it is possible to achieve a total of 68.2% reduction in carbon dioxide emissions over and above the 2013 Building Regulations by improving the energy efficiency of the development, its building services efficiencies and by including the solar photovoltaic systems. This could be further improved during detailed design.

e) CHP and Biomass CHP have been analysed but are considered not feasible for this development as the heating and electrical load profiles would not provide a good clean efficient system for the development.

f) Biomass heating has been analysed but is considered not feasible for this development due to particle discharge in the built up area, space requirements and the cost and the reliability of a biomass fuel source.

g) Wind power is considered not feasible for this development due to the visual impact in the area and the turbulence caused by the surrounding buildings and trees etc.

h) Due to distribution loses and the efficiency of the system, solar thermal hot water is not being considered further at this stage as the reduction in carbon emissions would be less than a photovoltaic system.

i) There is insufficient space for the installation of ground loops for ground source heat pumps. No suitable location been identified for the installation of the air source heat pump outdoor units without compromising the amenity space.

j) The use of the photovoltaic systems, by themselves, could provide a reduction of 61.2% in carbon dioxide emissions. When combined with the fabric and energy efficiencies identified in Section 3.0, the use of the photovoltaic systems, the total carbon emissions reduction could be in excess of 68.2%.

k) Detailed calculations of the total carbon dioxide emissions compared to the estimated carbon dioxide reduction for the development can be undertaken once the detailed design has progressed to construction drawing stage.

l) For the purpose of planning and based on the figures provided by initial SAP calculations, this report has demonstrated that it is feasible, with the improvement of the building fabric, the introduction of energy efficient heating systems and controls and the use of solar photovoltaics, a reduction of 68.2% over the 2013 Building Regulations for the developments carbon dioxide emissions could be achieved. This complies with the requirement to provide a minimum reduction in carbon dioxide emissions of 35% set out by the London Borough of Camden policies.

4.11 Energy Hierarchy Carbon Dioxide Emissions Summary

a) The concept of applying the energy hierarchy in relation to Approved Document L of the Building Regulations 2013, the Energy Planning, Greater London Authority Guidance on Preparing Energy Assessments (March 2016) document provides further guidance on how the carbon dioxide emission figures can be presented.

b) The regulated carbon dioxide emissions reduction target for the development would be to achieve a 35% reduction in carbon dioxide emissions as assessed under the Approved Document L 2013 of the Building Regulations.

c) These figures are based on the current design information and are subject to change when the detailed construction information is produced.

d) Table 6 provides Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings.

		Tonnes CO_2/yr
Baseline: Part L 2013 of the Building Regulations Compliant Development	a	7.7
After energy demand reduction	b	6.3
After heat network / CHP	c	6.3
After renewable energy	d	2.4

Table 6 – Carbon Dioxide Emissions after each stage of the Energy Hierarchy

e) Table 7 provides Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

		Tonnes CO_2/yr		%
Savings from energy demand reduction	a-b	1.4	(a-b)/a*100	18.0
Savings from heat network / CHP	b-c	0.0	(b-c)/a*100	0.0
Savings from renewable energy	c-d	3.9	(c-d)/a*100	50.2
Cumulative on site savings	**a-d=e**	**5.2**	**(a-d)/a*100**	**68.2**

Table 7 – Regulated carbon dioxide savings from each stage of the Energy Hierarchy

f) The calculations contained within this Energy Statement are based on the current design information and are subject to change when the detailed design is undertaken and the construction information is produced.

5.0 OVERHEATING

a) It is important to consider the internal comfort conditions for the occupants of the dwelling. At design stage, this can be met through the use of the “cooling hierarchy”.

b) The cooling hierarchy seeks to reduce any potential overheating and also the need to cool a building through active cooling measures. Air conditioning systems are a very resource intensive form of active cooling, increasing carbon dioxide emissions, and also emitting large amounts of heat into the surrounding area. By incorporating the cooling hierarchy into the design process buildings will be better equipped to manage their cooling needs and to adapt to the changing climate they will experience over their lifetime.

c) The development shall reduce the potential for overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

   a) minimise internal heat generation through energy efficient design
   b) reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
   c) manage the heat within the building through exposed internal thermal mass and high ceilings
   d) passive ventilation
   e) mechanical ventilation
   f) active cooling systems (ensuring they are the lowest carbon options).

d) During the initial design, the initial SAP Assessment was carried out for the dwelling to help assess the energy demand and carbon emissions of the development. The SAP Assessment includes an overheating assessment in line with the requirements of the Building Regulations.

e) Based on this SAP Assessment, the dwelling has a medium risk of solar overheating. This is acceptable under the requirements of the Building Regulations.

f) The internal heat generation has been minimised through energy efficient design. All of the luminaires shall be low energy which will also remove an internal heat generating load.

g) The heat entering the building in summer is reduced through the optimisation of glazing area, the use of shading via building form and other protruding edges, together with the inclusion of very high performance façade materials and improved air tightness. The use of a solar control glazing, which has a coating applied to lower the G Value of the glass, can be applied. This acts in the same way that the low e coating lowers the U Value which helps reduce heat losses through the windows.

h) The dwellings could have a mechanical ventilation system installed, which provides filtered fresh air to the dwelling. This is tempered by the crossover heat exchanger, which recovers waste heat from the extract air from the dwelling. The ventilation systems shall be controlled locally by the occupants.

i) Low energy lamps shall be used in the luminaires to reduce heat gain. These lamps do not emit heat like traditional GLS lamps.

6.0 WATER CALCULATIONS

a) The London Borough of Camden recognises that London and the South East is classified as 'seriously' water stressed, meaning that more water is taken from the environment than the environment can sustain in the long term. London is relatively resilient to drought and it takes two consecutive drier than normal winters to create water supply issues.

b) The London Plan Policy SI 5 Water Infrastructure requires all new dwellings should limit domestic water consumption to 105 litres per person per day (l/p/d), plus 5 l/p/d for external use, in line with the Government's higher 'optional requirements' for water efficiency set out in Part G of the Building Regulations as amended.

c) Low water usage fitting, or flow restrictors can be fitted in the dwelling. Efficient white goods that are not only energy efficient but also water efficient can also be installed.

d) At this stage in the design, the final selection of the water fittings and appliance has not been made, but this calculations shows the design intent for these fittings and appliances.

e) Dual flush toilets can be installed to reduce the water consumption of the dwelling. A full flush capacity of 4.5 litres and a part flush capacity of 3 litres has been selected.

f) Flow restrictors shall be installed to limit the flow rates of the taps to 3 litres / minute. Flow restrictors shall also be installed in the kitchen taps and the showers to restrict their flow. The kitchens shall be restricted to 10 litres / minute and the showers shall be restricted to 8 litres / minute.

g) The capacity of the baths to the over flow shall be 149 litres.

h) No appliances have been selected at this time, so the default Best Practise values have been used. The washing machine shall have a water consumption of 8.17 litres / kg of dry load. The dishwasher shall have a water consumption of 1.25 litres / place setting.

i) No water softeners are being installed.

j) Using the Building Regulations Approved Document G Calculator, the water consumption has been calculated as between 103.88 and 104.7 litres / person / day, including the 5 l/p/d for external use.

k) The calculated water consumption for the dwelling complies with the requirements of the Local Plan and the Building Regulations Approved Document G.

l) Details of the calculations can be found in Appendix B.

7.0 CONCLUSION

a) The London Borough of Camden requires all residential developments to achieve at least a 35% reduction in regulated carbon dioxide emissions on site over the 2013 Building Regulations.

b) The Application is for the construction of four dwellings, consisting of two houses and two flats, in a single block.

c) It is proposed that in order to meet the requirements of policy this development will adopt a high standard of design with regard to energy efficiency principles. It has been estimated that the proposed development will achieve a reduction of at least 18.0% in the carbon dioxide emissions through fabric and services efficiencies, then a further reduction by the use of solar photovoltaic systems, resulting in a total reduction over 2013 Building Regulations of 68.2%.

d) At planning stage it is not possible to produce the final reports on the energy demand, carbon dioxide emissions, based on the initial construction information. It is envisaged that during detailed design, the reduction in carbon dioxide emissions can be improved.

e) This report has assessed the risk of overheating and the development has been identified as having a slight risk, which can be reduced by incorporating low G value glazing, internal shading by light coloured curtains or cross ventilation by opening the windows fifty percent of the time.

f) The water usage has been assessed and although the actual water fittings have not been selected yet, the calculations show that it is possible for this development to achieve the requirements of the planning policy, thus minimising the impact of the development on the local water resources.

g) This Energy and Sustainability Statement demonstrates that the proposed development follows the principles of the planning policy requirements with regards to carbon dioxide reduction and the incorporation of low and zero carbon technologies. The Statement demonstrates that the development can exceed the requirement of a 35% reduction in carbon emissions as set out in planning policy. The development also meets the required of planning policy with regards to water consumption and minimises over heating. It is for these reasons it is considered that this application should be viewed favorably by the London Borough of Camden.

Appendix A – Full SAP Calculations Printout

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	E1099-F1	**Issued on Date**	12/05/2021
Assessment Reference	E1099-F1-BLR	**Prop Type Ref**	
Property	F1, Gondar Gardens, West Hampstead, London, NW6 1QF		

SAP Rating	82 B	**DER**	18.51	**TER**	22.29
Environmental	86 B	**% DER<TER**	16.94		
CO_2 Emissions (t/year)	1.07	**DFEE**	52.11	**TFEE**	69.52
General Requirements Compliance	Pass	**% DFEE<TFEE**	25.04		

Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01480451569, jason@doherty-energy.co.uk	**Assessor ID**	L143-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Mid-Terrace Maisonette, total floor area 65 m^2

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.29 $kgCO_2/m^2$
Dwelling Carbon Dioxide Emission Rate (DER) 18.51 $kgCO_2/m^2$OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)69.5 $kWh/m^2/yr$
Dwelling Fabric Energy Efficiency (DFEE)52.1 $kWh/m^2/yr$OK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	OK
Openings	1.04 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.025

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3 Air permeability

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

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4 Heating efficiency

Main heating system:	Boiler system with radiators or underfloor - Mains gas	
Data from database		
Ideal LOGIC+ HEAT H12		
Efficiency: 89.4% SEDBUK2009		
Minimum: 88.0%		OK
Secondary heating system:	None	

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5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.30 kWh/day	
Permitted by DBSCG 2.10		OK
Primary pipework insulated:	Yes	OK

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6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

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7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%

Minimum	75%	OK

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8 Mechanical ventilation
Continuous supply and extract system

Specific fan power:	0.68	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

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9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing East:	13.75 m^2, No overhang	
Windows facing South West:	1.08 m^2, No overhang	
Windows facing North West:	1.08 m^2, No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	Light-coloured curtain or roller blind, closed 100% of daylight hours	

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10 Key features

External wall U-value	0.14 W/m^2K
Party wall U-value	0.00 W/m^2K
Roof U-value	0.09 W/m^2K
Floor U-value	0.10 W/m^2K
Floor U-value	0.10 W/m^2K
Door U-value	0.55 W/m^2K
Window U-value	1.10 W/m^2K
Thermal bridging y-value	0.025 W/m^2K
Air permeability	1.5 m^3/m^2h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)
Basement floor	24.3400 (1a)	x	2.6000 (2a)	=	63.2840 (1a) - (3a)
Ground floor	40.9400 (1b)	x	3.2300 (2b)	=	132.2362 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 65.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.5202 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans							0 * 10 =	0.0000 (7a)
Number of passive vents							0 * 10 =	0.0000 (7b)
Number of flueless gas fires							0 * 40 =	0.0000 (7c)

		Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Measured/design AP50		1.5000
Infiltration rate		0.0750 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0638 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.0813	0.0797	0.0781	0.0701	0.0685	0.0606	0.0606	0.0590	0.0638	0.0685	0.0717	0.0749	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation: 0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2073	0.2057	0.2041	0.1961	0.1945	0.1866	0.1866	0.1850	0.1898	0.1945	0.1977	0.2009	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.9100	0.5500	1.0505			(26)
Window (Uw = 1.10)			15.9100	1.0536	16.7634			(27)
Base Floor			24.3400	0.1000	2.4340			(28)
Grd Floor			18.6300	0.1000	1.8630			(28a)
Basement	13.9100		13.9100	0.1400	1.9474			(29a)
Main Wall	181.0200	17.8200	163.2000	0.1600	26.1120			(29a)
Grd Roof	3.2500		3.2500	0.0900	0.2925			(30)
Total net area of external elements Aum(A, m2)			241.1500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4628			(33)
Party Wall 1			42.5200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area) 6.0288 (36)
Total fabric heat loss (33) + (36) = 56.4916 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.3741	13.2713	13.1685	12.6543	12.5515	12.0373	12.0373	11.9345	12.2430	12.5515	12.7571	12.9628	(38)
Heat transfer coeff	69.8657	69.7629	69.6600	69.1459	69.0430	68.5289	68.5289	68.4261	68.7345	69.0430	69.2487	69.4544	(39)
Average = Sum(39)m / 12 =												69.1202	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0702	1.0687	1.0671	1.0592	1.0576	1.0498	1.0498	1.0482	1.0529	1.0576	1.0608	1.0639	(40)
HLP (average)												1.0588	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1263 (42)
Average daily hot water use (litres/day) 84.7003 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.1704	89.7824	86.3944	83.0063	79.6183	76.2303	76.2303	79.6183	83.0063	86.3944	89.7824	93.1704	(44)
Energy conte	138.1690	120.8435	124.6996	108.7162	104.3158	90.0166	83.4136	95.7183	96.8615	112.8827	123.2203	133.8093	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)											Total = Sum(45)m =	1332.6663	(45)
Distribution loss (46)m = 0.15 x (45)m													
	20.7253	18.1265	18.7049	16.3074	15.6474	13.5025	12.5120	14.3577	14.5292	16.9324	18.4830	20.0714	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7020	(55)
Total storage loss													
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
If cylinder contains dedicated solar storage													
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	183.1934	161.5107	169.7240	152.2882	149.3402	133.5886	128.4380	140.7427	140.4335	157.9071	166.7923	178.8337	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	183.1934	161.5107	169.7240	152.2882	149.3402	133.5886	128.4380	140.7427	140.4335	157.9071	166.7923	178.8337	(64)
								Total per year (kWh/year) = Sum(64)m =				1862.7923	(64)
Heat gains from water heating, kWh/month													
	81.9607	72.7142	77.4822	71.0057	70.7045	64.7881	63.7545	67.8459	67.0640	73.5530	75.8284	80.5111	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5857	14.7312	11.9802	9.0698	6.7798	5.7238	6.1848	8.0392	10.7902	13.7006	15.9906	17.0466	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	186.0407	187.9712	183.1064	172.7497	159.6762	147.3890	139.1804	137.2499	142.1147	152.4714	165.5449	177.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	(71)
Water heating gains (Table 5)													
	110.1622	108.2057	104.1427	98.6191	95.0329	89.9835	85.6916	91.1907	93.1445	98.8616	105.3172	108.2139	(72)
Total internal gains													
	370.6836	368.8031	357.1243	338.3335	319.3839	300.9912	288.9517	294.3747	303.9444	322.9286	344.7476	360.9875	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.7500	19.6403	0.7200	0.7000	0.7700	94.3222	(76)
Southwest	1.0800	36.7938	0.7200	0.7000	0.7700	13.8791	(79)
Northwest	1.0800	11.2829	0.7200	0.7000	0.7700	4.2561	(81)

Solar gains	112.4574	216.8189	351.8243	508.8877	622.4760	637.2893	606.6548	521.4532	407.4561	255.6576	139.5879	92.9193	(83)
Total gains	483.1409	585.6220	708.9485	847.2212	941.8600	938.2806	895.6065	815.8279	711.4005	578.5862	484.3355	453.9069	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.9546	25.9928	26.0312	26.2248	26.2638	26.4609	26.4609	26.5006	26.3817	26.2638	26.1858	26.1083	
alpha	2.7303	2.7329	2.7354	2.7483	2.7509	2.7641	2.7641	2.7667	2.7588	2.7509	2.7457	2.7406	
util living area													
	0.9452	0.9115	0.8457	0.7286	0.5825	0.4352	0.3255	0.3683	0.5738	0.8068	0.9184	0.9527	(86)
MIT	19.0014	19.3402	19.8432	20.3801	20.7358	20.9142	20.9715	20.9595	20.8130	20.2897	19.5379	18.9283	(87)
Th 2	20.0252	20.0265	20.0278	20.0343	20.0356	20.0421	20.0421	20.0434	20.0395	20.0356	20.0330	20.0304	(88)
util rest of house													
	0.9376	0.8999	0.8263	0.6972	0.5383	0.3782	0.2585	0.2975	0.5135	0.7753	0.9056	0.9461	(89)
MIT 2	17.3636	17.8475	18.5563	19.2927	19.7518	19.9669	20.0239	20.0160	19.8615	19.1954	18.1429	17.2619	(90)
Living area fraction									fLA = Living area / (4) =			0.3634	(91)
MIT	17.9587	18.3899	19.0239	19.6878	20.1093	20.3111	20.3682	20.3588	20.2072	19.5930	18.6498	17.8674	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9587	18.3899	19.0239	19.6878	20.1093	20.3111	20.3682	20.3588	20.2072	19.5930	18.6498	17.8674	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9164	0.8755	0.8030	0.6850	0.5418	0.3946	0.2817	0.3214	0.5246	0.7587	0.8826	0.9262	(94)
Useful gains	442.7596	512.7081	569.3131	580.3344	510.3070	370.2389	252.2697	262.1841	373.2140	438.9864	427.4508	420.4277	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	954.2761	941.0920	872.4173	745.9326	580.6056	391.3746	258.2324	270.8876	419.7762	620.9050	799.8060	949.2616	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	380.5683	287.8740	225.5095	119.2307	52.3021	0.0000	0.0000	0.0000	0.0000	135.3474	268.0958	393.4524	(98)
Space heating												1862.3802	(98)
Space heating per m2											(98) / (4) =	28.5291	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.4000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1993.9830	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.5683	287.8740	225.5095	119.2307	52.3021	0.0000	0.0000	0.0000	0.0000	135.3474	268.0958	393.4524	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	407.4607	308.2163	241.4448	127.6560	55.9980	0.0000	0.0000	0.0000	0.0000	144.9116	287.0404	421.2553	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	183.1934	161.5107	169.7240	152.2882	149.3402	133.5886	128.4380	140.7427	140.4335	157.9071	166.7923	178.8337	(64)
Efficiency of water heater												79.7000	(216)
(217)m	86.6211	86.2389	85.4723	84.0696	82.2244	79.7000	79.7000	79.7000	79.7000	84.3055	85.9732	86.7602	(217)
Fuel for water heating, kWh/month	211.4881	187.2829	198.5719	181.1453	181.6252	167.6143	161.1518	176.5906	176.2026	187.3035	194.0049	206.1242	(219)

Water heating fuel used	2229.1053	(219)
Annual totals kWh/year		
Space heating fuel - main system	1993.9830	(211)
Space heating fuel - secondary	0.0000	(215)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8500)

mechanical ventilation fans (SFP = 0.8500)	202.7544	(230a)
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	277.7544	(231)
Electricity for lighting (calculated in Appendix L)	292.9080	(232)
Total delivered energy for all uses	4793.7508	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1993.9830	0.2160	430.7003	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2229.1053	0.2160	481.4867	(264)
Space and water heating			912.1871	(265)
Pumps and fans	277.7544	0.5190	144.1546	(267)
Energy for lighting	292.9080	0.5190	152.0193	(268)
Total CO2, kg/year			1208.3609	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.5100	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.5100	ZC1
Total Floor Area	TFA	65.2800	
Assumed number of occupants	N	2.1263	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8878	ZC2
CO2 emissions from cooking, equation (L16)		2.6047	ZC3
Total CO2 emissions		38.0025	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.0025	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

		Area (m2)			Storey height (m)			Volume (m3)	
Basement floor		24.3400	(1a)	x	2.6000	(2a)	=	63.2840	(1a) - (3a)
Ground floor		40.9400	(1b)	x	3.2300	(2b)	=	132.2362	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.2800								(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	195.5202	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1023	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3523	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3818	0.3743	0.3668	0.3294	0.3219	0.2845	0.2845	0.2770	0.2994	0.3219	0.3369	0.3519	(22b)
Effective ac	0.5729	0.5701	0.5673	0.5542	0.5518	0.5405	0.5405	0.5384	0.5448	0.5518	0.5567	0.5619	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9100	1.0000	1.9100			(26)
TER Opening Type (Uw = 1.40)			14.4200	1.3258	19.1174			(27)
Base Floor			24.3400	0.1300	3.1642			(28)
Grd Floor			18.6300	0.1300	2.4219			(28a)
Basement	13.9100		13.9100	0.1800	2.5038			(29a)
Main Wall	181.0200	16.3300	164.6900	0.1800	29.6442			(29a)
Grd Roof	3.2500		3.2500	0.1300	0.4225			(30)
Total net area of external elements Aum(A, m2)			241.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.1840			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		0.0000	(36)
Total fabric heat loss	(33) + (36) =	59.1840	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.9634	36.7808	36.6018	35.7611	35.6038	34.8716	34.8716	34.7360	35.1536	35.6038	35.9220	36.2547	(38)
Heat transfer coeff	96.1475	95.9648	95.7859	94.9451	94.7878	94.0556	94.0556	93.9200	94.3376	94.7878	95.1060	95.4387	(39)
Average = Sum(39)m / 12 =												94.9444	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4728	1.4700	1.4673	1.4544	1.4520	1.4408	1.4408	1.4387	1.4451	1.4520	1.4569	1.4620	(40)
HLP (average)												1.4544	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1263	(42)
Average daily hot water use (litres/day)	84.7003	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.1704	89.7824	86.3944	83.0063	79.6183	76.2303	76.2303	79.6183	83.0063	86.3944	89.7824	93.1704	(44)
Energy conte	138.1690	120.8435	124.6996	108.7162	104.3158	90.0166	83.4136	95.7183	96.8615	112.8827	123.2203	133.8093	(45)
Energy content (annual)										Total = Sum(45)m =		1332.6663	(45)
Distribution loss (46)m = 0.15 x (45)m	20.7253	18.1265	18.7049	16.3074	15.6474	13.5025	12.5120	14.3577	14.5292	16.9324	18.4830	20.0714	(46)
Water storage loss:													
Store volume												180.0000	(47)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):	1.5520	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8381	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	187.4117	165.3207	173.9423	156.3704	153.5584	137.6708	132.6562	144.9610	144.5157	162.1254	170.8745	183.0520	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from w/h	187.4117	165.3207	173.9423	156.3704	153.5584	137.6708	132.6562	144.9610	144.5157	162.1254	170.8745	183.0520	(64)

Total per year (kWh/year) = Sum(64)m = 1912.4590 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	85.3353	75.7623	80.8568	74.2715	74.0791	68.0539	67.1292	71.2205	70.3298	76.9276	79.0941	83.8857	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	106.3165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5894	14.7345	11.9829	9.0718	6.7813	5.7251	6.1861	8.0410	10.7926	13.7037	15.9942	17.0504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.0407	187.9712	183.1064	172.7497	159.6762	147.3890	139.1804	137.2499	142.1147	152.4714	165.5449	177.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	33.6317	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	-85.0532	(71)
Water heating gains (Table 5)	114.6980	112.7415	108.6785	103.1548	99.5687	94.5193	90.2274	95.7264	97.6803	103.3974	109.8529	112.7496	(72)
Total internal gains	375.2230	373.3421	361.6627	342.8713	323.9212	305.5283	293.4889	298.9123	308.4825	327.4674	349.2870	365.5271	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.4600	19.6403	0.6300	0.7000	0.7700	74.7889	(76)
Southwest	0.9800	36.7938	0.6300	0.7000	0.7700	11.0198	(79)
Northwest	0.9800	11.2829	0.6300	0.7000	0.7700	3.3792	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	89.1879	171.9523	279.0161	403.5721	493.6520	505.3997	481.1050	413.5366	323.1336	202.7526	110.7041	73.6931	(83)
Total gains	464.4110	545.2944	640.6788	746.4434	817.5732	810.9280	774.5939	712.4488	631.6162	530.2200	459.9911	439.2202	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.1498	47.2395	47.3278	47.7469	47.8261	48.1984	48.1984	48.2680	48.0543	47.8261	47.6661	47.4999	
alpha	4.1433	4.1493	4.1552	4.1831	4.1884	4.2132	4.2132	4.2179	4.2036	4.1884	4.1777	4.1667	
util living area	0.9958	0.9914	0.9780	0.9354	0.8364	0.6732	0.5158	0.5752	0.8198	0.9642	0.9920	0.9967	(86)
MIT	19.4467	19.6345	19.9632	20.3858	20.7304	20.9234	20.9805	20.9696	20.8182	20.3528	19.8206	19.4133	(87)
Th 2	19.7079	19.7100	19.7121	19.7219	19.7237	19.7322	19.7322	19.7338	19.7289	19.7237	19.7200	19.7161	(88)
util rest of house	0.9944	0.9883	0.9699	0.9112	0.7770	0.5662	0.3763	0.4317	0.7321	0.9459	0.9887	0.9955	(89)
MIT 2	17.6787	17.9533	18.4290	19.0284	19.4735	19.6851	19.7259	19.7227	19.5917	18.9981	18.2324	17.6354	(90)

Living area fraction fLA = Living area / (4) = 0.3634 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
MIT	18.3211	18.5642	18.9865	19.5216	19.9302	20.1350	20.1818	20.1757	20.0374	19.4903	18.8095	18.2814	(92)

Temperature adjustment 0.0000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
adjusted MIT	18.3211	18.5642	18.9865	19.5216	19.9302	20.1350	20.1818	20.1757	20.0374	19.4903	18.8095	18.2814	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9845	0.9639	0.9065	0.7879	0.6026	0.4275	0.4842	0.7565	0.9415	0.9852	0.9936	(94)
Useful gains	460.7153	536.8462	617.5189	676.6852	644.1487	488.6249	331.1080	344.9736	477.7946	499.1769	453.2053	436.4118	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1348.0962	1311.2822	1196.0259	1008.4728	780.1202	520.6021	336.8866	354.6173	560.1192	842.6964	1113.6407	1343.9115	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	660.2113	520.4210	430.4092	238.8870	101.1628	0.0000	0.0000	0.0000	0.0000	255.5785	475.5135	675.1798	(98)

Space heating 3357.3632 (98)

Space heating per m2 (98) / (4) = 51.4302 (99)

8c. Space cooling requirement

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3590.7628	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	660.2113	520.4210	430.4092	238.8870	101.1628	0.0000	0.0000	0.0000	0.0000	255.5785	475.5135	675.1798	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	706.1084	556.6000	460.3307	255.4942	108.1955	0.0000	0.0000	0.0000	0.0000	273.3460	508.5706	722.1174	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	187.4117	165.3207	173.9423	156.3704	153.5584	137.6708	132.6562	144.9610	144.5157	162.1254	170.8745	183.0520	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.8942	87.6661	87.1372	85.9411	83.7317	79.8000	79.8000	79.8000	79.8000	86.0231	87.4020	87.9838	(217)
Fuel for water heating, kWh/month	213.2241	188.5799	199.6189	181.9505	183.3934	172.5197	166.2359	181.6554	181.0973	188.4673	195.5042	208.0520	(219)

Water heating fuel used	2260.2986	(219)
Annual totals kWh/year		
Space heating fuel - main system	3590.7628	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	292.9732	(232)
Total delivered energy for all uses	6219.0346	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3590.7628	0.2160	775.6048	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2260.2986	0.2160	488.2245	(264)
Space and water heating			1263.8293	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	292.9732	0.5190	152.0531	(268)
Total CO2, kg/m2/year			1454.8074	(272)
Emissions per m2 for space and water heating			19.3601	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3292	(272b)
Emissions per m2 for pumps and fans			0.5963	(272c)
Target Carbon Dioxide Emission Rate (TER) = (19.3601 * 1.00) + 2.3292 + 0.5963, rounded to 2 d.p.			22.2900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	E1099-F2	Issued on Date	12/05/2021
Assessment Reference	E1099-F2-BLR	Prop Type Ref	
Property	F2, Gondar Gardens, West Hampstead, London, NW6 1QF		

SAP Rating	83 B	DER	16.78	TER	20.46
Environmental	86 B	% DER<TER	18.01		
CO_2 Emissions (t/year)	1.28	DFEE	52.23	TFEE	67.38
General Requirements Compliance	Pass	% DFEE<TFEE	22.48		

Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01480451569, jason@doherty-energy.co.uk	Assessor ID	L143-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-Terrace Maisonette, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.
----------------------------------------------------------------------------------------------------
1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.46 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.78 kgCO□/m²OK
----------------------------------------------------------------------------------------------------
1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)67.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.2 kWh/m²/yrOK
----------------------------------------------------------------------------------------------------
2 Fabric U-values
Element         Average                 Highest
External wall   0.16 (max. 0.30)        0.16 (max. 0.70)         OK
Party wall      0.00 (max. 0.20)         -                       OK
Floor           0.10 (max. 0.25)        0.10 (max. 0.70)         OK
Roof            0.14 (max. 0.20)        0.15 (max. 0.35)         OK
Openings        1.06 (max. 2.00)        1.10 (max. 3.30)         OK
----------------------------------------------------------------------------------------------------
2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.025
----------------------------------------------------------------------------------------------------
3 Air permeability
Air permeability at 50 pascals:         1.50 (design value)
Maximum                                 10.0                                                OK
----------------------------------------------------------------------------------------------------
4 Heating efficiency
Main heating system:                    Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC+ HEAT H12

Efficiency: 89.4% SEDBUK2009
Minimum: 88.0%                                    OK

Secondary heating system:               None
----------------------------------------------------------------------------------------------------
5 Cylinder insulation
Hot water storage                       Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 2.10                           OK
Primary pipework insulated:             Yes                                                 OK
----------------------------------------------------------------------------------------------------
6 Controls
Space heating controls:                 Time and temperature zone control                   OK


Hot water controls:                     Cylinderstat                                        OK
                                        Independent timer for DHW                           OK

Boiler interlock                        Yes                                                 OK
----------------------------------------------------------------------------------------------------
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum                                 75%                                                 OK
----------------------------------------------------------------------------------------------------
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power:                     0.57
Maximum                                 1.5                                                 OK
MVHR efficiency:                        88%
Minimum:                                70%                                                 OK
----------------------------------------------------------------------------------------------------
9 Summertime temperature
Overheating risk (Thames Valley):       Medium                                              OK
Based on:
Overshading:                            Average
Windows facing North East:              0.88 m², No overhang
Windows facing South East:              7.20 m², No overhang
Windows facing South West:              9.08 m², No overhang
Windows facing North West:              9.08 m², No overhang
Air change rate:                        4.00 ach
Blinds/curtains:                        Light-coloured curtain or roller blind, closed 100% of daylight hours
----------------------------------------------------------------------------------------------------
10 Key features
Party wall U-value                      0.00 W/m²K
Roof U-value                            0.09 W/m²K
Floor U-value                           0.10 W/m²K
Door U-value                            0.55 W/m²K
Window U-value                          1.10 W/m²K
Thermal bridging y-value                0.025 W/m²K
Air permeability                        1.5 m³/m²h



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FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)			Storey height (m)			Volume (m3)	
Ground floor	5.9800	(1b)	x	3.2300	(2b)	=	19.3154	(1b) - (3b)
First floor	45.4200	(1c)	x	2.4500	(2c)	=	111.2790	(1c) - (3c)
Second floor	35.2200	(1d)	x	3.4200	(2d)	=	120.4524	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.6200								(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	251.0468	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		1.5000	
Infiltration rate		0.0750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0638	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.0813	0.0797	0.0781	0.0701	0.0685	0.0606	0.0606	0.0590	0.0638	0.0685	0.0717	0.0749	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	74.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2073	0.2057	0.2041	0.1961	0.1945	0.1866	0.1866	0.1850	0.1898	0.1945	0.1977	0.2009	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.9100	0.5500	1.0505			(26)
Window (Uw = 1.10)			26.2400	1.0536	27.6475			(27)
Grd Floor			4.4800	0.1000	0.4480			(28a)
Main Wall	77.2000	28.1500	49.0500	0.1600	7.8480			(29a)
Main Wall	181.0200		181.0200	0.1600	28.9632			(29a)
1st Roof	7.7300		7.7300	0.0900	0.6957			(30)
2nd Roof	46.4600		46.4600	0.1500	6.9690			(30)
Total net area of external elements Aum(A, m2)			316.8900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		73.6219			(33)
Party Wall 1			104.1600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		100.0000	(35)
Thermal bridges (User defined value 0.025 * total exposed area)		7.9223	(36)
Total fabric heat loss	(33) + (36) =	81.5442	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.1723	17.0403	16.9082	16.2481	16.1160	15.4559	15.4559	15.3238	15.7199	16.1160	16.3801	16.6442	(38)
Heat transfer coeff	98.7165	98.5844	98.4524	97.7922	97.6602	97.0000	97.0000	96.8680	97.2641	97.6602	97.9243	98.1883	(39)
Average = Sum(39)m / 12 =												97.7592	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1396	1.1381	1.1366	1.1290	1.1275	1.1198	1.1198	1.1183	1.1229	1.1275	1.1305	1.1336	(40)
HLP (average)												1.1286	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5766	(42)
Average daily hot water use (litres/day)	95.3936	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.9330	101.1172	97.3015	93.4857	89.6700	85.8542	85.8542	89.6700	93.4857	97.3015	101.1172	104.9330	(44)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design System) version 4.14r17

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE   09 Jan 2014

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Energy conte   155.6126   136.0997   140.4427   122.4414   117.4854   101.3810    93.9444   107.8026   109.0901   127.1340   138.7767   150.7025 (45)
Energy content (annual)                                                                                      Total = Sum(45)m =    1500.9129 (45)
Distribution loss  (46)m = 0.15 x (45)m
                23.3419    20.4150    21.0664    18.3662    17.6228    15.2071    14.0917    16.1704    16.3635    19.0701    20.8165    22.6054 (46)
Water storage loss:
Store volume                                                                                                                   180.0000 (47)
a) If  manufacturer declared loss factor is known  (kWh/day):                                                                    1.3000 (48)
  Temperature factor from Table 2b                                                                                               0.5400 (49)
Enter (49) or (54) in (55)                                                                                                       0.7020 (55)
Total storage loss
                21.7620    19.6560    21.7620    21.0600    21.7620    21.0600    21.7620    21.7620    21.0600    21.7620    21.0600    21.7620 (56)
If cylinder contains dedicated solar storage
                21.7620    19.6560    21.7620    21.0600    21.7620    21.0600    21.7620    21.7620    21.0600    21.7620    21.0600    21.7620 (57)
Primary loss    23.2624    21.0112    23.2624    22.5120    23.2624    22.5120    23.2624    23.2624    22.5120    23.2624    22.5120    23.2624 (59)
Total heat required for water heating calculated for each month
               200.6370   176.7669   185.4671   166.0134   162.5098   144.9530   138.9688   152.8270   152.6621   172.1584   182.3487   195.7269 (62)
Solar input      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                   Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
               200.6370   176.7669   185.4671   166.0134   162.5098   144.9530   138.9688   152.8270   152.6621   172.1584   182.3487   195.7269 (64)
                                                                                     Total per year (kWh/year) = Sum(64)m =   2031.0389 (64)
Heat gains from water heating, kWh/month
                87.7607    77.7869    82.7167    75.5694    75.0834    68.5668    67.2560    71.8639    71.1300    78.2916    81.0008    86.1281 (65)


-----------------------------------------------------------------------------------------------------
5. Internal gains (see Table 5 and 5a)
-----------------------------------------------------------------------------------------------------
Metabolic gains (Table 5), Watts
                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
(66)m          128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287   128.8287 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                20.7472    18.4275    14.9862    11.3455     8.4809     7.1599     7.7366    10.0563    13.4975    17.1382    20.0028    21.3238 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               232.7202   235.1351   229.0496   216.0943   199.7406   184.3704   174.1022   171.6873   177.7728   190.7281   207.0818   222.4520 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829    35.8829 (69)
Pumps, fans      3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629  -103.0629 (71)
Water heating gains (Table 5)
               117.9579   115.7544   111.1784   104.9574   100.9186    95.2316    90.3979    96.5912    98.7917   105.2306   112.5012   115.7636 (72)
Total internal gains
               436.0739   433.9655   419.8628   397.0459   373.7887   351.4106   336.8853   342.9834   354.7106   377.7455   404.2344   424.1879 (73)


-----------------------------------------------------------------------------------------------------
6. Solar gains
-----------------------------------------------------------------------------------------------------
[Jan]                                   Area         Solar flux              g               FF            Access             Gains
                                          m2           Table 6a    Specific data    Specific data          factor                 W
                                                           W/m2      or Table 6b      or Table 6c        Table 6d
-----------------------------------------------------------------------------------------------------
Northeast                               0.8800          11.2829           0.7200           0.7000          0.7700            3.4679 (75)
Southeast                               7.2000          36.7938           0.7200           0.7000          0.7700           92.5276 (77)
Southwest                               9.0800          36.7938           0.7200           0.7000          0.7700          116.6876 (79)
Northwest                               9.0800          11.2829           0.7200           0.7000          0.7700           35.7826 (81)
-----------------------------------------------------------------------------------------------------

Solar gains    248.4657   436.2664   631.5486   840.5641   994.4824  1010.5952   964.6234   846.2306   703.3710   491.5044   299.9789   211.0986 (83)
Total gains    684.5396   870.2320  1051.4114  1237.6100  1368.2711  1362.0058  1301.5087  1189.2140  1058.0816   869.2499   704.2133   635.2865 (84)


-----------------------------------------------------------------------------------------------------
7. Mean internal temperature (heating season)
-----------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                                     21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau             24.3740    24.4066    24.4393    24.6043    24.6376    24.8053    24.8053    24.8391    24.7379    24.6376    24.5711    24.5051
alpha            2.6249     2.6271     2.6293     2.6403     2.6425     2.6537     2.6537     2.6559     2.6492     2.6425     2.6381     2.6337
util living area
                 0.9393     0.8950     0.8241     0.7088     0.5663     0.4231     0.3163     0.3569     0.5486     0.7792     0.9067     0.9486 (86)

MIT             18.9185    19.3258    19.8374    20.3642    20.7227    20.9072    20.9684    20.9559    20.8112    20.2967    19.4994    18.8283 (87)
Th 2            19.9686    19.9698    19.9711    19.9772    19.9785    19.9847    19.9847    19.9859    19.9822    19.9785    19.9760    19.9735 (88)
util rest of house
                 0.9308     0.8813     0.8024     0.6754     0.5203     0.3643     0.2473     0.2841     0.4862     0.7441     0.8921     0.9413 (89)
MIT 2           17.2109    17.7897    18.5064    19.2245    19.6845    19.9050    19.9652    19.9570    19.8064    19.1593    18.0518    17.0848 (90)
Living area fraction                                                                                 fLA = Living area / (4) =   0.3172 (91)
MIT             17.7526    18.2770    18.9286    19.5861    20.0139    20.2230    20.2834    20.2739    20.1251    19.5201    18.5110    17.6379 (92)
Temperature adjustment                                                                                                          0.0000
adjusted MIT    17.7526    18.2770    18.9286    19.5861    20.0139    20.2230    20.2834    20.2739    20.1251    19.5201    18.5110    17.6379 (93)


-----------------------------------------------------------------------------------------------------
8. Space heating requirement
-----------------------------------------------------------------------------------------------------

                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation      0.9064     0.8534     0.7769     0.6615     0.5220     0.3785     0.2680     0.3053     0.4954     0.7263     0.8655     0.9186 (94)
Useful gains   620.4958   742.6846   816.8306   818.7150   714.1991   515.5395   348.8283   363.0769   524.2208   631.2946   609.5246   583.5996 (95)
Ext temp.        4.3000     4.9000     6.5000     8.9000    11.7000    14.6000    16.6000    16.4000    14.1000    10.6000     7.1000     4.2000 (96)
Heat loss rate W
              1327.9979  1318.7679  1223.6280  1045.0159   811.9327   545.4263   357.2945   375.2579   586.0286   871.1424  1117.4155  1319.4461 (97)
Month fracti     1.0000     1.0000     1.0000     1.0000     1.0000     0.0000     0.0000     0.0000     0.0000     1.0000     1.0000     1.0000 (97a)
Space heating kWh
               526.3816   387.1280   302.6573   162.9367    72.7138     0.0000     0.0000     0.0000     0.0000   178.4468   365.6814   547.4698 (98)
```

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating		2543.4154	(98)
Space heating per m2	(98) / (4) =	29.3629	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.4000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2723.1428	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.3816	387.1280	302.6573	162.9367	72.7138	0.0000	0.0000	0.0000	0.0000	178.4468	365.6814	547.4698	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	563.5777	414.4839	324.0442	174.4504	77.8520	0.0000	0.0000	0.0000	0.0000	191.0565	391.5219	586.1561	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	200.6370	176.7669	185.4671	166.0134	162.5098	144.9530	138.9688	152.8270	152.6621	172.1584	182.3487	195.7269	(64)
Efficiency of water heater												79.7000	(216)
(217)m	87.1703	86.7492	86.0124	84.6637	82.7269	79.7000	79.7000	79.7000	79.7000	84.8091	86.5344	87.3129	(217)
Fuel for water heating, kWh/month	230.1666	203.7679	215.6283	196.0858	196.4413	181.8733	174.3649	191.7528	191.5459	202.9950	210.7238	224.1672	(219)

Water heating fuel used	2419.5127	(219)
Annual totals kWh/year		
Space heating fuel - main system	2723.1428	(211)
Space heating fuel - secondary	0.0000	(215)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7125)

mechanical ventilation fans (SFP = 0.7125)	218.2224	(230a)
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	293.2224	(231)
Electricity for lighting (calculated in Appendix L)	366.4016	(232)
Total delivered energy for all uses	5802.2795	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2723.1428	0.2160	588.1988	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2419.5127	0.2160	522.6147	(264)
Space and water heating			1110.8136	(265)
Pumps and fans	293.2224	0.5190	152.1824	(267)
Energy for lighting	366.4016	0.5190	190.1624	(268)
Total CO2, kg/year			1453.1585	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.7800	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.7800	ZC1
Total Floor Area	TFA	86.6200	
Assumed number of occupants	N	2.5766	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.9207	ZC2
CO2 emissions from cooking, equation (L16)		2.0877	ZC3
Total CO2 emissions		34.7884	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.7884	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)			Storey height (m)			Volume (m3)	
Ground floor	5.9800	(1b)	x	3.2300	(2b)	=	19.3154	(1b) - (3b)
First floor	45.4200	(1c)	x	2.4500	(2c)	=	111.2790	(1c) - (3c)
Second floor	35.2200	(1d)	x	3.4200	(2d)	=	120.4524	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.6200								(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	251.0468	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1195	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3695	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3141	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4004	0.3926	0.3847	0.3455	0.3376	0.2984	0.2984	0.2905	0.3141	0.3376	0.3533	0.3690	(22b)
Effective ac	0.5802	0.5771	0.5740	0.5597	0.5570	0.5445	0.5445	0.5422	0.5493	0.5570	0.5624	0.5681	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9100	1.0000	1.9100			(26)
TER Opening Type (Uw = 1.40)			19.7400	1.3258	26.1705			(27)
Grd Floor			4.4800	0.1300	0.5824			(28a)
Main Wall	77.2000	21.6500	55.5500	0.1800	9.9990			(29a)
Main Wall	181.0200		181.0200	0.1800	32.5836			(29a)
1st Roof	7.7300		7.7300	0.1300	1.0049			(30)
2nd Roof	46.4600		46.4600	0.1300	6.0398			(30)
Total net area of external elements Aum(A, m2)			316.8900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.2902			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		0.0000	(36)
Total fabric heat loss	(33) + (36) =	78.2902	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	48.0651	47.8072	47.5544	46.3669	46.1447	45.1104	45.1104	44.9189	45.5088	46.1447	46.5941	47.0640	(38)
Heat transfer coeff	126.3553	126.0973	125.8445	124.6570	124.4348	123.4005	123.4005	123.2090	123.7989	124.4348	124.8843	125.3542	(39)
Average = Sum(39)m / 12 =												124.6559	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4587	1.4558	1.4528	1.4391	1.4366	1.4246	1.4246	1.4224	1.4292	1.4366	1.4417	1.4472	(40)
HLP (average)												1.4391	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5766	(42)
Average daily hot water use (litres/day)	95.3936	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.9330	101.1172	97.3015	93.4857	89.6700	85.8542	85.8542	89.6700	93.4857	97.3015	101.1172	104.9330	(44)
Energy conte	155.6126	136.0997	140.4427	122.4414	117.4854	101.3810	93.9444	107.8026	109.0901	127.1340	138.7767	150.7025	(45)
Energy content (annual)										Total = Sum(45)m =		1500.9129	(45)
Distribution loss (46)m = 0.15 x (45)m	23.3419	20.4150	21.0664	18.3662	17.6228	15.2071	14.0917	16.1704	16.3635	19.0701	20.8165	22.6054	(46)

Water storage loss:

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Store volume	180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5520	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8381	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	204.8552	180.5770	189.6854	170.0956	166.7281	149.0352	143.1871	157.0452	156.7443	176.3766	186.4308	199.9451	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h	204.8552	180.5770	189.6854	170.0956	166.7281	149.0352	143.1871	157.0452	156.7443	176.3766	186.4308	199.9451	(64)
Total per year (kWh/year) = Sum(64)m =												2080.7057	(64)
Heat gains from water heating, kWh/month	91.1353	80.8350	86.0913	78.8351	78.4580	71.8325	70.6306	75.2385	74.3958	81.6662	84.2666	89.5027	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts (66)m	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	128.8287	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7472	18.4275	14.9862	11.3455	8.4809	7.1599	7.7366	10.0563	13.4975	17.1382	20.0028	21.3238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.7202	235.1351	229.0496	216.0943	199.7406	184.3704	174.1022	171.6873	177.7728	190.7281	207.0818	222.4520	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	35.8829	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	-103.0629	(71)
Water heating gains (Table 5)	122.4937	120.2901	115.7142	109.4932	105.4544	99.7674	94.9337	101.1270	103.3275	109.7664	117.0369	120.2993	(72)
Total internal gains	440.6097	438.5013	424.3986	401.5817	378.3245	355.9464	341.4210	347.5192	359.2464	382.2812	408.7702	428.7237	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.6600	11.2829	0.6300	0.7000	0.7700	2.2758	(75)
Southeast	5.4200	36.7938	0.6300	0.7000	0.7700	60.9461	(77)
Southwest	6.8300	36.7938	0.6300	0.7000	0.7700	76.8011	(79)
Northwest	6.8300	11.2829	0.6300	0.7000	0.7700	23.5513	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	163.5744	287.2064	415.7549	553.3344	654.6422	665.2427	634.9834	557.0589	463.0304	323.5681	197.4867	138.9747	(83)
Total gains	604.1841	725.7077	840.1536	954.9161	1032.9667	1021.1891	976.4045	904.5780	822.2769	705.8494	606.2568	567.6984	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.6061	47.7034	47.7993	48.2546	48.3408	48.7460	48.7460	48.8217	48.5891	48.3408	48.1668	47.9863	
alpha	4.1737	4.1802	4.1866	4.2170	4.2227	4.2497	4.2497	4.2548	4.2393	4.2227	4.2111	4.1991	
util living area	0.9961	0.9912	0.9786	0.9412	0.8515	0.6940	0.5347	0.5915	0.8242	0.9633	0.9922	0.9970	(86)
MIT	19.4517	19.6537	19.9698	20.3721	20.7138	20.9163	20.9785	20.9673	20.8179	20.3671	19.8322	19.4161	(87)
Th 2	19.7186	19.7208	19.7231	19.7335	19.7354	19.7445	19.7445	19.7462	19.7410	19.7354	19.7315	19.7274	(88)
util rest of house	0.9948	0.9882	0.9708	0.9188	0.7951	0.5877	0.3926	0.4469	0.7379	0.9447	0.9889	0.9960	(89)
MIT 2	17.6931	17.9884	18.4462	19.0197	19.4660	19.6920	19.7374	19.7340	19.6026	19.0262	18.2569	17.6469	(90)
Living area fraction — fLA = Living area / (4) =												0.3172	(91)
MIT	18.2510	18.5167	18.9296	19.4488	19.8619	20.0804	20.1312	20.1253	19.9882	19.4516	18.7566	18.2082	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2510	18.5167	18.9296	19.4488	19.8619	20.0804	20.1312	20.1253	19.9882	19.4516	18.7566	18.2082	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9840	0.9643	0.9125	0.8016	0.6184	0.4381	0.4931	0.7575	0.9392	0.9853	0.9941	(94)
Useful gains	599.6164	714.1260	810.1364	871.3328	828.0473	631.4984	427.8074	446.0112	622.8775	662.9262	597.3184	564.3371	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1762.7883	1717.0294	1564.1953	1314.9786	1015.6194	676.2840	435.7464	458.9860	728.9506	1101.4472	1455.7308	1755.9838	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	865.3999	673.9511	561.0198	319.4250	139.5536	0.0000	0.0000	0.0000	0.0000	326.2596	618.0569	886.5851	(98)
Space heating												4390.2510	(98)
Space heating per m2 — (98) / (4) =												50.6840	(99)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	4695.4556	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	865.3999	673.9511	561.0198	319.4250	139.5536	0.0000	0.0000	0.0000	0.0000	326.2596	618.0569	886.5851	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	925.5614	720.8033	600.0212	341.6310	149.2552	0.0000	0.0000	0.0000	0.0000	348.9408	661.0234	948.2194	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	204.8552	180.5770	189.6854	170.0956	166.7281	149.0352	143.1871	157.0452	156.7443	176.3766	186.4308	199.9451	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.2354	88.0064	87.5343	86.4712	84.3437	79.8000	79.8000	79.8000	79.8000	86.4332	87.7727	88.3207	(217)
Fuel for water heating, kWh/month	232.1689	205.1863	216.6983	196.7078	197.6770	186.7609	179.4324	196.7985	196.4214	204.0611	212.4019	226.3853	(219)

Water heating fuel used	2450.6998	(219)
Annual totals kWh/year		
Space heating fuel - main system	4695.4556	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	366.4016	(232)
Total delivered energy for all uses	7587.5571	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4695.4556	0.2160	1014.2184	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2450.6998	0.2160	529.3512	(264)
Space and water heating			1543.5696	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	366.4016	0.5190	190.1624	(268)
Total CO2, kg/m2/year			1772.6570	(272)
Emissions per m2 for space and water heating			17.8200	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1954	(272b)
Emissions per m2 for pumps and fans			0.4494	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.8200 * 1.00) + 2.1954 + 0.4494, rounded to 2 d.p.			20.4600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	E1099-H1	**Issued on Date**	12/05/2021
Assessment Reference	E1099-H1-BLR	**Prop Type Ref**	
Property	H1, Gondar Gardens, West Hampstead, London, NW6 1QF		

SAP Rating	86 B	**DER**	12.86	**TER**	15.92
Environmental	88 B	**% DER<TER**	19.22		
CO_2 Emissions (t/year)	1.67	**DFEE**	43.15	**TFEE**	57.50
General Requirements Compliance	Pass	**% DFEE<TFEE**	24.95		

Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01480451569, jason@doherty-energy.co.uk	**Assessor ID**	L143-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Semi-Detached House, total floor area 150 m^2

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.92 $kgCO_2/m^2$
Dwelling Carbon Dioxide Emission Rate (DER) 12.86 $kgCO_2/m^2$OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.5 $kWh/m^2/yr$
Dwelling Fabric Energy Efficiency (DFEE)43.2 $kWh/m^2/yr$OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.08 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.025

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC+ SYSTEM s18

Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.30 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.87	
Maximum	1.5	OK
MVHR efficiency:	84%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North:	4.86 m^2, No overhang	
Windows facing North East:	8.08 m^2, No overhang	
Windows facing East:	14.80 m^2, No overhang	
Windows facing South West:	8.27 m^2, No overhang	
Windows facing North West:	6.07 m^2, No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	Light-coloured curtain or roller blind, closed 100% of daylight hours	

10 Key features

External wall U-value	0.14 W/m^2K
Party wall U-value	0.00 W/m^2K
Roof U-value	0.09 W/m^2K
Roof U-value	0.09 W/m^2K
Roof U-value	0.09 W/m^2K
Floor U-value	0.11 W/m^2K
Floor U-value	0.12 W/m^2K
Door U-value	0.55 W/m^2K
Window U-value	1.10 W/m^2K
Thermal bridging y-value	0.025 W/m^2K
Air permeability	1.5 m^3/m^2h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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SAP 2012 WORKSHEET FOR New Build (As Designed)   (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE      09 Jan 2014
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----------------------------------------------------------------------------------------------------
1. Overall dwelling dimensions
----------------------------------------------------------------------------------------------------
                                                                                    Area          Storey height              Volume
                                                                                    (m2)              (m)                     (m3)
Basement floor                                                                 39.5800 (1a)    x      2.6000 (2a)    =    102.9080 (1a) - (3a)
Ground floor                                                                   46.5400 (1b)    x      3.2300 (2b)    =    150.3242 (1b) - (3b)
First floor                                                                    34.2000 (1c)    x      2.7000 (2c)    =     92.3400 (1c) - (3c)
Second floor                                                                   29.2000 (1d)    x      3.4200 (2d)    =     99.8640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)              149.5200                                                       (4)
Dwelling volume                                                                      (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =    445.4362 (5)


----------------------------------------------------------------------------------------------------
2. Ventilation rate
----------------------------------------------------------------------------------------------------
                                                             main            secondary             other              total        m3 per hour
                                                           heating            heating
Number of chimneys                                            0      +           0       +           0      =           0 * 40 =      0.0000 (6a)
Number of open flues                                          0      +           0       +           0      =           0 * 20 =      0.0000 (6b)
Number of intermittent fans                                                                                             0 * 10 =      0.0000 (7a)
Number of passive vents                                                                                                 0 * 10 =      0.0000 (7b)
Number of flueless gas fires                                                                                            0 * 40 =      0.0000 (7c)

                                                                                                                        Air changes per hour
Infiltration due to chimneys, flues and fans   = (6a)+(6b)+(7a)+(7b)+(7c) =                                     0.0000 / (5) =      0.0000 (8)
Pressure test                                                                                                                           Yes
Measured/design AP50                                                                                                                 1.5000
Infiltration rate                                                                                                                    0.0750 (18)
Number of sides sheltered                                                                                                                 2 (19)

Shelter factor                                                                                    (20) = 1 - [0.075 x (19)] =      0.8500 (20)
Infiltration rate adjusted to include shelter factor                                                       (21) = (18) x (20) =      0.0638 (21)


                 Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Wind speed       5.1000     5.0000     4.9000     4.4000     4.3000     3.8000     3.8000     3.7000     4.0000     4.3000     4.5000     4.7000 (22)
Wind factor      1.2750     1.2500     1.2250     1.1000     1.0750     0.9500     0.9500     0.9250     1.0000     1.0750     1.1250     1.1750 (22a)
Adj infilt rate
                 0.0813     0.0797     0.0781     0.0701     0.0685     0.0606     0.0606     0.0590     0.0638     0.0685     0.0717     0.0749 (22b)
 Balanced mechanical ventilation with heat recovery
If mechanical ventilation:                                                                                                           0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =                                         71.4000 (23c)

Effective ac     0.2243     0.2227     0.2211     0.2131     0.2115     0.2036     0.2036     0.2020     0.2068     0.2115     0.2147     0.2179 (25)



----------------------------------------------------------------------------------------------------
3. Heat losses and heat loss parameter
----------------------------------------------------------------------------------------------------
Element                                          Gross        Openings         NetArea         U-value          A x U         K-value          A x K
                                                   m2             m2               m2           W/m2K             W/K          kJ/m2K            kJ/K
Door                                                                            1.9100          0.5500         1.0505                                (26)
Window (Uw = 1.10)                                                             42.0800          1.0536        44.3372                                (27)
Base Floor                                                                     19.7800          0.1100         2.1758                                (28)
Grd Floor                                                                      19.8000          0.1200         2.3760                                (28a)
Basement                                        34.5000                        34.5000          0.1400         4.8300                                (29a)
Main Wall                                      181.0200        43.9900        137.0300          0.1600        21.9248                                (29a)
Basement roof                                   12.8300                        12.8300          0.0900         1.1547                                (30)
Grd Roof                                        12.5400                        12.5400          0.0900         1.1286                                (30)
1st Roof                                         3.1700                         3.1700          0.0900         0.2853                                (30)
2nd Roof                                        39.3400                        39.3400          0.1500         5.9010                                (30)
Total net area of external elements Aum(A, m2)                                322.9800                                                       (31)
Fabric heat loss, W/K = Sum (A x U)                                       (26)...(30) + (32) =        85.1639                                (33)
Party Wall 1                                                                   76.2600          0.0000         0.0000                                (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                                                    100.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)                                                                        8.0745 (36)
Total fabric heat loss                                                                                            (33) + (36) =       93.2384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
                 Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
(38)m           32.9680    32.7337    32.4994    31.3281    31.0938    29.9225    29.9225    29.6882    30.3910    31.0938    31.5624    32.0309 (38)
Heat transfer coeff
               126.2064   125.9721   125.7378   124.5664   124.3322   123.1608   123.1608   122.9265   123.6294   124.3322   124.8007   125.2693 (39)
Average = Sum(39)m / 12 =                                                                                                            124.5079 (39)

                 Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
HLP              0.8441     0.8425     0.8409     0.8331     0.8315     0.8237     0.8237     0.8221     0.8268     0.8315     0.8347     0.8378 (40)
HLP (average)                                                                                                                          0.8327 (40)
Days in month
                     31         28         31         30         31         30         31         31         30         31         30         31 (41)



----------------------------------------------------------------------------------------------------
4. Water heating energy requirements (kWh/year)
----------------------------------------------------------------------------------------------------
Assumed occupancy                                                                                                                      2.9334 (42)
Average daily hot water use (litres/day)                                                                                             103.8691 (43)
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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	114.2560	110.1013	105.9465	101.7917	97.6370	93.4822	93.4822	97.6370	101.7917	105.9465	110.1013	114.2560	(44)
Energy conte	169.4384	148.1919	152.9208	133.3200	127.9238	110.3885	102.2911	117.3806	118.7825	138.4295	151.1067	164.0920	(45)
Energy content (annual)										Total = Sum(45)m =		1634.2658	(45)
Distribution loss (46)m = 0.15 x (45)m													
	25.4158	22.2288	22.9381	19.9980	19.1886	16.5583	15.3437	17.6071	17.8174	20.7644	22.6660	24.6138	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7020	(55)
Total storage loss													
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
If cylinder contains dedicated solar storage													
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	214.4628	188.8591	197.9452	176.8920	172.9482	153.9605	147.3155	162.4050	162.3545	183.4539	194.6787	209.1164	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	214.4628	188.8591	197.9452	176.8920	172.9482	153.9605	147.3155	162.4050	162.3545	183.4539	194.6787	209.1164	(64)
								Total per year (kWh/year) = Sum(64)m =				2164.3918	(64)
Heat gains from water heating, kWh/month													
	92.3578	81.8076	86.8657	79.1865	78.5542	71.5618	70.0313	75.0486	74.3528	82.0473	85.1006	90.5801	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.5282	25.3385	20.6067	15.6006	11.6616	9.8452	10.6381	13.8278	18.5597	23.5658	27.5047	29.3211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	320.0001	323.3207	314.9529	297.1388	274.6518	253.5171	239.3979	236.0773	244.4451	262.2591	284.7462	305.8809	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	(71)
Water heating gains (Table 5)													
	124.1368	121.7375	116.7549	109.9813	105.5836	99.3913	94.1281	100.8717	103.2677	110.2787	118.1952	121.7475	(72)
Total internal gains													
	542.6667	540.3982	522.3161	492.7222	461.8985	432.7552	414.1657	420.7784	436.2740	466.1051	500.4477	526.9510	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8600	10.6334	0.7200	0.7000	0.7700	18.0498	(74)
Northeast	8.0800	11.2829	0.7200	0.7000	0.7700	31.8418	(75)
East	14.8000	19.6403	0.7200	0.7000	0.7700	101.5250	(76)
Southwest	8.2700	36.7938	0.7200	0.7000	0.7700	106.2782	(79)
Northwest	6.0700	11.2829	0.7200	0.7000	0.7700	23.9207	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	281.6155	527.6358	837.8838	1213.9225	1506.6389	1556.7837	1475.7686	1250.4357	968.2624	615.5131	346.3169	235.0269	(83)
Total gains	824.2822	1068.0340	1360.1999	1706.6447	1968.5374	1989.5390	1889.9342	1671.2141	1404.5365	1081.6182	846.7646	761.9779	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	32.9091	32.9703	33.0317	33.3423	33.4051	33.7228	33.7228	33.7871	33.5950	33.4051	33.2797	33.1552	
alpha	3.1939	3.1980	3.2021	3.2228	3.2270	3.2482	3.2482	3.2525	3.2397	3.2270	3.2186	3.2103	
util living area													
	0.9690	0.9347	0.8596	0.7138	0.5387	0.3841	0.2832	0.3317	0.5534	0.8266	0.9465	0.9752	(86)
MIT	19.2506	19.6227	20.1249	20.6120	20.8713	20.9677	20.9910	20.9850	20.8981	20.4641	19.7481	19.1759	(87)
Th 2	20.2153	20.2166	20.2180	20.2247	20.2261	20.2328	20.2328	20.2342	20.2301	20.2261	20.2234	20.2207	(88)
util rest of house													
	0.9649	0.9265	0.8435	0.6862	0.5021	0.3412	0.2351	0.2787	0.5033	0.8005	0.9384	0.9718	(89)
MIT 2	17.8402	18.3756	19.0860	19.7536	20.0852	20.2034	20.2266	20.2232	20.1296	19.5750	18.5667	17.7356	(90)
Living area fraction									fLA = Living area / (4) =			0.2647	(91)
MIT	18.2136	18.7057	19.3610	19.9809	20.2933	20.4057	20.4289	20.4249	20.3330	19.8103	18.8795	18.1169	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2136	18.7057	19.3610	19.9809	20.2933	20.4057	20.4289	20.4249	20.3330	19.8103	18.8795	18.1169	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.9068	0.8233	0.6769	0.5054	0.3510	0.2475	0.2921	0.5102	0.7847	0.9204	0.9593	(94)
Useful gains	783.5062	968.5116	1119.8459	1155.2800	994.8785	698.3255	467.6655	488.0820	716.6087	848.7792	779.3750	730.9340	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	1755.9811	1739.1317	1617.1193	1380.3033	1068.4246	715.0363	471.5717	494.7660	770.5858	1145.1421	1470.0847	1743.3582	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	723.5213	517.8567	369.9714	162.0168	54.7183	0.0000	0.0000	0.0000	0.0000	220.4940	497.3110	753.2436	(98)

Space heating		3299.1331	(98)
Space heating per m2	(98) / (4) =	22.0648	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.6000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3524.7149	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	723.5213	517.8567	369.9714	162.0168	54.7183	0.0000	0.0000	0.0000	0.0000	220.4940	497.3110	753.2436	(98)
Space heating efficiency (main heating system 1)	93.6000	93.6000	93.6000	93.6000	93.6000	0.0000	0.0000	0.0000	0.0000	93.6000	93.6000	93.6000	(210)
Space heating fuel (main heating system)	772.9929	553.2657	395.2685	173.0949	58.4597	0.0000	0.0000	0.0000	0.0000	235.5705	531.3152	804.7475	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	214.4628	188.8591	197.9452	176.8920	172.9482	153.9605	147.3155	162.4050	162.3545	183.4539	194.6787	209.1164	(64)
Efficiency of water heater												79.9000	(216)
(217)m	87.9083	87.4697	86.5597	84.6810	82.2342	79.9000	79.9000	79.9000	79.9000	85.4057	87.3106	88.0381	(217)
Fuel for water heating, kWh/month	243.9619	215.9138	228.6805	208.8922	210.3117	192.6915	184.3749	203.2603	203.1971	214.8029	222.9726	237.5294	(219)

Water heating fuel used	2566.5888	(219)
Annual totals kWh/year		
Space heating fuel - main system	3524.7149	(211)
Space heating fuel - secondary	0.0000	(215)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0875)

mechanical ventilation fans (SFP = 1.0875)	590.9825	(230a)
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	665.9825	(231)
Electricity for lighting (calculated in Appendix L)	503.8177	(232)
Total delivered energy for all uses	7261.1038	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3524.7149	0.2160	761.3384	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2566.5888	0.2160	554.3832	(264)
Space and water heating			1315.7216	(265)
Pumps and fans	665.9825	0.5190	345.6449	(267)
Energy for lighting	503.8177	0.5190	261.4814	(268)
Total CO2, kg/year			1922.8479	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.8600	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.8600	ZC1
Total Floor Area	TFA	149.5200	
Assumed number of occupants	N	2.9334	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		12.6823	ZC2
CO2 emissions from cooking, equation (L16)		1.2667	ZC3
Total CO2 emissions		26.8090	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		26.8090	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	39.5800 (1a)	x	2.6000 (2a)	=	102.9080	(1a) - (3a)
Ground floor	46.5400 (1b)	x	3.2300 (2b)	=	150.3242	(1b) - (3b)
First floor	34.2000 (1c)	x	2.7000 (2c)	=	92.3400	(1c) - (3c)
Second floor	29.2000 (1d)	x	3.4200 (2d)	=	99.8640	(1d) - (3d)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 149.5200 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 445.4362 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0898	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3398	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2888	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3683	0.3610	0.3538	0.3177	0.3105	0.2744	0.2744	0.2672	0.2888	0.3105	0.3249	0.3394	(22b)
Effective ac	0.5678	0.5652	0.5626	0.5505	0.5482	0.5376	0.5376	0.5357	0.5417	0.5482	0.5528	0.5576	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9100	1.0000	1.9100			(26)
TER Opening Type (Uw = 1.40)			35.4700	1.3258	47.0246			(27)
Base Floor			19.7800	0.1300	2.5714			(28)
Grd Floor			19.8000	0.1300	2.5740			(28a)
Basement	34.5000		34.5000	0.1800	6.2100			(29a)
Main Wall	181.0200	37.3800	143.6400	0.1800	25.8552			(29a)
Basement roof	12.8300		12.8300	0.1300	1.6679			(30)
Grd Roof	12.5400		12.5400	0.1300	1.6302			(30)
1st Roof	3.1700		3.1700	0.1300	0.4121			(30)
2nd Roof	39.3400		39.3400	0.1300	5.1142			(30)
Total net area of external elements Aum(A, m2)			322.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.9696			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		0.0000	(36)
Total fabric heat loss	(33) + (36) =	94.9696	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	83.4642	83.0771	82.6978	80.9159	80.5825	79.0305	79.0305	78.7431	79.6283	80.5825	81.2569	81.9620	(38)
Heat transfer coeff	178.4338	178.0468	177.6674	175.8855	175.5521	174.0001	174.0001	173.7127	174.5979	175.5521	176.2265	176.9316	(39)
Average = Sum(39)m / 12 =												175.8839	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1934	1.1908	1.1883	1.1763	1.1741	1.1637	1.1637	1.1618	1.1677	1.1741	1.1786	1.1833	(40)
HLP (average)												1.1763	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9334	(42)
Average daily hot water use (litres/day)	103.8691	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.2560	110.1013	105.9465	101.7917	97.6370	93.4822	93.4822	97.6370	101.7917	105.9465	110.1013	114.2560	(44)
Energy conte	169.4384	148.1919	152.9208	133.3200	127.9238	110.3885	102.2911	117.3806	118.7825	138.4295	151.1067	164.0920	(45)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy content (annual) — Total = Sum(45)m = 1634.2658 (45)

Distribution loss (46)m = 0.15 x (45)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	25.4158	22.2288	22.9381	19.9980	19.1886	16.5583	15.3437	17.6071	17.8174	20.7644	22.6660	24.6138	(46)

Water storage loss:

Store volume	180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5520	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8381	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	218.6811	192.6692	202.1634	180.9742	177.1664	158.0427	151.5338	166.6233	166.4367	187.6722	198.7609	213.3347	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from w/h	218.6811	192.6692	202.1634	180.9742	177.1664	158.0427	151.5338	166.6233	166.4367	187.6722	198.7609	213.3347	(64)

Total per year (kWh/year) = Sum(64)m = 2214.0586 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	95.7324	84.8556	90.2403	82.4523	81.9288	74.8275	73.4059	78.4232	77.6185	85.4220	88.3663	93.9547	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts (66)m	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	146.6718	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.5282	25.3385	20.6067	15.6006	11.6616	9.8452	10.6381	13.8278	18.5597	23.5658	27.5047	29.3211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.0001	323.3207	314.9529	297.1388	274.6518	253.5171	239.3979	236.0773	244.4451	262.2591	284.7462	305.8809	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	37.6672	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	-117.3375	(71)
Water heating gains (Table 5)	128.6726	126.2732	121.2907	114.5170	110.1193	103.9271	98.6639	105.4075	107.8035	114.8145	122.7310	126.2833	(72)
Total internal gains	547.2025	544.9340	526.8519	497.2580	466.4343	437.2910	418.7014	425.3141	440.8098	470.6409	504.9835	531.4868	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.1000	10.6334	0.6300	0.7000	0.7700	13.3238	(74)
Northeast	6.8100	11.2829	0.6300	0.7000	0.7700	23.4823	(75)
East	12.4700	19.6403	0.6300	0.7000	0.7700	74.8489	(76)
Southwest	6.9700	36.7938	0.6300	0.7000	0.7700	78.3754	(79)
Northwest	5.1200	11.2829	0.6300	0.7000	0.7700	17.6549	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	207.6853	389.1210	617.9295	895.2702	1111.1670	1148.1580	1088.4042	922.2052	714.0871	453.9302	255.4013	173.3272	(83)
Total gains	754.8878	934.0550	1144.7814	1392.5282	1577.6013	1585.4490	1507.1057	1347.5193	1154.8970	924.5711	760.3848	704.8140	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.1915	58.3180	58.4425	59.0346	59.1467	59.6743	59.6743	59.7730	59.4700	59.1467	58.9204	58.6856	
alpha	4.8794	4.8879	4.8962	4.9356	4.9431	4.9783	4.9783	4.9849	4.9647	4.9431	4.9280	4.9124	
util living area	0.9991	0.9972	0.9894	0.9537	0.8457	0.6614	0.4993	0.5743	0.8494	0.9826	0.9978	0.9994	(86)
MIT	19.6130	19.7935	20.0996	20.4998	20.8133	20.9593	20.9918	20.9842	20.8599	20.4264	19.9435	19.5840	(87)
Th 2	19.9253	19.9274	19.9294	19.9390	19.9408	19.9491	19.9491	19.9507	19.9459	19.9408	19.9371	19.9334	(88)
util rest of house	0.9988	0.9962	0.9855	0.9363	0.7938	0.5692	0.3846	0.4526	0.7771	0.9734	0.9969	0.9991	(89)
MIT 2	18.0686	18.3338	18.7803	19.3551	19.7627	19.9232	19.9462	19.9444	19.8329	19.2632	18.5605	18.0318	(90)

Living area fraction — fLA = Living area / (4) = 0.2647 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
MIT	18.4774	18.7202	19.1296	19.6581	20.0408	20.1975	20.2230	20.2196	20.1048	19.5711	18.9266	18.4427	(92)

Temperature adjustment 0.0000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
adjusted MIT	18.4774	18.7202	19.1296	19.6581	20.0408	20.1975	20.2230	20.2196	20.1048	19.5711	18.9266	18.4427	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9945	0.9815	0.9306	0.7993	0.5922	0.4151	0.4850	0.7897	0.9690	0.9956	0.9986	(94)
Useful gains	753.4367	928.9466	1123.5964	1295.9112	1260.9570	938.8365	625.5893	653.5224	912.0157	895.9197	757.0193	703.8419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2529.7354	2460.6414	2243.8603	1892.1919	1464.2477	973.9574	630.4009	663.5208	1048.4238	1574.8937	2084.1593	2519.9803	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1321.5662	1029.2989	833.4763	429.3222	151.2483	0.0000	0.0000	0.0000	0.0000	505.1566	955.5408	1351.2070	(98)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Space heating		6576.8162	(98)
Space heating per m2	(98) / (4) =	43.9862	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	7034.0280	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1321.5662	1029.2989	833.4763	429.3222	151.2483	0.0000	0.0000	0.0000	0.0000	505.1566	955.5408	1351.2070	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1413.4398	1100.8544	891.4185	459.1681	161.7629	0.0000	0.0000	0.0000	0.0000	540.2745	1021.9688	1445.1411	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	218.6811	192.6692	202.1634	180.9742	177.1664	158.0427	151.5338	166.6233	166.4367	187.6722	198.7609	213.3347	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.8093	88.6263	88.1916	87.0392	84.3954	79.8000	79.8000	79.8000	79.8000	87.3282	88.4577	88.8751	(217)
Fuel for water heating, kWh/month	246.2366	217.3950	229.2320	207.9226	209.9243	198.0485	189.8920	208.8011	208.5673	214.9045	224.6960	240.0389	(219)

Water heating fuel used	2595.6587	(219)
Annual totals kWh/year		
Space heating fuel - main system	7034.0280	(211)
Space heating fuel - secondary	0.0000	(215)
Electricity for pumps and fans:		
central heating pump	30.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	75.0000	(231)
Electricity for lighting (calculated in Appendix L)	503.8177	(232)
Total delivered energy for all uses	10208.5044	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7034.0280	0.2160	1519.3501	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2595.6587	0.2160	560.6623	(264)
Space and water heating			2080.0123	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	503.8177	0.5190	261.4814	(268)
Total CO2, kg/m2/year			2380.4187	(272)
Emissions per m2 for space and water heating			13.9113	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.7488	(272b)
Emissions per m2 for pumps and fans			0.2603	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9113 * 1.00) + 1.7488 + 0.2603, rounded to 2 d.p.			15.9200	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	E1099-H2	Issued on Date	12/05/2021
Assessment Reference	E1099-H2-BLR	Prop Type Ref	
Property	H2, Gondar Gardens, West Hampstead, London, NW6 1QF		

SAP Rating	86 B	DER	12.83	TER	15.54
Environmental	88 B	% DER<TER	17.46		
CO_2 Emissions (t/year)	1.52	DFEE	40.79	TFEE	53.54
General Requirements Compliance	Pass	% DFEE<TFEE	23.82		

Assessor Details	Mr. Jason Doherty, Doherty Energy Limited, Tel: 01480451569, jason@doherty-energy.co.uk	Assessor ID	L143-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Semi-Detached House, total floor area 134 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.
----------------------------------------------------------------------------------------------------
1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.54 kgCO2/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.83 kgCO2/m²OK
----------------------------------------------------------------------------------------------------
1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.8 kWh/m²/yrOK
----------------------------------------------------------------------------------------------------
2 Fabric U-values
Element         Average                Highest
External wall   0.16 (max. 0.30)       0.16 (max. 0.70)          OK
Party wall      0.00 (max. 0.20)        -                        OK
Floor           0.11 (max. 0.25)       0.12 (max. 0.70)          OK
Roof            0.13 (max. 0.20)       0.15 (max. 0.35)          OK
Openings        1.07 (max. 2.00)       1.10 (max. 3.30)          OK
----------------------------------------------------------------------------------------------------
2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.025
----------------------------------------------------------------------------------------------------
3 Air permeability
Air permeability at 50 pascals:        1.50 (design value)
Maximum                                10.0                                               OK
----------------------------------------------------------------------------------------------------
4 Heating efficiency
Main heating system:                   Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC+ SYSTEM s18

Efficiency: 89.6% SEDBUK2009
Minimum: 88.0%                                   OK

Secondary heating system:              None
----------------------------------------------------------------------------------------------------
5 Cylinder insulation
Hot water storage                      Measured cylinder loss: 1.30 kWh/day
Permitted by DBSCG 2.10                          OK
Primary pipework insulated:            Yes                                                OK
----------------------------------------------------------------------------------------------------
6 Controls
Space heating controls:                Time and temperature zone control                  OK


Hot water controls:                    Cylinderstat                                       OK
                                       Independent timer for DHW                          OK

Boiler interlock                       Yes                                                OK
----------------------------------------------------------------------------------------------------
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum                                75%                                                OK
----------------------------------------------------------------------------------------------------
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power:                    0.87
Maximum                                1.5                                                OK
MVHR efficiency:                       84%
Minimum:                               70%                                                OK
----------------------------------------------------------------------------------------------------
9 Summertime temperature
Overheating risk (Thames Valley):      Slight                                             OK
Based on:
Overshading:                           Average
Windows facing East:                   13.20 m², No overhang
Windows facing South East:             8.08 m², No overhang
Windows facing South:                  3.78 m², No overhang
Windows facing South West:             9.94 m², No overhang
Windows facing North West:             4.40 m², No overhang
Air change rate:                       4.00 ach
Blinds/curtains:                       Light-coloured curtain or roller blind, closed 100% of daylight hours
----------------------------------------------------------------------------------------------------
10 Key features
External wall U-value                  0.14 W/m²K
Party wall U-value                     0.00 W/m²K
Roof U-value                           0.09 W/m²K
Roof U-value                           0.09 W/m²K
Floor U-value                          0.11 W/m²K
Floor U-value                          0.12 W/m²K
Door U-value                           0.55 W/m²K
Window U-value                         1.10 W/m²K
Thermal bridging y-value               0.025 W/m²K
Air permeability                       1.5 m³/m²h



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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	24.2800 (1a)	x	2.6000 (2a)	=	63.1280	(1a) - (3a)
Ground floor	46.5400 (1b)	x	3.2300 (2b)	=	150.3242	(1b) - (3b)
First floor	34.2000 (1c)	x	2.7000 (2c)	=	92.3400	(1c) - (3c)
Second floor	29.2000 (1d)	x	3.4200 (2d)	=	99.8640	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 134.2200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	405.6562	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							0 * 10 =	0.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		1.5000	
Infiltration rate		0.0750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0638	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.0813	0.0797	0.0781	0.0701	0.0685	0.0606	0.0606	0.0590	0.0638	0.0685	0.0717	0.0749	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation: 0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 71.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2243	0.2227	0.2211	0.2131	0.2115	0.2036	0.2036	0.2020	0.2068	0.2115	0.2147	0.2179	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.9100	0.5500	1.0505			(26)
Window (Uw = 1.10)			39.4000	1.0536	41.5134			(27)
Base Floor			24.2800	0.1100	2.6708			(28)
Grd Floor			21.1800	0.1200	2.5416			(28a)
Basement	29.3000		29.3000	0.1400	4.1020			(29a)
Main Wall	174.8800	41.3100	133.5700	0.1600	21.3712			(29a)
Grd Roof	12.5400		12.5400	0.0900	1.1286			(30)
1st Roof	3.1700		3.1700	0.0900	0.2853			(30)
2nd Roof	39.3400		39.3400	0.1500	5.9010			(30)
Total net area of external elements Aum(A, m2)			304.6900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.5644			(33)
Party Wall 1			76.2600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		100.0000	(35)
Thermal bridges (User defined value 0.025 * total exposed area)		7.6173	(36)
Total fabric heat loss	(33) + (36) =	88.1817	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.0238	29.8104	29.5971	28.5303	28.3170	27.2502	27.2502	27.0369	27.6769	28.3170	28.7437	29.1704	(38)
Heat transfer coeff	118.2054	117.9921	117.7787	116.7120	116.4986	115.4319	115.4319	115.2185	115.8586	116.4986	116.9253	117.3520	(39)
Average = Sum(39)m / 12 =												116.6586	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8807	0.8791	0.8775	0.8696	0.8680	0.8600	0.8600	0.8584	0.8632	0.8680	0.8711	0.8743	(40)
HLP (average)												0.8692	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9052	(42)
Average daily hot water use (litres/day)	103.1976	(43)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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                 Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
Daily hot water use
               113.5174    109.3895    105.2616    101.1337     97.0058     92.8779     92.8779     97.0058    101.1337    105.2616    109.3895    113.5174 (44)
Energy conte   168.3430    147.2339    151.9322    132.4581    127.0967    109.6748    101.6298    116.6217    118.0146    137.5346    150.1298    163.0312 (45)
Energy content (annual)                                                                                          Total = Sum(45)m =    1623.7004 (45)
Distribution loss  (46)m = 0.15 x (45)m
                25.2515     22.0851     22.7898     19.8687     19.0645     16.4512     15.2445     17.4933     17.7022     20.6302     22.5195     24.4547 (46)
Water storage loss:
Store volume                                                                                                                                  180.0000 (47)
a) If  manufacturer declared loss factor is known  (kWh/day):                                                                                   1.3000 (48)
  Temperature factor from Table 2b                                                                                                              0.5400 (49)
Enter (49) or (54) in (55)                                                                                                                      0.7020 (55)
Total storage loss
                21.7620     19.6560     21.7620     21.0600     21.7620     21.0600     21.7620     21.7620     21.0600     21.7620     21.0600     21.7620 (56)
If cylinder contains dedicated solar storage
                21.7620     19.6560     21.7620     21.0600     21.7620     21.0600     21.7620     21.7620     21.0600     21.7620     21.0600     21.7620 (57)
Primary loss    23.2624     21.0112     23.2624     22.5120     23.2624     22.5120     23.2624     23.2624     22.5120     23.2624     22.5120     23.2624 (59)
Total heat required for water heating calculated for each month
               213.3674    187.9011    196.9566    176.0301    172.1211    153.2468    146.6542    161.6461    161.5866    182.5590    193.7018    208.0556 (62)
Solar input      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000 (63)
                                                                                     Solar input (sum of months) = Sum(63)m =          0.0000 (63)
Output from w/h
               213.3674    187.9011    196.9566    176.0301    172.1211    153.2468    146.6542    161.6461    161.5866    182.5590    193.7018    208.0556 (64)
                                                                                       Total per year (kWh/year) = Sum(64)m =       2153.8264 (64)
Heat gains from water heating, kWh/month
                91.9936     81.4890     86.5370     78.8999     78.2792     71.3245     69.8114     74.7962     74.0974     81.7498     84.7757     90.2274 (65)


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5. Internal gains (see Table 5 and 5a)
-----------------------------------------------------------------------------------------------------
Metabolic gains (Table 5), Watts
                 Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
(66)m          145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582    145.2582 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                26.9893     23.9717     19.4951     14.7590     11.0325      9.3141     10.0643     13.0819     17.5585     22.2946     26.0210     27.7394 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               302.7381    305.8796    297.9632    281.1101    259.8360    239.8415    226.4839    223.3424    231.2588    248.1119    269.3859    289.3805 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258     37.5258 (69)
Pumps, fans      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000      3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065   -116.2065 (71)
Water heating gains (Table 5)
               123.6473    121.2634    116.3131    109.5832    105.2140     99.0618     93.8326    100.5326    102.9131    109.8787    117.7441    121.2734 (72)
Total internal gains
               522.9521    520.6921    503.3488    475.0298    445.6600    417.7948    399.9581    406.5343    421.3079    449.8626    482.7285    507.9708 (73)


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6. Solar gains
-----------------------------------------------------------------------------------------------------
[Jan]                                       Area          Solar flux                g                 FF              Access               Gains
                                              m2            Table 6a      Specific data      Specific data             factor                   W
                                                                W/m2        or Table 6b        or Table 6c           Table 6d
-----------------------------------------------------------------------------------------------------
East                                     13.2000             19.6403             0.7200             0.7000             0.7700             90.5493 (76)
Southeast                                 8.0800             36.7938             0.7200             0.7000             0.7700            103.8365 (77)
South                                     3.7800             46.7521             0.7200             0.7000             0.7700             61.7243 (78)
Southwest                                 9.9400             36.7938             0.7200             0.7000             0.7700            127.7395 (79)
Northwest                                 4.4000             11.2829             0.7200             0.7000             0.7700             17.3396 (81)
-----------------------------------------------------------------------------------------------------

Solar gains    401.1892    707.9770   1023.7904   1344.1537   1562.4795   1572.9806   1507.6873   1343.6135   1135.6751    798.3129    485.2611    340.1400 (83)
Total gains    924.1414   1228.6692   1527.1392   1819.1835   2008.1394   1990.7755   1907.6455   1750.1478   1556.9830   1248.1756    967.9896    848.1108 (84)


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7. Mean internal temperature (heating season)
-----------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                                                    21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                 Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
tau             31.5411     31.5982     31.6554     31.9447     32.0032     32.2990     32.2990     32.3588     32.1800     32.0032     31.8865     31.7705
alpha            3.1027      3.1065      3.1104      3.1296      3.1335      3.1533      3.1533      3.1573      3.1453      3.1335      3.1258      3.1180
util living area
                 0.9472      0.8905      0.7972      0.6551      0.5006      0.3607      0.2632      0.2979      0.4807      0.7467      0.9093      0.9576 (86)

MIT             19.3870     19.8166     20.2793     20.6749     20.8845     20.9693     20.9915     20.9873     20.9246     20.5875     19.9021     19.2939 (87)
Th 2            20.1839     20.1853     20.1867     20.1935     20.1948     20.2016     20.2016     20.2030     20.1989     20.1948     20.1921     20.1894 (88)
util rest of house
                 0.9405      0.8780      0.7768      0.6256      0.4641      0.3184      0.2165      0.2480      0.4324      0.7148      0.8966      0.9521 (89)
MIT 2           18.0156     18.6261     19.2701     19.8047     20.0700     20.1741     20.1958     20.1940     20.1265     19.7073     18.7616     17.8854 (90)
Living area fraction                                                                                  fLA = Living area / (4) =         0.1809 (91)
MIT             18.2637     18.8414     19.4526     19.9621     20.2174     20.3179     20.3398     20.3375     20.2709     19.8665     18.9679     18.1402 (92)
Temperature adjustment                                                                                                                  0.0000
adjusted MIT    18.2637     18.8414     19.4526     19.9621     20.2174     20.3179     20.3398     20.3375     20.2709     19.8665     18.9679     18.1402 (93)


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8. Space heating requirement
-----------------------------------------------------------------------------------------------------

                 Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
Utilisation      0.9198      0.8536      0.7563      0.6167      0.4651      0.3247      0.2247      0.2565      0.4368      0.7005      0.8732      0.9335 (94)
Useful gains   850.0243   1048.7901   1155.0014   1121.8697    933.9828    646.3149    428.5988    448.9187    680.1373    874.4036    845.2419    791.6744 (95)
Ext temp.        4.3000      4.9000      6.5000      8.9000     11.7000     14.6000     16.6000     16.4000     14.1000     10.6000      7.1000      4.2000 (96)
Heat loss rate W
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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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              1650.5795  1644.9783  1525.5450  1291.0802   992.2613   660.0310   431.6874   453.6700   714.9528  1079.5350  1387.6609  1635.9122 (97)
Month fracti     1.0000     1.0000     1.0000     1.0000     1.0000     0.0000     0.0000     0.0000     0.0000     1.0000     1.0000     1.0000 (97a)
Space heating kWh
               595.6131   400.6385   275.6845   121.8316    43.3591     0.0000     0.0000     0.0000     0.0000   152.6177   390.5417   628.1129 (98)
Space heating                                                                                                                          2608.3992 (98)
Space heating per m2                                                                                               (98) / (4) =      19.4338 (99)


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8c. Space cooling requirement
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Not applicable


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9a. Energy requirements - Individual heating systems, including micro-CHP
----------------------------------------------------------------------------------------------------
Fraction of space heat from secondary/supplementary system (Table 11)                                                                    0.0000 (201)
Fraction of space heat from main system(s)                                                                                               1.0000 (202)
Efficiency of main space heating system 1 (in %)                                                                                        93.6000 (206)
Efficiency of secondary/supplementary heating system, %                                                                                  0.0000 (208)
Space heating requirement                                                                                                             2786.7512 (211)

                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Space heating requirement
               595.6131   400.6385   275.6845   121.8316    43.3591     0.0000     0.0000     0.0000     0.0000   152.6177   390.5417   628.1129 (98)
Space heating efficiency (main heating system 1)
                93.6000    93.6000    93.6000    93.6000    93.6000     0.0000     0.0000     0.0000     0.0000    93.6000    93.6000    93.6000 (210)
Space heating fuel (main heating system)
               636.3388   428.0326   294.5347   130.1619    46.3239     0.0000     0.0000     0.0000     0.0000   163.0531   417.2454   671.0608 (211)
Water heating requirement
                 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (215)

Water heating
Water heating requirement
               213.3674   187.9011   196.9566   176.0301   172.1211   153.2468   146.6542   161.6461   161.5866   182.5590   193.7018   208.0556 (64)
Efficiency of water heater                                                                                                              79.9000 (216)
(217)m          87.5091    86.8852    85.8113    83.9556    81.8450    79.9000    79.9000    79.9000    79.9000    84.4409    86.7484    87.6784 (217)
Fuel for water heating, kWh/month
               243.8230   216.2636   229.5230   209.6706   210.3013   191.7983   183.5472   202.3106   202.2360   216.1974   223.2914   237.2939 (219)
Water heating fuel used                                                                                                               2566.2564 (219)
Annual totals kWh/year
Space heating fuel - main system                                                                                                      2786.7512 (211)
Space heating fuel - secondary                                                                                                           0.0000 (215)

Electricity for pumps and fans:
    (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0875)
   mechanical ventilation fans (SFP =       1.0875)                                                                                    538.2044 (230a)
   central heating pump                                                                                                                  30.0000 (230c)
   main heating flue fan                                                                                                                 45.0000 (230e)
Total electricity for the above, kWh/year                                                                                              613.2044 (231)
Electricity for lighting (calculated in Appendix L)                                                                                    476.6399 (232)
Total delivered energy for all uses                                                                                                   6442.8519 (238)


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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
----------------------------------------------------------------------------------------------------
                                                                                      Energy       Emission factor              Emissions
                                                                                    kWh/year            kg CO2/kWh            kg CO2/year
Space heating - main system 1                                                      2786.7512                0.2160               601.9383 (261)
Space heating - secondary                                                             0.0000                0.0000                 0.0000 (263)
Water heating (other fuel)                                                         2566.2564                0.2160               554.3114 (264)
Space and water heating                                                                                                          1156.2496 (265)
Pumps and fans                                                                      613.2044                0.5190               318.2531 (267)
Energy for lighting                                                                 476.6399                0.5190               247.3761 (268)
Total CO2, kg/year                                                                                                               1721.8788 (272)
Dwelling Carbon Dioxide Emission Rate (DER)                                                                                        12.8300 (273)


16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES
DER                                                                                                                              12.8300 ZC1
Total Floor Area                                                                                                        TFA    134.2200
Assumed number of occupants                                                                                               N      2.9052
CO2 emission factor in Table 12 for electricity displaced from grid                                                      EF      0.5190
CO2 emissions from appliances, equation (L14)                                                                                    13.3658 ZC2
CO2 emissions from cooking, equation (L16)                                                                                        1.4061 ZC3
Total CO2 emissions                                                                                                              27.6019 ZC4
Residual CO2 emissions offset from biofuel CHP                                                                                    0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year                                                                          0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation                                                   0.0000 ZC7
Net CO2 emissions                                                                                                                27.6019 ZC8


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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)			Storey height (m)			Volume (m3)	
Basement floor	24.2800	(1a)	x	2.6000	(2a)	=	63.1280	(1a) - (3a)
Ground floor	46.5400	(1b)	x	3.2300	(2b)	=	150.3242	(1b) - (3b)
First floor	34.2000	(1c)	x	2.7000	(2c)	=	92.3400	(1c) - (3c)
Second floor	29.2000	(1d)	x	3.4200	(2d)	=	99.8640	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 134.2200								(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	405.6562	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							4 * 10 =	40.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0986	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3486	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2963	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3778	0.3704	0.3630	0.3259	0.3185	0.2815	0.2815	0.2741	0.2963	0.3185	0.3334	0.3482	(22b)
Effective ac	0.5714	0.5686	0.5659	0.5531	0.5507	0.5396	0.5396	0.5376	0.5439	0.5507	0.5556	0.5606	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9100	1.0000	1.9100			(26)
TER Opening Type (Uw = 1.40)			31.6400	1.3258	41.9470			(27)
Base Floor			24.2800	0.1300	3.1564			(28)
Grd Floor			21.1800	0.1300	2.7534			(28a)
Basement	29.3000		29.3000	0.1800	5.2740			(29a)
Main Wall	174.8800	33.5500	141.3300	0.1800	25.4394			(29a)
Grd Roof	12.5400		12.5400	0.1300	1.6302			(30)
1st Roof	3.1700		3.1700	0.1300	0.4121			(30)
2nd Roof	39.3400		39.3400	0.1300	5.1142			(30)
Total net area of external elements Aum(A, m2)			304.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.6367			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		0.0000	(36)
Total fabric heat loss	(33) + (36) =	87.6367	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	76.4869	76.1159	75.7523	74.0443	73.7248	72.2372	72.2372	71.9617	72.8102	73.7248	74.3712	75.0471	(38)
Heat transfer coeff	164.1236	163.7526	163.3890	161.6810	161.3614	159.8739	159.8739	159.5984	160.4468	161.3614	162.0079	162.6837	(39)
Average = Sum(39)m / 12 =												161.6795	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2228	1.2200	1.2173	1.2046	1.2022	1.1911	1.1911	1.1891	1.1954	1.2022	1.2070	1.2121	(40)
HLP (average)												1.2046	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9052	(42)
Average daily hot water use (litres/day)	103.1976	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.5174	109.3895	105.2616	101.1337	97.0058	92.8779	92.8779	97.0058	101.1337	105.2616	109.3895	113.5174	(44)
Energy conte	168.3430	147.2339	151.9322	132.4581	127.0967	109.6748	101.6298	116.6217	118.0146	137.5346	150.1298	163.0312	(45)
Energy content (annual)											Total = Sum(45)m =	1623.7004	(45)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	25.2515	22.0851	22.7898	19.8687	19.0645	16.4512	15.2445	17.4933	17.7022	20.6302	22.5195	24.4547	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8381	(55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	217.5857	191.7111	201.1748	180.1123	176.3394	157.3290	150.8725	165.8644	165.6688	186.7773	197.7840	212.2739	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h	217.5857	191.7111	201.1748	180.1123	176.3394	157.3290	150.8725	165.8644	165.6688	186.7773	197.7840	212.2739	(64)
Total per year (kWh/year) = Sum(64)m =												2203.4932	(64)
Heat gains from water heating, kWh/month	95.3682	84.5371	89.9116	82.1657	81.6538	74.5902	73.1861	78.1709	77.3632	85.1244	88.0415	93.6020	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	145.2582	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.9893	23.9717	19.4951	14.7590	11.0325	9.3141	10.0643	13.0819	17.5585	22.2946	26.0210	27.7394	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.7381	305.8796	297.9632	281.1101	259.8360	239.8415	226.4839	223.3424	231.2588	248.1119	269.3859	289.3805	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	37.5258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	-116.2065	(71)
Water heating gains (Table 5)	128.1830	125.7992	120.8489	114.1190	109.7497	103.5975	98.3684	105.0684	107.4489	114.4145	122.2799	125.8092	(72)
Total internal gains	527.4879	525.2279	507.8846	479.5655	450.1958	422.3306	404.4939	411.0701	425.8436	454.3984	487.2643	512.5065	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.6000	19.6403	0.6300	0.7000	0.7700	63.6246	(76)
Southeast	6.4900	36.7938	0.6300	0.7000	0.7700	72.9779	(77)
South	3.0400	46.7521	0.6300	0.7000	0.7700	43.4356	(78)
Southwest	7.9800	36.7938	0.6300	0.7000	0.7700	89.7325	(79)
Northwest	3.5300	11.2829	0.6300	0.7000	0.7700	12.1722	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	281.9428	497.5325	719.4453	944.5359	1097.9230	1105.2897	1059.4149	944.1445	798.0568	561.0091	341.0238	239.0408	(83)
Total gains	809.4308	1022.7604	1227.3299	1424.1014	1548.1188	1527.6203	1463.9089	1355.2146	1223.9005	1015.4075	828.2881	751.5473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7916	56.9202	57.0469	57.6495	57.7637	58.3012	58.3012	58.4018	58.0930	57.7637	57.5332	57.2942	
alpha	4.7861	4.7947	4.8031	4.8433	4.8509	4.8867	4.8867	4.8935	4.8729	4.8509	4.8355	4.8196	
util living area	0.9979	0.9934	0.9791	0.9307	0.8159	0.6353	0.4735	0.5290	0.7856	0.9636	0.9950	0.9986	(86)
MIT	19.6651	19.8805	20.1930	20.5629	20.8354	20.9634	20.9928	20.9880	20.8990	20.5150	20.0112	19.6282	(87)
Th 2	19.9018	19.9040	19.9062	19.9163	19.9182	19.9271	19.9271	19.9287	19.9237	19.9182	19.9144	19.9104	(88)
util rest of house	0.9972	0.9912	0.9718	0.9070	0.7593	0.5428	0.3617	0.4122	0.7025	0.9462	0.9929	0.9981	(89)
MIT 2	18.1283	18.4436	18.8961	19.4196	19.7653	19.9043	19.9246	19.9242	19.8478	19.3672	18.6428	18.0805	(90)
Living area fraction									fLA = Living area / (4) =			0.1809	(91)
MIT	18.4063	18.7035	19.1307	19.6264	19.9589	20.0959	20.1179	20.1166	20.0380	19.5748	18.8904	18.3605	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4063	18.7035	19.1307	19.6264	19.9589	20.0959	20.1179	20.1166	20.0380	19.5748	18.8904	18.3605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9877	0.9649	0.8993	0.7616	0.5581	0.3820	0.4333	0.7124	0.9390	0.9900	0.9969	(94)
Useful gains	805.9798	1010.1341	1184.2243	1280.6762	1179.1225	852.6314	559.1748	587.2692	871.8659	953.4243	819.9728	749.2537	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2315.1814	2260.3659	2063.7144	1734.2629	1332.6615	878.6514	562.4170	593.1654	952.7304	1448.1921	1910.1322	2303.6755	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1122.8460	840.1557	654.3407	326.5824	114.2330	0.0000	0.0000	0.0000	0.0000	368.1072	784.9148	1156.4898	(98)
Space heating												5367.6696	(98)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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Space heating per m2                                                                                  (98) / (4) =     39.9916 (99)

----------------------------------------------------------------------------------------------------
8c. Space cooling requirement
----------------------------------------------------------------------------------------------------
Not applicable

----------------------------------------------------------------------------------------------------
9a. Energy requirements - Individual heating systems, including micro-CHP
----------------------------------------------------------------------------------------------------
Fraction of space heat from secondary/supplementary system (Table 11)                                                          0.0000 (201)
Fraction of space heat from main system(s)                                                                                     1.0000 (202)
Efficiency of main space heating system 1 (in %)                                                                              93.5000 (206)
Efficiency of secondary/supplementary heating system, %                                                                        0.0000 (208)
Space heating requirement                                                                                                   5740.8231 (211)

              Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Space heating requirement
         1122.8460   840.1557   654.3407   326.5824   114.2330     0.0000     0.0000     0.0000     0.0000   368.1072   784.9148  1156.4898 (98)
Space heating efficiency (main heating system 1)
           93.5000    93.5000    93.5000    93.5000    93.5000     0.0000     0.0000     0.0000     0.0000    93.5000    93.5000    93.5000 (210)
Space heating fuel (main heating system)
         1200.9048   898.5623   699.8296   349.2860   122.1743     0.0000     0.0000     0.0000     0.0000   393.6975   839.4810  1236.8875 (211)
Water heating requirement
            0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (215)

Water heating
Water heating requirement
          217.5857   191.7111   201.1748   180.1123   176.3394   157.3290   150.8725   165.8644   165.6688   186.7773   197.7840   212.2739 (64)
Efficiency of water heater                                                                                                              79.8000 (216)
(217)m     88.5722    88.3003    87.7337    86.3828    83.6900    79.8000    79.8000    79.8000    79.8000    86.5918    88.1219    88.6564 (217)
Fuel for water heating, kWh/month
          245.6591   217.1127   229.3016   208.5049   210.7056   197.1542   189.0633   207.8501   207.6050   215.6986   224.4437   239.4343 (219)
Water heating fuel used                                                                                                               2592.5330 (219)
Annual totals kWh/year
Space heating fuel - main system                                                                                                      5740.8231 (211)
Space heating fuel - secondary                                                                                                           0.0000 (215)

Electricity for pumps and fans:
   central heating pump                                                                                                                 30.0000 (230c)
   main heating flue fan                                                                                                                45.0000 (230e)
Total electricity for the above, kWh/year                                                                                               75.0000 (231)
Electricity for lighting (calculated in Appendix L)                                                                                    476.6399 (232)
Total delivered energy for all uses                                                                                                   8884.9959 (238)

----------------------------------------------------------------------------------------------------
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
----------------------------------------------------------------------------------------------------
                                                                                    Energy      Emission factor          Emissions
                                                                                  kWh/year        kg CO2/kWh           kg CO2/year
Space heating - main system 1                                                    5740.8231            0.2160             1240.0178 (261)
Space heating - secondary                                                           0.0000            0.0000                0.0000 (263)
Water heating (other fuel)                                                       2592.5330            0.2160              559.9871 (264)
Space and water heating                                                                                                  1800.0049 (265)
Pumps and fans                                                                     75.0000            0.5190               38.9250 (267)
Energy for lighting                                                               476.6399            0.5190              247.3761 (268)
Total CO2, kg/m2/year                                                                                                    2086.3060 (272)
Emissions per m2 for space and water heating                                                                               13.4109 (272a)
Fuel factor (mains gas)                                                                                                     1.0000
Emissions per m2 for lighting                                                                                               1.8431 (272b)
Emissions per m2 for pumps and fans                                                                                         0.2900 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.4109 * 1.00) + 1.8431 + 0.2900, rounded to 2 d.p.                          15.5400 (273)
```

Appendix B – Water Calculations

Water Efficiency Calculator for New Dwellings (V1f - Aug 2010)

Project Details

Adress/Reference	Flat 1, Gondar Gardens	Case Reference	E1099
Number of Bedrooms	1	Occupancy for Calculation Purposes	2

Appliance/Useage Details

Taps (Excluding Kitchen Taps)

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Mixer Taps	3.00	2	6.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		2	
Total Flow (l/s)			6.00
Maximum Flow (l/s)			3.00
Average Flow (l/s)			3.00
Weighted Average Flow (l/s)			2.10
Flow for Calculation (l/s)			**3.00**

Showers

Shower fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Thermostatic Shower	8.00	1	8.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			8.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Baths

Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bath	149.00	1	149.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Capacity (l)			149.00
Maximum Capacity (l)			149.00
Average Capacity (l)			149.00
Weighted Average Capacity (l)			104.30
Capacity for Calculation (l)			**149.00**

WCs

WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
Dual WC	4.50	3.00	2
Total number of fittings			**2**
Average effective flushing volume			**3.50**

Dishwashers

Dishwasher Type	L per Place Setting	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			1.25
Maximum Consumption (l)			1.25
Average Consumption (l/s)			1.25
Weighted Average Consumption (l)			0.88
Consumption for Calculation (l/s)			**1.25**

Washing Machines

Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			8.17
Maximum Consumption (l)			8.17
Average Consumption (l/s)			8.17
Weighted Average Consumption (l)			5.72
Consumption for Calculation (l/s)			**8.17**

Kitchen Taps

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Kitchen Tap	8.00	1	8.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			8.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Other Fittings

Waste Disposal Y/N	N
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (l)	0
Total Availble Grey Water Supply (l)	102.70
Possible Demand (l)	65.25
Grey/Rain Installed Capacity (l)	0.00
Figure for Calculation lit/person/day	0.00

Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	Total Use (l/p/day)	
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00	
WC Dual Flush	Full Flush (l)	0.00	1.46	0.00	0.00	
	Pt Flush (l)	0.00	2.96	0.00	0.00	
WC's (Multiple)	Volume (l)	3.50	4.42	0.00	15.47	
Taps Exc. Kitchen	Flow Rate	3.00	1.58	1.58	6.32	
Bath (shower present)	(l/s)	149.00	0.11	0.00	16.39	
Shower (bath present)	(l/s)	8.00	4.37	0.00	34.96	
Bath Only	(l)	0.00	0.50	0.00	0.00	
Shower Only	(l/s)	0.00	5.60	0.00	0.00	
Kitchen Taps	(l/s)	8.00	0.44	10.36	13.88	
Washing Machines	(l/kgdry)	8.17	2.10	0.00	17.16	<< Note - these may be default values.
Dishwashers	(l/place)	1.25	3.60	0.00	4.50	<< You can change them by entering
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00	___the actual applicances in the
Water Softner	(l/s)	0.00	1.00	0.00	0.00	___appropriate sections above
Total Calculated Water Use (l/p/day)					**108.68**	
Grey/RainWater Reused (l)					0.00	
Normalisation Factor	(Factor)				0.91	
Total Consumption CSH (l/p/day)					**98.90**	
External Water Use Allowance (l)					5.00	
Total Comsumption Part G (l/p/day)					**103.90**	

Assesment Result	**PASS**

Water Efficiency Calculator for New Dwellings (V1f - Aug 2010)

Project Details

Adress/Reference	Flat 2, Gondar Gardens	Case Reference	E1099
Number of Bedrooms	2	Occupancy for Calculation Purposes	3

Appliance/Useage Details

Taps (Excluding Kitchen Taps)

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Mixer Taps	3.00	1	3.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			3.00
Maximum Flow (l/s)			3.00
Average Flow (l/s)			3.00
Weighted Average Flow (l/s)			2.10
Flow for Calculation (l/s)			**3.00**

Showers

Shower fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Thermostatic Shower	8.00	1	8.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			8.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Baths

Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bath	149.00	1	149.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Capacity (l)			149.00
Maximum Capacity (l)			149.00
Average Capacity (l)			149.00
Weighted Average Capacity (l)			104.30
Capacity for Calculation (l)			**149.00**

WCs

WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
Dual WC	4.50	3.00	1
Total number of fittings			**1**
Average effective flushing volume			**N/a**

Dishwashers

Dishwasher Type	L per Place Setting	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			1.25
Maximum Consumption (l)			1.25
Average Consumption (l/s)			1.25
Weighted Average Consumption (l)			0.88
Consumption for Calculation (l/s)			**1.25**

Washing Machines

Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			8.17
Maximum Consumption (l)			8.17
Average Consumption (l/s)			8.17
Weighted Average Consumption (l)			5.72
Consumption for Calculation (l/s)			**8.17**

Kitchen Taps

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Kitchen Tap	8.00	1	8.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			8.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Other Fittings

Waste Disposal Y/N	N
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (l)	0
Total Availble Grey Water Supply (l)	154.05
Possible Demand (l)	97.82
Grey/Rain Installed Capacity (l)	0.00
Figure for Calculation lit/person/day	0.00

Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	**Total Use (l/p/day)**	
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00	
WC Dual Flush	Full Flush (l)	4.50	1.46	0.00	6.57	
	Pt Flush (l)	3.00	2.96	0.00	8.88	
WC's (Multiple)	Volume (l)	0.00	4.42	0.00	0.00	
Taps Exc. Kitchen	Flow Rate	3.00	1.58	1.58	6.32	
Bath (shower present)	(l/s)	149.00	0.11	0.00	16.39	
Shower (bath present)	(l/s)	8.00	4.37	0.00	34.96	
Bath Only	(l)	0.00	0.50	0.00	0.00	
Shower Only	(l/s)	0.00	5.60	0.00	0.00	
Kitchen Taps	(l/s)	8.00	0.44	10.36	13.88	
Washing Machines	(l/kgdry)	8.17	2.10	0.00	17.16	<< Note - these may be default values.
Dishwashers	(l/place)	1.25	3.60	0.00	4.50	<< You can change them by entering
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00	___the actual applicances in the
Water Softner	(l/s)	0.00	1.00	0.00	0.00	___appropriate sections above
Total Calculated Water Use (l/p/day)					**108.66**	
Grey/RainWater Reused (l)					0.00	
Normalisation Factor	(Factor)				0.91	
Total Consumption CSH (l/p/day)					**98.88**	
External Water Use Allowance (l)					5.00	
Total Comsumption Part G (l/p/day)					**103.88**	

Assesment Result	**PASS**

Water Efficiency Calculator for New Dwellings (V1f - Aug 2010)

Project Details

Adress/Reference	House 1 & 2	Case Reference	E1099
Number of Bedrooms	3	Occupancy for Calculation Purposes	4

Appliance/Useage Details

Taps (Excluding Kitchen Taps)

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Mixer Taps	3.00	3	9.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		3	
Total Flow (l/s)			9.00
Maximum Flow (l/s)			3.00
Average Flow (l/s)			3.00
Weighted Average Flow (l/s)			2.10
Flow for Calculation (l/s)			**3.00**

Showers

Shower fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Thermostatic Shower	8.00	2	16.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		2	
Total Flow (l/s)			16.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Baths

Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bath	149.00	1	149.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Capacity (l)			149.00
Maximum Capacity (l)			149.00
Average Capacity (l)			149.00
Weighted Average Capacity (l)			104.30
Capacity for Calculation (l)			**149.00**

WCs

WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
Dual WC	4.50	3.00	3
Total number of fittings			**3**
Average effective flushing volume			**3.50**

Dishwashers

Dishwasher Type	L per Place Setting	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			1.25
Maximum Consumption (l)			1.25
Average Consumption (l/s)			1.25
Weighted Average Consumption (l)			0.88
Consumption for Calculation (l/s)			**1.25**

Washing Machines

Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			8.17
Maximum Consumption (l)			8.17
Average Consumption (l/s)			8.17
Weighted Average Consumption (l)			5.72
Consumption for Calculation (l/s)			**8.17**

Kitchen Taps

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Kitchen Tap	10.00	1	10.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			10.00
Maximum Flow (l/s)			10.00
Average Flow (l/s)			10.00
Weighted Average Flow (l/s)			7.00
Flow for Calculation (l/s)			**10.00**

Other Fittings

Waste Disposal Y/N	N
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (l)	0
Total Availble Grey Water Supply (l)	205.40
Possible Demand (l)	130.51
Grey/Rain Installed Capacity (l)	0.00
Figure for Calculation lit/person/day	0.00

Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	**Total Use (l/p/day)**	
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00	
WC Dual Flush	Full Flush (l)	0.00	1.46	0.00	0.00	
	Pt Flush (l)	0.00	2.96	0.00	0.00	
WC's (Multiple)	Volume (l)	3.50	4.42	0.00	15.47	
Taps Exc. Kitchen	Flow Rate	3.00	1.58	1.58	6.32	
Bath (shower present)	(l/s)	149.00	0.11	0.00	16.39	
Shower (bath present)	(l/s)	8.00	4.37	0.00	34.96	
Bath Only	(l)	0.00	0.50	0.00	0.00	
Shower Only	(l/s)	0.00	5.60	0.00	0.00	
Kitchen Taps	(l/s)	10.00	0.44	10.36	14.76	
Washing Machines	(l/kgdry)	8.17	2.10	0.00	17.16	<< Note - these may be default values.
Dishwashers	(l/place)	1.25	3.60	0.00	4.50	<< You can change them by entering
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00	___the actual applicances in the
Water Softner	(l/s)	0.00	1.00	0.00	0.00	___appropriate sections above
Total Calculated Water Use (l/p/day)					**109.56**	
Grey/RainWater Reused (l)					0.00	
Normalisation Factor	(Factor)				0.91	
Total Consumption CSH (l/p/day)					**99.70**	
External Water Use Allowance (l)					5.00	
Total Comsumption Part G (l/p/day)					**104.70**	

Assesment Result	**PASS**