

ENERGY STATEMENT

(To Accompany Full Planning Application)

Site LAND BETWEEN GONDAR HOUSE AND SOUTH MANSIONS WEST HAMPSTEAD NW6 1QD

Proposal

ERECTION OF SIX RESIDENTIAL DWELLINGS

Client
AN:X DEVELOPMENTS

14th MAY 2020 Ref. E909-ES-02



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1.0 INTRODUCTION

- a) Doherty Energy Limited have been instructed by AN:X Developments to prepare an Energy Statement to support the submission of the planning application for the development at Land between Gondar House and South Mansions, West Hampstead NW6 1QD. 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) This development is for the erection of six dwellings in a single block at Land between Gondar House and South Mansions, West Hampstead NW6 1QD.
- 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.
- d) The objectives of this Energy Statement are 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, review 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. It also investigates the water usage of the development with a view to reducing the water consumptions of the dwelling.
- e) The Energy Statement also looks at the initial risk of overheating with the view of following the cooling hierarchy.
- f) 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



- g) 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.
- h) 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. 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 calculations 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 sets five policies with regard to sustainability and climate change. Although this Energy Statement shall address CC1 Climate change mitigation and the associated Sustainability Statement shall mainly address Policy CC2 Adapting to climate change, as these Policies are interlinked, there is a degree of cross over between the two reports.
- 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
- 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 Council's Sustainability Plan 'Green Action for Change' commits the Council 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.



- i) 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
- h) 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.
- i) The target for new dwellings within the policy area must be carbon neutral. A carbon neutral development can be defined as one where the building and its use contribute no net additional carbon dioxide emissions to the atmosphere during occupation in a calendar year. This includes emissions from 'regulated' and 'unregulated' energy use covered under Approved Document L1A of the Building Regulations
- j) Regulated energy uses include space and water heating, lighting and ventilation. Unregulated energy uses are those relating to 'plug loads' or 'process loads' (electricity usage by 'unregulated' appliances and equipment used within the building).
- k) In a calendar year, to be carbon neutral the emissions from both 'regulated' energy use and expected energy use from 'unregulated' appliances, must be cancelled out by the generation of renewable energy. As renewable energy is generated irregularly throughout
- Under the Policy CC2 Adapting to climate change, the Local Authority requires new development to be resilient to climate change.
- m) The Policy states that all development should adopt appropriate climate change adaptation measures such as:



- a. the protection of existing green spaces and promoting new appropriate green infrastructure;
- b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.
- n) Developments of highly sustainable buildings will go some way to achieving the principles of sustainable living and should ensure that carbon emissions in construction and occupation are minimised.
- o) In addition, as Greater London is an area of serious water stress as it's rainfall is lower than the national average, a key part of achieving sustainable development is making sure new developments are as water efficient as possible. As such, the London Borough of Camden would expect new residential developments to deliver predicted water consumption of below 110 litres per person per day.
- p) There are numerous water saving measures that can be incorporated to improve the water efficiency of the development, such as low flush toilets and water efficient taps, showers, dishwashers and washing machines. It should also include water recycling through rainwater harvesting and/or greywater recycling.



3.0 LOW CARBON AND RENEWABLE ENERGY SYSTEMS

3.1 Introduction

- a) This section of the Energy 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 carbon dioxide emissions and renewable energy provision.
- b) The Renewables Toolkit (LRT) is the system developed by the Greater London Authority to assist Planners, Developers and Consultants with the assessment of the appropriateness of renewable energy resources and technologies. It offers advice on which renewable technologies are suitable including aesthetic issues, risks, reliability and gives an insight into the cost benefit analysis of installing renewable. Whilst this development in not within the Greater London Area, the principles set out in the Toolkit can still be applied to this development.
- c) Within Section 4 of the Renewable Toolkit 'Including Renewables in the Development Proposals', a route map is provided to help consider the feasibility of renewable technologies and how to include them into the development.
- d) The dwellings emissions have been estimated using the Standard Assessment Procedure. A second set of SAP calculations have been undertaken to demonstrate an improvement in the carbon dioxide emissions by incorporating better fabric constructions, better windows and doors, improved ventilation systems and enhanced air tightness.



3.2 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 dwellings carbon dioxide emission estimates can be based on initial stage SAP calculations.
- c) Table 1 below summarises the results from the Full SAP Worksheets that can be found in Appendix A.

Dwelling	Floor Area (m²)	Heating (kg/yr)	Water Heating (kg/yr)	g & Fans	Electricity for Lighting (kg/yr)	Total Emissions (kg/yr)	Dwelling CO ₂ Emission Rate	
1	89	761.76	531.65	38.93	193.83	1526.16	17.15	
2	99	753.21	545.91	38.93	214.79	1552.84	15.69	
3	50	353.63	416.35	38.93	120.92	929.82	18.60	
4	73	524.83	497.71	38.93	169.10	1230.57	16.86	
5	50	393.91	415.11	38.93	125.18	973.13	19.46	
6	118	970.60	558.07	38.93	230.91	1798.51	15.24	
Dwelling	g	TER (kg/m²/	/yr)	Area	(m²)	Total Emi	ssions (kg/yr)	
1		17.15		89		1,	526.4	
2		15.69	99		1,	553.3		
3		18.6	50		930.0			
4		16.86		73	73		1,230.8	
5		19.46		50		973.0		
6		15.24		11	8	1,798.3		
Baseline Carbon Dioxide Emissions (kg/yr) 8,012.8								

Table 1 - Baseline Carbon Dioxide Emissions



3.3 Improved Baseline Carbon Dioxide Emissions – BE LEAN

- a) Following the principles set out in the "Energy Hierarchy", the design has been improved to use less energy BE LEAN.
- 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 0.12 W/m²K.
- 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 0.16 W/m²K.
- e) The roof areas offer excellent opportunity to enhance the insulation levels and for the purposes of these calculations, the U Values of 0.09 W/m²K and 0.12W/m²K have 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 1.2 W/m²K has been used, which uses triple 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/m²K.
- h) The air leakage rate for the dwellings can be improved. The maximum allowed under the current Building Regulations Approved Document



L1A:2013 is 10 m³/hr/m² at 50 Pascal's. With carful detailing, this can be easily improved to 3 m³/hr/m² at 50 Pascal's.

- i) The use of Accredited 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 combi boilers shall be provided in the dwellings to provide the heating and hot water. Due to the size and layout of the development, it is more suited to individual heating systems instead of a communal heating system. This would provide better individual control of the systems and reduce distribution losses.
- k) More efficient controls can be installed to control the heating, which can include weather compensation on the boiler controls and the use of time and temperature zone control all improve the efficiency of the heating system.
- 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 of the development. This has to be 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) Mechanical ventilation heat recovery systems work by removing the warm moist air from kitchens and bathrooms and passing it through a heat exchanger to recover waste heat. This waste heat can then be used to warm the fresh air that is brought into the living areas of the dwelling, therefore reducing the heating load.



- 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).
- p) 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.
- q) Full details of the SAP calculations can be found in the SAP Worksheets 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 CO ₂ Emission Rate
1	89	489.54	536.68	183.36	193.84	1403.42	15.77
2	99	466.36	551.34	197.79	214.79	1430.28	14.45
3	50	215.40	420.36	101.61	120.33	857.71	17.15
4	73	287.61	503.73	151.24	167.76	1110.34	15.21
5	50	232.48	419.68	101.61	120.66	874.43	17.49
6	118	624.92	563.05	226.25	230.91	1645.13	13.94

Dwelling	DER (kg/m²/yr)	Area (m²)	Total Emissions (kg/yr)
1	15.77	89	1,403.5
2	14.45	99	1,430.6
3	17.15	50	857.5
4	15.21	73	1,110.3
5	17.49	50	874.5
6	13.94	118	1,644.9

Baseline Carbon Dioxide Emissions (kg/yr)	7,321.3
Precentage improvement over the Building Regulations	8.62%

Table 2 - Actual Carbon Dioxide Emissions

r) As demonstrated in Table 2 above, it can be seen that the improvements in the thermal performance and fixed building services, a reduction of 8.62% can be achieved in the carbon dioxide emissions of the development.



3.4 Supplying Energy Efficiently – BE CLEAN

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

3.5 District Heat Network

a) Although Camden have identified possible areas for district heat networks, unfortunately, the development site is outside these future areas so there are no district heating systems in this location at this time.

3.6 Combined Heat and Power

- a) Combined Heat and Power typically generates electricity on site as a byproduct 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. 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.
- b) 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.
- c) 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.



3.7 Renewable Technologies Considered – BE GREEN

- a) Taking into account the requirements of planning policy set out by London Borough of Camden, the developments annual carbon dioxide emission reduction target of carbon neutral, based on the Building Regulations 2013, from energy efficiencies and renewable technology has been calculated as 7,321 kgCO₂/year.
- b) The final step in the "Energy Hierarchy" is to reduce the carbon dioxide emissions by the use of renewable technologies BE GREEN.
- c) In accordance with the toolkit 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
- d) A preliminary assessment has been carried out for each renewable energy technology and for those appearing viable a further detailed appraisal has been undertaken.
- e) 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.
- f) Table 3 below provides a summary of the assessment.



3.8 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. As policy requires a reduction in carbon dioxide emissions via true renewable sources this would not assist in achieving the policy objectives.
Combined F	leat 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	Wood pellet or wood chip fired or dual biodiesel/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
	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	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.
	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.	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 He		Feasible - NO



Energy System	Description	Comment
Biomass CHP	CHP as above, but with biomass as the fuel.	Biomass CHP overcomes 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	There is little or no available area around the development for the installation of ground heat collectors so the use of a ground source heat pump for this development would not be feasible. Air source heat pumps are not considered feasible due to the size of the dwellings and their close proximity to each other, which may cause issues with noise. 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.
Ground/Air So	discreet location. ource Heat Pumps	Feasible – NO
Glound/All St	ource fleat rullips	i easible – NO
Solar Photovoltaics (PV)	Building Integrated Photovoltaics (BIPV) or Roof mounted collectors provide noiseless, low maintenance, carbon free electricity.	There appears to be a reasonable amount of roof area that can 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 orientated south for optimal performance. Careful consideration must be given to the chosen roof finish to ensure compatibility.
Solar PhotoVo	oltaics	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. The area of roof could be used for the installation of solar thermal collectors. These could be mounted on frames and orientated south for optimal performance. These would have to be installed at a pitch of 30-40 degrees and ideally as close to the dwelling served as possible. In this case, the distance from the available roof to the dwellings would reduce the efficiency of the systems.
Solar Therma	i 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 built up location. There are also concerns that the wind across the site would be turbulent because of the surrounding buildings.
Wind Power	•	Feasible - NO

Table 3 - Renewable Technology Feasibility Assessment

- a) From the above it has been established that there are one potential ways of providing energy via renewable sources appropriate for inclusion in this scheme, these being the use of a photovoltaic system to generate electricity.
- b) 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.
- c) 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.
- d) There is insufficient ground area for the installation of ground source heat pumps and air source heat pumps not being considered for this development due to the size of the dwellings and their close proximity to each other.
- 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.



3.9 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 8-20m², 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 system PV systems are still considered likely to have visual implications, therefore careful sighting of the panels is required. As this installation will be contained on the roof of the proposed dwellings, it involves no additional land use.



- h) 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 proposed roof of the bike store for the installation of a photovoltaic system. This area is south facing and has a good aspect. The area available has been calculated to allow the installation of a photovoltaic system with a total output of 3.5 kWp.

Development incorporating Energy Efficiency Measures	Total Carbon Dioxide Emissions (kgCO₂/yr)	Percentage Reduction (%)	
No Renewables	7,321.3	-	
Reduction by including 3.5 kWp PV system	1,568.8	21.4%	
Final Carbon Dioxide emissions	5,752.6 kgCO ₂ /yr		
Total Reduction over baseline emissions	28.2%		

Table 4 – Photovoltaic Carbon Dioxide Emissions

- k) As can be seen from Table 4 above, the incorporation of photovoltaic systems, with a total output of 3.5 kWp, on the roof of the cycle store, the development could reduce the carbon dioxide emissions by a further 21.4% and when combined with the fabric energy efficiency measures from in Table 2 above, a total reduction of 28.2% could be achieved.
- From the above calculations, based on 250 watt panels, orientated towards the south and mounted on the roof finishes at a 10 degree pitch, it is calculated that 14-No. panels are required on the each of the proposed roof.
- m) It is estimated that a system of this size would generate 3,024 kWh of electricity per year and could reduce the carbon emissions of the development by a further 21.4%. This, combined with the carbon dioxide emissions from Table 2 above, would result in a total reduction of 28.2% other Approved Document L1A:2013 of the Building Regulations.



5.0 Annual Carbon Dioxide Emission Reduction

- a) From the above, it can be seen that a Photovoltaic system, together with the outlined fabric and energy efficiency measures, could be used in the developments to achieve a total reduction in carbon dioxide emissions in line with the requirements of Planning Policy.
- b) In accordance with the Planning Policies set out by London Borough of Camden and the London Plan, this report has demonstrated a 28.5% improvement in carbon dioxide emissions by fabric and energy efficiencies and the use of low or zero carbon technologies.
- 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	8,011.8	-		
Development incorporating Energy Efficiency Measures	7,321.3	8.6%		
Further Reduction in Carbon Dioxide Emissions by incorporating a Renewable Technology				
PV (3.5 kWp)	1,568.8	21.4%		
Total Carbon Dioxide Emission	28.2%			

Table 5 – Summary of Reduction in Carbon Dioxide Emissions

d) As can be seen from Table 5 above, the incorporation of 3.5 kWp photovoltaic systems on the roof of the cycle store, it is possible to achieve a 28.2% reduction in carbon dioxide emissions over and above the 2013 Building Regulations by improving the energy efficiency of the development and its building services efficiencies and including low or zero carbon technology.



- 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 turbulence caused by the surrounding buildings and trees etc.
- h) It is considered that the use of solar hot water would be inefficient due to the distance from the south facing roof and the dwelling. In addition, the proposed method of heating is by use of combi boilers. Whilst technically feasible to use solar hot water with combi boilers, the introduction of additional storage cylinders would impact the layout of the dwellings.
- 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.
- j) 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 and the introduction of energy efficient controls and systems, a reduction in excess of 28.2% of the developments carbon dioxide emissions could be achieved. This complies with the requirements of the planning policies set out by London Borough of Camden and in the London Plan.



3.10 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 zero carbon 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	а	8.0
After energy demand reduction	b	7.3
After heat network / CHP	С	7.3
After renewable energy	d	5.8

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	0.7	(a-b)/a*100	8.6%
Savings from heat network / CHP	b-c	0.0	(b-c)/a*100	0.0%
Savings from renewable energy	c-d	1.6	(c-d)/a*100	19.6%
Cumulative on site savings	a-d=e	2.3	(a-d)/a*100	28.2%
Annual Savings from off-set payment	a-e=f	5.8		
Cumulative savings for off-set payment	f*30=g	172.6		

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.



4.0 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 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:
 - i) minimise internal heat generation through energy efficient design
 - ii) reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
 - iii) manage the heat within the building through exposed internal thermal mass and high ceilings
 - iv) passive ventilation
 - v) mechanical ventilation
 - vi) 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 included an overheating assessment in line with the requirements of the Building Regulations.
- e) Based on this SAP Assessment, the dwellings have 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 will have a mechanical ventilation system installed, which provides filtered fresh air to the dwellings. This is tempered by the crossover heat exchanger, which recovers waste heat from the extract air from the dwellings. These ventilation systems shall be individual systems installed in the dwelling so it is controlled locally by the occupants.
- Low energy lamps shall be used in the luminaires to reduce heat gain. These lamps do not emit heat like traditional GLS lamps.
- j) If required, during the detailed design phase of this project, dynamic thermal modelling, using IES software to produce an SBEM model, in accordance with CIBSE Guide A, TM52 and TM49, can be used to ensure that the finding of the initial overheating assessment are still valid and provide a more detailed assessment and prediction of the overheating risk for the development.



5.0 WATER CALCULATIONS

- a) In the London Borough of Camden's Local Plan Policy CC3 Water and flooding, there is a requirement to limit the water use in new dwellings to be under 110 litres/person/day, including 5 litres for external use.
- b) Low water usage fitting, or flow restrictors can be fitted in the dwellings. Efficient white goods that are not only energy efficient but also water efficient can also be installed.
- c) At this stage in the design, the final selection of the water fittings and appliance has not been made, but this calculation shows the design intent for these fittings and appliances.
- d) Dual flush toilets can be installed to reduce the water consumption of the dwellings, with full flush capacity of 6 litres and part flush capacity of 3 litres.
- e) Flow restrictors shall be installed to limit the flow rates of the tap to 3 litres / minute. Flow restrictors shall also be installed in the kitchen taps and the showers to restrict their flow to 8 litres / minute. The showers shall be restricted to 8 litres / minute.
- f) The capacity of the baths to the over flow shall be 175 litres.
- g) 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.
- h) No water softeners are being installed.
- Using the Building Regulations Approved Document G Calculator, the water consumption has been calculated as 108.5 litres / person / day.
- j) The calculated water consumption for the dwellings complies with the requirements of the Planning Policy as set out in the London Borough of Camden's Local Plan. Details of the calculations can be found in Appendix B.



6.0 CONCLUSION

- a) The London Borough of Camden's Local Plan and the London Plan require new residential developments to minimise and exhibit the highest standards of sustainable design and construction. The development should achieve a minimum of 8.6% over the Target Emission Rate, as defined by the Building Regulations 2013, with low or zero carbon technologies providing a further 21.4% carbon dioxide reduction, resulting in a total reduction of 28.2%.
- b) This development is for the erection of six residential units in a single block at Land between Gondar House and South Mansions, West Hampstead NW6 1QD.
- c) At planning stage it is not possible to produce final reports on the energy demand, carbon dioxide emissions or financial appraisals of the appropriate systems, based on the initial construction information.
- d) However, this Energy Statement has demonstrated using initial SAP calculations that it is possible to achieve an 8.6% reduction in carbon dioxide emissions by making improvements in fabric and energy efficiency measures, with a further 21.4% reduction by incorporating photovoltaic and solar hot water systems, resulting in a total reduction of 28.2% carbon dioxide emissions. It is envisaged during detailed design, these figures can be improved.
- e) This Energy Statement demonstrates that the proposed development follows the principles of the planning policy requirements with regard to carbon dioxide reduction and incorporation of low and zero carbon technologies. It identifies how the development can achieve zero carbon emissions and it is for these reasons it is considered that this application should be viewed favorably by London Borough of Camden.



Appendix A – SAP Worksheets



Property Reference	E909-01			Issued on Date	11/05/2020					
Assessment	E909-01			Prop Type Ref						
Reference										
Property	Flat 1, 1 Hillfield Road, N\	W6 1QD								
SAP Rating		84 B	DER	15.77	TER	17.15				
Environmental		87 B	% DER <ter< th=""><th></th><th colspan="4">8.04</th></ter<>		8.04					
CO₂ Emissions (t/ye	ear)	1.20	DFEE	41.82	TFEE	48.67				
General Requireme	nts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th colspan="4">14.07</th></tfe<>	E	14.07					
Assessor Details	Mr. Jason Doherty, Doherty E jason@doherty-energy.co.uk	lr. Jason Doherty, Doherty Energy Limited, Tel: 01480451569, son@doherty-energy.co.uk								
Client										





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

REGULATIONS COMPLIANCE REPORT - Approve											
	ed Document L1A, 2013 Editi	on, England									
DWELLING AS DESIGNED											
Semi-Detached Maisonette, total floor area 89 m^2											
This report covers items included within It is not a complete report of regulati											
la TER and DER Fuel for main heating:Mains gas Fuel factor:1.00 (mains gas) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate											
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) 4											
Dwelling Fabric Energy Efficiency (DFEE	:)41.8 kWh/m²/yrOK										
2 Fabric U-values Element Average	Highest										
External wall 0.16 (max. 0.30)		OK									
Party wall 0.00 (max. 0.20)	-	OK									
Floor 0.12 (max. 0.25) Roof 0.09 (max. 0.20)	0.12 (max. 0.70) 0.09 (max. 0.35)	OK OK									
		OK									
2a Thermal bridging Thermal bridging calculated using user-											
3 Air permeability											
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0		OK								
4 Heating efficiency Main heating system: Data from database	Boiler system with radiat	ors or underfloor - Mains	gas								
Vaillant ecoTEC pro 24 VUW 246/5-3 (H-G	GB) R6										
Combi boiler Efficiency: 89.5% SEDBUK2009											
Minimum: 88.0%	OK										
Secondary heating system:	None										
5 Cylinder insulation Hot water storage	No cylinder										
Hot water storage	No cylinder Time and temperature zone	control	ок								
Hot water storage 6 Controls		control	ОК								
Hot water storage	Time and temperature zone No cylinder Yes		ok								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock	Time and temperature zone No cylinder Yes										
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Time and temperature zone No cylinder Yes ergy fittings:100%										
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Time and temperature zone No cylinder Yes ergy fittings:100%		OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Time and temperature zone No cylinder Yes ergy fittings:100%		OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power:	Time and temperature zone No cylinder Yes ergy fittings:100% 75%		OK OK								
Hot water storage	Time and temperature zone No cylinder Yes ergy fittings:100% 75%		OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency:	Time and temperature zone No cylinder Yes ergy fittings:100% 75%		OK OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum:	Time and temperature zone No cylinder Yes ergy fittings:100% 75%		OK								
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Hot water storage	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average		OK OK								
Hot water storage	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 8.97 m², No overhang		OK OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North: Windows facing East:	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 8.97 m², No overhang 14.43 m², No overhang		OK OK								
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Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North: Windows facing East: Air change rate: Blinds/curtains:	Time and temperature zone No cylinder Yes Programmer Times:100% 75% 0.81 1.5 89% 70% Medium Average Average 8.97 m², No overhang 14.43 m², No overhang 4.00 ach None		OK OK								
Hot water storage	Time and temperature zone No cylinder Yes Programmer Times:100% 75% 0.81 1.5 89% 70% Medium Average Average 8.97 m², No overhang 14.43 m², No overhang 4.00 ach None		OK OK								
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Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North: Windows facing Fast: Air change rate: Blinds/curtains: 10 Key features Party wall U-value Roof U-value Floor U-value Floor U-value Floor U-value	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 8.97 m², No overhang 14.43 m², No overhang 4.00 ach None 0.00 W/m²K 0.09 W/m²K 0.12 W/m²K 0.12 W/m²K		OK OK								
Hot water storage	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 8.97 m², No overhang 14.43 m², No overhang 4.00 ach None 0.00 W/m²K 0.12 W/m²K 0.12 W/m²K 0.12 W/m²K 0.12 W/m²K		OK OK								
Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North: Windows facing Fast: Air change rate: Blinds/curtains: 10 Key features Party wall U-value Roof U-value Floor U-value Floor U-value Floor U-value	Time and temperature zone No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 8.97 m², No overhang 14.43 m², No overhang 4.00 ach None 0.00 W/m²K 0.09 W/m²K 0.12 W/m²K 0.12 W/m²K		OK OK								





CALCULATI	ON OF D	WELLING	G EMISSI	ONS FOR	REGULAT	rions co	OMPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKS	HEET FOR Ne	w Build (As	s Designed)	(Version	9.92, Janua	 ry 2014)							
ALCULATION OF						Jan 2014							
. Overall dwel	 lling dimen	sions											
								Area	Store	ey height		Volume	
round floor irst floor								(m2) 50.0000 39.0000		(m) 2.4000 2.7000		(m3) 120.0000 105.3000	
otal floor are welling volume		a) + (1b) + (1d	c) + (1d) + (1e))(1n)		89.0000			3a) + (3b) + (3c)			225.3000	(4)
. Ventilation													
					main		econdary		other	tot	al m	3 per hour	
umber of chimnumber of open					heating 0 0	+	heating 0 0	+	0 = 0		0 * 40 = 0 * 20 =	0.0000	
umber of open umber of inter umber of passi	rmittent fa	ns			Ü	T	Ü	,	0 -		0 * 10 = 0 * 10 =	0.0000	(7a) (7b)
umber of flue	less gas fi	res									0 * 40 =	0.0000	(7c)
nfiltration du ressure test	ue to chimn	eys, flues	and fans	= (6a) + (6b))+(7a)+(7b)+	(7c) =				0.000	Air change) / (5) =	0.0000 Yes	(8)
easured/design nfiltration ra umber of sides	ate											3.0000 0.1500	(18) (19)
helter factor		1							(20) = 1 -	[0.075]	(19)] =	0.9250	
nfiltration ra	ate adjuste	d to includ	de shelter i	factor					(2:	1) = (18)	x (20) =	0.1388	(21)
ind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000		Oct 4.3000	Nov 4.5000	Dec 4.7000	
ind factor dj infilt rate	1.2750 e 0.1769	1.2500 0.1734	1.2250 0.1700	1.1000 0.1526	1.0750 0.1492	0.9500	0.9500	0.9250		1.0750 0.1492	1.1250 0.1561	1.1750 0.1630	
Balanced mecha E mechanical v	anical vent ventilation	ilation wit	th heat reco	overy						******	******	0.5000	(23a)
f balanced wit ffective ac	th heat rec 0.2987	0.2952	iciency in 9	8 allowing :	for in-use f	actor (from	n Table 4h)	0.2501	0.2605	0.2709	0.2778	75.6500 0.2848	
. Heat losses lement				Gross	Openings		tArea	U-value	Ax	J I	(-value	АхК	
oor				m2	m2	2.	m2 .3000	W/m2K 0.5500	W/1 1.265	K D	kJ/m2K	kJ/K	(26)
indow (Uw = 1. eat Loss Floor eat Loss Floor	r 1					50.	.4000 .0000 .2000	1.1450 0.1200 0.1200	26.793 6.000 0.744)			(27) (28a) (28a)
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hermal mass pa hermal bridges otal fabric he	s (User def				area)					(33)	+ (36) =	150.0000 9.7380 57.0129	(36)
entilation hea	at loss cal					-		_	~				
38)m eat transfer o	Jan 22.2048 coeff	Feb 21.9469	Mar 21.6890	Apr 20.3995	May 20.1416	Jun 18.8521	Jul 18.8521	Aug 18.5942	Sep 19.3679	Oct 20.1416	Nov 20.6574	Dec 21.1732	(38)
verage = Sum(3	79.2177	78.9598	78.7019	77.4124	77.1545	75.8650	75.8650	75.6071	76.3808	77.1545	77.6703	78.1861 77.3479	
LP	Jan 0.8901	Feb 0.8872	Mar 0.8843	Apr 0.8698	May 0.8669	Jun 0.8524	Jul 0.8524	Aug 0.8495	Sep 0.8582	Oct 0.8669	Nov 0.8727	Dec 0.8785	(40)
LP (average) ays in month												0.8691	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heatin	ng energy r	equirements	s (kWh/year))								0.6115	/40:
ssumed occupar		ee (litree	/dav)									2.6118 96.2299	
verage daily 1	hot water u	.50 (110105)	,, ,										
Average daily h	Jan r use	Feb 102.0037	Mar 98.1545	Apr 94.3053	May 90.4561	Jun 86.6069	Jul 86.6069	Aug 90.4561	Sep 94.3053	Oct 98.1545	Nov 102.0037	Dec 105.8529	





Part	CALCULAT	ION OF I	OWELLIN	IG EMISSI	ONS FOR	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014	1			
March 1968	Energy content	(annual)									Total = Su	ım (45) m =	1514.0705	(45)
Street	Water storage	23.5465 loss:			18.5272	17.7773	15.3405	14.2152	16.3121	16.5070	19.2373	20.9990	22.8035	(46)
Second S	-	0.0000			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Part	-	0.0000	0.0000	0.0000										
Company Comp		quired for	water heati	ing calculat	ed for each	n month								
Companies Comp			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
Second Companies	-	207.9356			170.0215	164.6108	144.9800	138.9019						
Control point Inter Table 1	Heat gains fro	64.9345	57.1567	59.6112	52.6953	50.9302	44.6822	42.5438	47.6824	48.2171	55.1472	58.8765	63.2876	(65)
Markabalic Mar														
California 130, 5857 130														
Appliance quint (15:00)	(66)m	Jan 130.5892	Feb 130.5892	130.5892	130.5892	130.5892	130.5892	130.5892						(66)
Conting paties Cont		21.1489	18.7842	15.2764	11.5652	8.6451	7.2986	7.8864	10.2510	13.7589	17.4700	20.3901	21.7367	(67)
March Marc		237.2259	239.6876	233.4843	220.2782	203.6078	187.9400	177.4730	175.0113	181.2146	194.4208	211.0911	226.7589	(68)
Design Telephone Telepho		36.0589	36.0589	36.0589	36.0589	36.0589	36.0589	36.0589						
Solar gains	Losses e.g. ev	/aporation	(negative v	values) (Tab	le 5)									
A		gains (Tab	le 5)											
Color Colo	Total internal		408.7032	394.0600	370.2081	345.8843	322.4740	307.7187	314.5284	327.1185	351.1902	378.4309	398.7362	(73)
Campaign														
North														
No. 10.6334					m2	Table 6a W/m2	Speci or	fic data Table 6b			facto	or		
Total gains 543.1300 666.0074 821.1385 1009.0677 1149.9530 1156.5487 1097.1776 977.3112 828.0782 656.7442 542.9531 507.9105 (84) Temperature during heating periods in the living area from Table 9, Thi (C) Utilisation factor for gains for living area from Table 9, Thi (C) Utilisation factor for gains for living area from Table 9, Thi (C) Utilisation factor for gains for living area from Table 9, Thi (C) What is a second of the control o	North East			8.9 14.4	700 300	10.6334 19.6403		0.7200 0.7200	0					
The presentative during heating periods in the living area from Table 9, Thi (C) T														
Reperature during heating periods in the living area from Table 9, Thi (C) Utilisation factor for gains for living area, nil,m (see Table 9) Thi (C)	7. Mean intern	nal tempera	ture (heati	ing season)										
tau 46.8119 46.9648 47.1187 47.9036 48.0637 48.8807 49.0474 48.5506 48.0637 47.7445 47.4296 alpha 4.1208 4.1310 4.1412 4.1936 4.2042 4.2587 4.2587 4.2698 4.2678 4.2698 4.2367 4.2042 4.1830 4.1620 util living area 0.9848 0.9658 0.9120 0.7763 0.5886 0.4137 0.3029 0.3531 0.5988 0.8792 0.9711 0.9882 (86) MIT 19.6934 19.9579 20.3485 20.7442 20.9322 20.9882 20.9975 20.9954 20.9478 20.6245 20.0796 19.6498 (87) Th 2 20.1759 20.1784 20.1809 20.1932 20.1957 20.2081 20.2081 20.2086 20.2092 20.1957 20.1988 20.1858 (88) util rest of house 0.9819 0.9596 0.8972 0.7456 0.5456 0.3646 0.2490 0.2937 0.5403 0.8529 0.9649 0.9859 (89) MIT 2 18.4169 18.7997 19.3539 19.8955 20.1272 20.1988 20.2068 20.2079 20.1571 19.7552 18.9878 18.3606 (90) MIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5386 19.0110 (92) Emperature adjustment adjustmen	Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9,							21.0000	(85)
MIT 19.6934 19.9579 20.3485 20.7442 20.9322 20.9862 20.9975 20.9954 20.9478 20.6245 20.0796 19.6498 (87) Th 2 20.1759 20.1784 20.1809 20.1932 20.1957 20.2081 20.2081 20.2016 20.2032 20.1957 20.1908 20.1886 (88) WIT 18.4169 18.7997 19.3539 19.8955 20.1272 20.1988 20.2068 20.2079 20.1571 19.7552 18.9878 18.9606 (90) Living area fraction MIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0100 (93) Temperature adjustment adjustment 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93) 8. Space heating requirement WIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93) 8. Space heating requirement WIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93) 8. Space heating requirement WIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93) 8. Space heating requirement WIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93) 8. Space heating requirement WIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5366 19.0110 (93)	alpha	46.8119 4.1208	46.9648	47.1187	47.9036	48.0637	48.8807	48.8807	49.0474	48.5506	48.0637	47.7445	47.4296	
The 2	util living an		0.9658	0.9120	0.7763	0.5886	0.4137	0.3029	0.3531	0.5988	0.8792	0.9711	0.9882	(86)
Note Color	Th 2	20.1759												
MIT 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5386 19.0110 (92) Temperature adjustment adjustment 19.0609 19.3840 19.8557 20.3237 20.5333 20.5970 20.6057 20.6052 20.5560 20.1938 19.5386 19.0110 (93) 20.0000 20.000	MIT 2	0.9819 18.4169								20.1571	19.7552	18.9878	18.3606	(90)
8. Space heating requirement Jan	MIT	19.0609	19.3840	19.8557	20.3237	20.5333	20.5970	20.6057	20.6052				19.0110	(92)
8. Space heating requirement Space Space	adjusted MIT	19.0609	19.3840	19.8557	20.3237	20.5333	20.5970	20.6057	20.6052	20.5560	20.1938	19.5386	19.0110	(93)
The color of the	8. Space heat:	ng require	ment											
Useful gains 530.5416 634.2200 731.2656 757.6146 648.5855 449.7323 302.9645 316.1637 469.3561 560.1186 520.4694 498.5437 (95) Useful gains 530.5416 634.2200 731.2656 757.6146 648.5855 449.7323 302.9645 316.1637 469.3561 560.1186 520.4694 498.5437 (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 Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 97a) Space heating kWh 475.2530 342.3376 237.9691 91.2391 24.5102 0.0000 0.0000 0.0000 133.9820 320.8637 490.6452 (98) Space heating				Mar						Sep	Oct	Nov	Dec	
169.3226 143.6510 1051.1165 884.3357 681.5293 454.9628 303.8933 317.9432 493.1171 740.2019 966.1133 1158.0130 (97)	Useful gains Ext temp.	530.5416 4.3000	634.2200	0.8906 731.2656	0.7508 757.6146	0.5640 648.5855	0.3889 449.7323	0.2761 302.9645	0.3235 316.1637	0.5668 469.3561	0.8529 560.1186	520.4694	0.9816 498.5437	(95)
475.2530 342.3376 237.9691 91.2391 24.5102 0.0000 0.0000 0.0000 133.9820 320.8637 490.6452 (98) Space heating 24.5102 0.0000 0.0000 0.0000 0.0000 133.9820 2116.7998 (98)	Month fracti	1169.3226 1.0000												
	Space heating	475.2530	342.3376	237.9691	91.2391	24.5102	0.0000	0.0000	0.0000	0.0000			2116.7998	(98)



Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable 9a. Energy requirements - Individual heating systems, including micro-CHP Fraction of space heat from secondary/supplementary system (Table 11) Fraction of space heat from main system(s) Efficiency of main space heating system 1 (in %) Efficiency of secondary/supplementary heating system, % Space heating requirement 0.0000 (201) 1.0000 (202) 93.4000 (206) 0.0000 (208) 2266.3810 (211) Feb Mar Apr May Jun J111 Aug Sep Oct Nov Dec 91.2391 24.5102 0.0000 133.9820 320.8637 490.6452 (98) 93.4000 93.4000 93.4000 (210) 0.0000 0.0000 0.0000 0.0000 93.4000 93.4000 Space heating fuel (main heating system) 508.8362 366.5285 254.7849 26.2422 97.6864 0.0000 0.0000 0.0000 0.0000 143.4496 343.5371 525.3160 (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 (215) 0.0000 Water heating
Water heating requirement
207.9356 183.3202 191.6924 170.0215 164.6108 144.9800 138.9019 154.8430 156.5531 178.2669 189.3083 202.9825 (64)
80.3000 (216 Efficiency of water heater /217\m 87.0669 86.6013 85.5967 83.5603 81.4798 80.3000 (216) 87.1907 (217) Fuel for water heating, kWh/month
238.8228 211.6831 223.9483 203.4715 202.0265
Water heating fuel used 232.8029 (219) 2484.6165 (219) 180.5479 172.9787 192.8307 194.9603 211.3584 219.1856 Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary 2266.3810 (211) Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0125) mechanical ventilation fans (SFP = 1.0125) central heating pump 278.3018 (230a) 278.3018 (230a) 30.0000 (230c) 45.0000 (230e) 353.3018 (231) 373.4955 (232) 5477.7949 (238) main heating flue fan Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Energy Emission factor Emissions kWh/year 2266.3810 kg CO2/kWh 0.2160 kg CO2/year 489.5383 (261) Space heating - main system 1 489.5383 (261) 0.0000 (263) 536.6772 (264) 1026.2155 (265) 183.3636 (267) 193.8442 (268) 1403.4233 (272) 15.7700 (273) Space heating - secondary Water heating (other fuel) 2484.6165 0.2160 Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide Emission Rate (DER) 16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES 15.7700 ZC1 15.7700 ZC1 89.0000 2.6118 0.5190 15.7950 ZC2 2.0414 ZC3 Total Floor Area TFA Total Fiber Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16) Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation 33.6063 ZC4 0.0000 ZC5 0.0000 ZC6 0.0000 ZC7 Net CO2 emissions 33.6063 ZC8





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014 (Version 9.92, January 2014) 1. Overall dwelling dimensions Volume (m3) 120.0000 (1b) - (3b) (m2) 50.0000 (1b) (m) 2.4000 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 39.0000 (1c) 2.7000 (2c) 105.3000 (1c) - (3c) (4) 89.0000 2. Ventilation rate secondary other total m3 per hour heating 0 * 40 = 0 * 20 = 3 * 10 = 0 * 10 = Number of chimneys Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0 0.0000 (6b) 30.0000 (7a) Air changes 30.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1332 (8) Pressure test Measured/design AP50 0.3832 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] = (21) = (18) x (20) = 0.9250 (20) 0.3544 (21) (20) = 1 -Infiltration rate adjusted to include shelter factor Feb 5.0000 1.2500 Jul 3.8000 Aug 3.7000 0.9250 Dec 4.7000 (22) 1.1750 (22a) 5.1000 1.2750 4.9000 1.2250 Wind speed 1.1000 1.0750 1.1250 Wind factor 0.9500 0.9500 1.0000 1.0750 Adj infilt rate 3. Heat losses and heat loss parameter U-value W/m2K 1.0000 A x U W/K 2.3000 TER Opaque door TEK Opaque door
TER Opening Type (Uw = 1.40)
Heat Loss Floor 1
Heat Loss Floor 2
External Wall 1
External Poof 1 19.9500 1.3258 26.4489 (27)50.0000 0.1300 6.5000 (28a) External Roof 1 5.6000 5.6000 0.1300 0.7280 (30)Total net area of external elements Aum(A, m2) Fabric heat loss, $W/K = Sum (A \times U)$ 162.3000 (31) (26)...(30) + (32) =50.8679 (33) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2KThermal bridges (Sum(L x Psi) calculated using Appendix K) 250.0000 (35) 0.0000 (36) Total fabric heat loss (33) + (36) =50.8679 (37) Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan 44.7655 Feb 44.4707 Mar 44.1818 Apr 42.8247 May 42.5708 Jun Jul Aug 41.1699 Oct 42.5708 Dec 43.6215 (38) 43.0845 41.3888 41.3888 Heat transfer coeff 95.6334 Average = Sum(39)m / 12 = 95.3386 95 0497 93 6926 93.4387 92 2567 92 2567 92 0378 92 7120 93 4387 93.9523 94.4893 (39) 93.6914 (39) Feb Mar Jul 1.0499 1.0366 1.0499 1.0745 1.0712 1.0680 1.0527 1.0366 1.0341 1.0556 1.0617 (40) 1.0527 (40) Days in month 31 (41) 31 28 31 30 31 30 31 31 30 31 30 4. Water heating energy requirements (kWh/year) 2.6118 (42) 96.2299 (43) Assumed occupancy Average daily hot water use (litres/dav) Jul Aug Apr May Sep Daily hot water use
105.8529
Energy conte 156.9767 105.8529 (44) 152.0236 (45) 1514.0705 (45) 102.0037 137.2928 98.1545 94.3053 123.5148 90.4561 86.6069 86.6069 90.4561 102.0037 118.5154 141.6739 102.2697 94.7679 108.7476 110.0464 128.2485 139.9932 Energy content (annual)
Distribution loss (46)m
23.5465 18.5272 15.3405 14.2152 16.3121 16.5070 19.2373 20.9990 22.8035 (46) 20.5939 Water storage loss: Water storage 1000.
Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)



Regs Region: England **Elmhurst Energy Systems** SAP2012 Calculator (Design System) version 4.12r02

0.0000

0.0000

0.0000

0.0000



CALCULAT	ION OF 1	TARGET I	EMISSION	NS 09.	Jan 2014								
If cylinder co	ontains ded	icated sola	er storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss Total heat red	50.9589	46.0274	50.0184	46.5067	46.0954	42.7102	44.1339	46.0954	46.5067	50.0184	49.3151	50.9589	,
Solar input	207.9356 0.0000	183.3202	191.6924	170.0215 0.0000	164.6108 0.0000	144.9800 0.0000	138.9019	154.8430 0.0000	156.5531	178.2669 0.0000 months) = S	189.3083	202.9825 0.0000 0.0000	(63)
Output from w		183.3202	191.6924	170.0215	164.6108	144.9800	138.9019	-	156.5531		189.3083	202.9825	
Heat gains from				50 5050	50.000	44 5000	40 5400			Th/year) = S		2083.4161	
	64.9345	57.1567	59.6112	52.6953	50.9302	44.6822	42.5438	47.6824	48.2171	55.1472	58.8765	63.2876	(65)
5. Internal ga													
Metabolic gain	ns (Table 5), Watts											
(66)m Lighting gain:					May 130.5892 L9a), also		Jul 130.5892	Aug 130.5892	Sep 130.5892	Oct 130.5892	Nov 130.5892	Dec 130.5892	(66)
Appliances gas	21.1469 ins (calcul	18.7825 ated in App	15.2750 endix L, eq	11.5641 puation L13	8.6443 or L13a), a	7.2979 lso see Tab		10.2500	13.7576	17.4684	20.3882	21.7346	(67)
Cooking gains	(calculate	d in Append	dix L, equat	ion L15 or		see Table		175.0113	181.2146	194.4208	211.0911	226.7589	
Pumps, fans Losses e.g. e	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	36.0589 3.0000	
Water heating	-104.4714	-104.4714			-104.4714	-104.4714	-104.4714	-104.4714	-104.4714	-104.4714	-104.4714	-104.4714	(71)
Total internal	87.2775 gains	85.0546	80.1226	73.1880	68.4546	62.0587	57.1826	64.0893	66.9682	74.1226	81.7729	85.0639	
	410.8271	408.7015	394.0585	370.2070	345.8835	322.4734	307.7179	314.5274	327.1172	351.1885	378.4290	398.7342	(73)
6. Solar gain:	3												
[Jan]			А	rea m2	Solar flux Table 6a		g fic data	Specific	FF data	Acce fact		Gains W	
					W/m2	or '	Table 6b	or Tab		Table			
North East			12.3		19.6403		0.6300 0.6300	0	.7000 .7000	0.77 0.77		24.8602 73.8285	
Solar gains Total gains	98.6888 509.5159	191.9334 600.6349	318.5759 712.6344	476.5571 846.7641	599.8008 945.6843	622.1870 944.6603	588.9041 896.6221	494.4046 808.9321	373.6882 700.8054	227.9250 579.1136	122.7238 501.1528	81.4377 480.1719	
7. Mean inter													
Temperature di	ring heati	ng periods	in the livi	ng area fr	om Table 9,							21.0000	(85)
Utilisation fa	Jan 64.6276	eins for li Feb 64.8274	Mar 65.0245	nil,m (see Apr 65.9663	May	Jun 66.9930	Jul 66.9930	Aug 67.1524	Sep 66.6641	Oct 66.1456	Nov 65.7840	Dec 65.4101	
alpha util living a:	5.3085	5.3218	5.3350	5.3978		5.4662	5.4662	5.4768	5.4443	5.4097	5.3856	5.3607	
-	0.9984	0.9959	0.9855	0.9380	0.8062	0.6062	0.4495	0.5161	0.8039	0.9745	0.9964	0.9989	
MIT Th 2 util rest of 1	19.8355	19.9971 20.0244	20.2759 20.0271	20.6354 20.0396	20.8855 20.0420	20.9808 20.0530	20.9968	20.9936 20.0550	20.9178 20.0487	20.5621 20.0420	20.1340 20.0372	19.8119 20.0323	
MIT 2	0.9979	0.9945 18.7000	0.9804 19.1060	0.9173 19.6195	0.7526 19.9353	0.5245 20.0409	0.3545 20.0518	0.4139 20.0524	0.7291 19.9848	0.9622 19.5303	0.9950 18.9100	0.9985 18.4354	
Living area f				20.1320		20.5151	20.5286	20.5273	fLA =	Living are 20.0509	a / (4) =	0.5045	(91)
Temperature adjusted MIT	ljustment 19.1551	19.3543	19.6962	20.1320	20.4146	20.5151	20.5286	20.5273	20.4555	20.0509	19.5275	0.0000 19.1299	
8. Space heat:	ing require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp.	0.9972 508.1004 4.3000	0.9932 596.5335	0.9782 697.1268	0.9195 778.6300	0.7747	0.5652 533.8857	0.4025	0.4656 376.6317	0.7634 534.9955	0.9624 557.3153	0.9940 498.1317	0.9980 479.1899	(95)
Heat loss rate Month fracti	1420.6413				814.2838 1.0000			379.8643 0.0000		883.0749 1.0000			
Space heating	kWh				60.7669	0.0000	0.0000			242.3651		693.0526	(98)
Space heating Space heating	per m2									(98) / (4) =	3293.9253 37.0104	
8c. Space coo	ling require	ement											
Not applicable													





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP					
Fraction of space heat from secondary/supplementary system (Table 11) Fraction of space heat from main system(s) Efficiency of main space heating system 1 (in %) Efficiency of secondary/supplementary heating system, % Space heating requirement				0.0000 1.0000 93.4000 0.0000 3526.6866	(202) (206) (208)
Jan Feb Mar Apr May Jun Space heating requirement	Jul Aug	Sep Oct	Nov	Dec	
678.9304 525.1842 414.5319 197.0839 60.7669 0.0000 Space heating efficiency (main heating system 1)	0.0000 0.0000	0.0000 242.3651	482.0102	693.0526	(98)
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) 726.9062 562.2957 443.8243 211.0106 65.0610 0.0000	0.0000 0.0000	0.0000 259.4916	516.0709	742.0263	(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	(215)
Water heating					
	38.9019 154.8430	156.5531 178.2669	189.3083	202.9825	
	80.3000 80.3000	80.3000 85.8250	87.3034	80.3000 87.8956	
Water heating fuel used	72.9787 192.8307	194.9603 207.7097	216.8394	230.9359 2461.3256	
Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary				3526.6866 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Total delivered energy for all uses				30.0000 45.0000 75.0000 373.4610 6436.4732	(230e) (231) (232)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP					
Space heating - main system 1 Space heating - secondary Water heating (other fuel) Space and water heating Pumps and fans Energy for lighting Total CO2, kg/m2/year Emissions per m2 for space and water heating Fuel factor (mains gas) Emissions per m2 for lighting Emissions per m2 for pumps and fans Target Carbon Dioxide Emission Rate (TER) = (14.5327 * 1.00) + 2.1778 + 0.4374, ro	Energy kWh/year 3526.6866 0.0000 2461.3256 75.0000 373.4610	kg CO2/kWh 0.2160 0.0000 0.2160	1	Emissions to Co2/year 761.7643 0.0000 531.6463 1293.4106 38.9250 193.8262 1526.1619 14.5327 1.0000 2.1778 0.4374 17.1500	(263) (264) (265) (267) (268) (272) (272a) (272b) (272c)





Property Reference	E909-02				Issued on Date	11/05/2020
Assessment	E909-02			Prop Type Ref		
Reference						
Property	Flat 2, 1 Hillfield Road, N\	W6 1QD				
SAP Rating		85 B	DER	14.45	TER	15.69
Environmental		88 B	% DER <ter< th=""><th></th><th>7.88</th><th></th></ter<>		7.88	
CO ₂ Emissions (t/yea	r)	1.22	DFEE	37.19	TFEE	43.53
General Requiremen	ts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>14.57</th><th></th></tfe<>	E	14.57	
	Mr. Jason Doherty, Doherty E ason@doherty-energy.co.uk	0,	l, Tel: 0148045	1569,	Assessor ID	L143-0001
Client						





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

		ed Document L1A, 2013 Edi		
DWELLING AS DES	IGNED			
Semi-Detached M	aisonette, total floor a	area 99 m²		
This report covers It is not a company	ers items included with: plete report of regulat:	in the SAP calculations.		
la TER and DER Fuel for main he Fuel factor:1.0 Target Carbon D	eating:Mains gas	ER) 15.69 kgCO□/m²		
Target Fabric E Dwelling Fabric	nergy Efficiency (TFEE)	E) 37.2 kWh/m²/yrOK		
2 Fabric U-value Element	es	Highest		
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK	
Floor	0.00 (max. 0.20) 0.12 (max. 0.25)	- 0.12 (max. 0.70)	OK OK	
	(no roof) 1.12 (max. 2.00)	1.20 (max. 3.30)	OK	
	g calculated using user-	-specified y-value of 0.0	60	
3 Air permeabil: Air permeabilit		3.00 (design value)		
Maximum		10.0		OK
4 Heating effic Main heating sy Data from databa	iency stem: ase	Boiler system with radi		Mains gas
Vaillant ecoTEC Combi boiler	pro 24 VUW 246/5-3 (H-0	3B) R6		
Efficiency: 89. Minimum: 88.0%	5% SEDBUK2009	OK		
Secondary heati	ng system:			
5 Cylinder insu				
Hot water stora	ge	No cylinder		
Hot water stora	ge 		ne control	ok
Hot water storage 6 Controls	ge ontrols:	No cylinder	ne control	OK
Hot water storad	ge ontrols: pls:	No cylinder Time and temperature zo No cylinder Yes		ok Ok
Hot water storad	ge ontrols: ols: k	No cylinder Time and temperature zo No cylinder Yes	ne control	
Hot water storading of the storage of f. Minimum	ontrols: pls: k phts ixed lights with low-ene	No cylinder Time and temperature zo No cylinder Yes		
Hot water storage of Controls Space heating of Hot water controls Space heating of Town water controls of Controls	ontrols: pls: k phts ixed lights with low-ene	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100%		OK
Hot water stora- 6 Controls Space heating of Hot water control Boiler interloc 7 Low energy lipercentage of fininum 8 Mechanical veron continuous supp Specific fan poo	ontrols: cols: k ghts ixed lights with low-ene intilation ly and extract system	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75%		OK OK
Hot water storading of Controls Space heating of Hot water control Boiler interlocity Low energy lipercentage of f. Minimum Semenators support ontinuous support ontinuous support of Semenators support support of Semenators support support of	ontrols: bls: k phts ixed lights with low-end ntilation ly and extract system wer:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75%		OK
Hot water storading of Controls Space heating of Hot water controls Town energy liver her centage of f. Minimum Section 1 Minimum Section	ontrols: bls: k phts ixed lights with low-end ntilation ly and extract system wer:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70%		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc- 7 Low energy lipercentage of f. Minimum 8 Mechanical verontinuous supp Specific fan por Maximum MYHR efficiency Minimum: 9 Summertime tee	ontrols: bls: k ghts ixed lights with low-encentilation ly and extract system wer: :	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70%		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc 7 Low energy line Percentage of f. Minimum 8 Mechanical vec Continuous supp Specific fan por Maximum MVHR efficiency Minimum: 9 Summertime tee Overheating ris: Based on: Overshading:	ontrols: cols: k ghts ixed lights with low-ence intilation ly and extract system weer: : mperature k (Thames Valley):	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc- 7 Low energy lipercentage of f. Minimum 8 Mechanical vec Continuous supp Specific fan poor Maximum MYHR efficiency Minimum: 9 Summertime tec Overheating ris Based on: Overshading: Windows facing ! Windows facing ! Windows facing !	controls:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.39 m², No overhang 1.38 m², No overhang		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc 7 Low energy li Percentage of f. Minimum 8 Mechanical vei Continuous supp Specific fan por Maximum MVHR efficiency Minimum: 9 Summertime tei Overheating ris Based on: Overshading: Windows facing ! Air change rate Blinds/curtains	controls: controls: controls: controls: k dynts ixed lights with low-ener itilation ly and extract system wer: : controls co	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 1.38 m², No overhang 1.38 m², No overhang 4.00 ach None		OK OK
Hot water storadice of Controls Space heating of Hot water controls Space heating of Hot water controls of Low energy lipercentage of finimum——————————————————————————————————	controls: cols: k cols: k cols:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.39 m², No overhang 1.38 m², No overhang 4.00 ach None		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc 7 Low energy lipercentage of fininum 8 Mechanical very continuous supp Specific fan por Maximum MYHR efficiency Minimum: 9 Summertime ter Overheating rise Based on: Overshading: Windows facing is Windows facing is Windows facing in Air change rate Blinds/curtains 10 Key features Party wall U-va.	controls: cols: k cols: k cols:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.39 m², No overhang 1.38 m², No overhang 4.00 ach None 0.00 W/m²K		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc 7 Low energy li Percentage of f. Minimum 8 Mechanical vei Continuous supp Specific fan por Maximum MVHR efficiency Minimum: 9 Summertime tei Overheating ris Based on: Overshading: Windows facing ! Windows facing ! Windows facing ! Windows facing ! Air change rate Blinds/curtains 10 Key features Party wall U-va. Floor U-value Floor U-value	controls: cols: k cols: k cols:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 1.38 m², No overhang 1.38 m², No overhang 4.00 ach None 0.00 W/m²K 0.12 W/m²K 0.12 W/m²K		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc 7 Low energy lirer percentage of fininum 8 Mechanical vec Continuous supp. Specific fan por Maximum MVHR efficiency Minimum: 9 Summertime tel Overheating ris Based on: overshading: Windows facing: Windows facing: Windows facing: Windows facing: Air change rate Blinds/curtains 10 Key features Party wall U-va Floor U-value	controls:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.39 m², No overhang 1.38 m², No overhang 1.38 m², No overhang 1.38 m², No overhang 1.30 m², No overhang		OK OK
Hot water stora- 6 Controls Space heating of Hot water controls Boiler interloc	controls:	No cylinder Time and temperature zo No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.39 m², No overhang 1.38 m², No overhang 4.00 ach None 0.00 W/m²K 0.12 W/m²K 0.12 W/m²K 0.12 W/m²K		OK OK





CALCULATION	ON OF D	OWELLIN	G EMISSI	ONS FOR	REGULAT	IONS CO	OMPLIAN	CE 09	Jan 2014				
SAP 2012 WORKSH	EET FOR N	ew Build (A:	s Designed)	(Version	9.92, Janua								
ALCULATION OF						Jan 2014							
. Overall dwel	ling dime	nsions											
								Area	Store	ey height		Volume	
round floor								(m2) 65.0000		(m) 2.4000		(m3) 156.0000	
irst floor otal floor are welling volume		la) + (1b) + (1	c)+(1d)+(1e)(ln)		99.0000		34.0000	(1c) x 3a)+(3b)+(3c)	2.7000		91.8000 247.8000	(4)
welling volume								(.	34) + (35) + (36)	r(3u) r(3e)	(311) -	247.0000	(5)
. Ventilation	rate												
					main	se	econdary		other	tot	al m	3 per hour	
umber of chimn					heating 0	+	heating 0	+	0 =		0 * 40 =	0.0000	
umber of open umber of inter	mittent fa	ans			0	+	0	+	0 =		0 * 20 = 0 * 10 =	0.0000	(7a)
umber of passi umber of fluel		ires									0 * 10 = 0 * 40 =	0.0000	
nfiltration du	e to chim	neys, flues	and fans	= (6a) + (6b)	+(7a)+(7b)+	(7c) =				0.0000	Air change / (5) =	s per hour 0.0000	(8)
ressure test easured/design	AP50	-			. ,							Yes 3.0000	
nfiltration ra umber of sides		i										0.1500	(18) (19)
helter factor	+ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	nd +a 4a-3	do shalt	factor					(20) = 1 -	[0.075 x 1) = (18)		0.9250 0.1388	
nfiltration ra	te adjust	ed to inclu	de Sherter	Idctor					(2.	1) - (10)	x (20) -	0.1300	(21)
ind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
ind factor dj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	
Balanced mecha			0.1700 th heat rec	0.1526 overy	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	
f mechanical v f balanced wit			iciency in	% allowing :	For in-use fa	actor (from	m Table 4h)	=				0.5000 75.6500	
ffective ac	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848	(25)
. Heat losses													
lement				Gross m2	Openings m2		m2 .3000	U-value W/m2K 0.5500	A x 1 W/1 1.265	K	-value kJ/m2K	A x K kJ/K	
indow (Uw = 1. eat Loss Floor						16	.7700 .0000	1.1450	19.202	3			(27) (28a)
eat Loss Floor xternal Wall 1	2			97.0000	19.0700	15.	.0000	0.1200	1.800	D			(28a) (29a)
otal net area abric heat los			Aum(A, m2)			177	.0000 (26)(3	30) + (32)	= 42.536	1			(31) (33)
arty Wall 1 arty Ceilings	1						.8000 .0000	0.0000	0.000	D			(32) (32b)
hermal mass pa hermal bridges												150.0000 10.6200	
otal fabric he		rineu value	0.000 - 20	car exposed	area)					(33)	+ (36) =	53.1561	
entilation hea	t loss cai	lculated mon	Mar	= 0.33 x (2	25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
38)m eat transfer c		24.1387	23.8550	22.4367	22.1531	20.7348	20.7348	20.4512	21.3021	22.1531	22.7204	23.2877	
verage = Sum(3	77.5784 9)m / 12 =	77.2948 =	77.0111	75.5928	75.3092	73.8909	73.8909	73.6073	74.4582	75.3092	75.8765	76.4438 75.5219	
LP	Jan 0.7836	Feb 0.7808	Mar 0.7779	Apr 0.7636	May 0.7607	Jun 0.7464	Jul 0.7464	Aug 0.7435	Sep 0.7521	Oct 0.7607	Nov 0.7664	Dec 0.7722	(40)
LP (average) ays in month	0.7030	5.7000	3.1113	3.7030	0.7007	V./104	0.7404	0.7433	0.7321	5.7007	0.7004	0.7722	
	31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heating													
ssumed occupan	 су			,								2.7301	(42)
verage daily h		use (litres	/day)									99.0393	
aily hot water		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	108.9432 161.5596	104.9816 141.3010	101.0200 145.8100	97.0585 127.1207	93.0969 121.9753	89.1353 105.2555	89.1353 97.5346	93.0969 111.9224			144.0803		(45)
nergy content											um (45) m =		





GALCOLAT	ION OF E	OWELLIN	IG EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ.			
Distribution 1			(45)m 21.8715	19.0681	18.2963	15.7883	14.6302	16.7884	16.9889	19.7989	21.6120	23.4693	(46)
Water storage Fotal storage	loss: loss												
If cylinder co	0.0000 ntains ded: 0.0000			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Combi loss Cotal heat req	50.9589	46.0274	50.9589	47.8644	47.4412	43.9571	45.4224	47.4412	47.8644	50.9589	49.3151	50.9589	
Solar input	212.5185	187.3284 0.0000	196.7689	174.9852 0.0000	169.4165 0.0000	149.2126 0.0000	142.9570 0.0000	0.0000	161.1236	182.9515	193.3953	207.4207	(63)
Output from w/		187.3284	196.7689	174.9852	169.4165	149.2126	142.9570			months) = Su 182.9515		0.0000	
Heat gains fro				F4 0007	EQ 4171	45 0067	43.7859	Total p	er year (kW 49.6248	h/year) = Su			
	66.4383	58.4894	61.2216	54.2337	52.4171	45.9867	43.7859	49.0745	49.6248	56.6273	60.2355	64.7633	(63)
. Internal ga	ins (see Ta	able 5 and	5a)										
Metabolic gain	s (Table 5)), Watts							0	0-1		D	
(66) m		136.5037			May 136.5037			Aug 136.5037	Sep 136.5037	Oct 136.5037	Nov 136.5037	Dec 136.5037	(66)
Lighting gains Appliances gai	23.4342	20.8140	16.9271	12.8149	9.5793	8.0872	8.7385	11.3587	15.2456	19.3578	22.5934	24.0855	(67)
	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains Pumps, fans	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000				36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	
Losses e.g. ev	aporation	(negative v	values) (Tab	le 5)	-109.2030							-109.2030	
Water heating	gains (Tab	le 5)	82.2870	75.3247	70.4531	63.8705	58.8520	65.9603	68.9233	76.1119	83.6604	87.0474	
Total internal	gains			391.5954	365.5898	340.6932	325.0880	332.1735	345.6837	371.1634	399.8458	421.5468	
6. Solar gains													
[Jan]				rea m2	W/m2	Speci or	Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	r	Gains W	
East West			15.3 1.3	900 800	19.6403 19.6403		0.7200 0.7200	0	.7000 .7000	0.770 0.770		105.5722 9.4665	
Solar gains Total gains					662.4169 1028.0068					267.0292 638.1926		94.6023 516.1491	
7. Mean intern													
Temperature du Utilisation fa	ring heatin ctor for ga	ng periods ains for li	in the livi	ng area fro nil,m (see	om Table 9, 'Table 9a)	Th1 (C)						21.0000	(85)
tau alpha	Jan 53.1720 4.5448	53.3671		54.5687	May 54.7742 4.6516	Jun 55.8255 4.7217	Jul 55.8255 4.7217	Aug 56.0407 4.7360	Sep 55.4002 4.6933	Oct 54.7742 4.6516	Nov 54.3647 4.6243	Dec 53.9612 4.5974	
atil living ar		0.9735	0.9303	0.8148	0.6402	0.4575	0.3337	0.3794	0.6259	0.8958	0.9769	0.9909	(86)
MIT	19.8430	20.0696	20.4085	20.7600	20.9346	20.9894	20.9981	20.9966	20.9571	20.6726	20.1904	19.8079	(87)
Th 2 util rest of h	20.2676 louse 0.9860	20.2700	20.2725 0.9185	20.2850	20.2875	20.3000	20.3000	20.3026	20.2950	20.2875	20.2825	20.2775 0.9892	
MIT 2 Living area fr	18.6982			20.0000	20.2196	20.2913	20.2989	20.3004	20.2561	19.8971 Living area	19.2138		(90)
MIT Temperature ad	19.0913 ljustment	19.3854	19.8196	20.2610	20.4651	20.5310	20.5390	20.5395	20.4969	20.1634	19.5492	19.0504 0.0000	
adjusted MIT	19.0913	19.3854	19.8196	20.2610	20.4651	20.5310	20.5390	20.5395	20.4969	20.1634	19.5492	19.0504	(93)
3. Space heati	ng require	ment											
									~	<u> </u>		_	
T+ilicoti:-	Jan 0.9813 539.1994 4.3000		Mar 0.9100 716.5674 6.5000	Apr 0.7874 733.9082 8.9000	May 0.6102 627.3244 11.7000	Jun 0.4256 433.5610 14.6000	Jul 0.2991 290.3675 16.6000	Aug 0.3422 303.4250 16.4000	Sep 0.5878 456.5189 14.1000	Oct 0.8689 554.5364 10.6000	Nov 0.9656 524.5698 7.1000	Dec 0.9853 508.5456 4.2000	(95)
Useful gains Ext temp.			1005 7570	858.8091		438.2502	291.0589	304.6981	476.3001 0.0000	720.2150 1.0000	944.6014	1135.2237	
Useful gains Ext temp. Heat loss rate Month fracti	W 1147.4884 1.0000	1119.6443	1.0000	1.0000	1.0000	0.0000							(3,4)
Heat loss rate	W 1147.4884 1.0000 kWh	1.0000				0.0000	0.0000	0.0000	0.0000	123.2648	302.4228	466.2485 2016.5844	(98)





CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

9a. Energy requirement	s - Individua	al heating s	ystems, inc	luding micr	o-CHP							
Fraction of space heat Fraction of space heat Efficiency of main spa Efficiency of secondar Space heating requirem	from seconda from main sy ce heating sy y/supplementa	ary/suppleme ystem(s) ystem 1 (in	ntary syste %)								0.0000 1.0000 93.4000 0.0000 2159.0839	(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirem 452.567	ent 0 327.7339	230.0371	89.9286	24.3817	0.0000	0.0000	0.0000	0.0000	123.2648	302.4228	466.2485	(98)
Space heating efficien 93.400				93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (ma		ystem)	96.2833	26.1046	0.0000	0.0000	0.0000	0.0000	131.9752	323.7931	499.1954	
Water heating requirem	ent											
	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 requirem	ent											
212.518 Efficiency of water he	5 187.3284 ater	196.7689	174.9852	169.4165	149.2126	142.9570	159.3636	161.1236	182.9515	193.3953	207.4207 80.3000	,
(217)m 86.907 Fuel for water heating	1 86.4455	85.4453	83.4656	81.4448	80.3000	80.3000	80.3000	80.3000	84.0815	86.1724	87.0296	
	1 216.7012 d	230.2865	209.6495	208.0139	185.8189	178.0287	198.4603	200.6520	217.5883	224.4285	238.3335 2552.4964	
Space heating fuel - m Space heating fuel - s	ain system										2159.0839 0.0000	
(BalancedWithHeatR mechanical ventilat central heating pum main heating flue f Total electricity for Electricity for lighti Total delivered energy	ion fans (SF) p an the above, ki ng (calculate	P = 1. Wh/year ed in Append	0125)	1.2500, SFP	> = 1.0125)						306.0950 30.0000 45.0000 381.0950 413.8547 5506.5300	(230c) (230e) (231) (232)
12a. Carbon dioxide em	issions - Ind	dividual hea	ting system	s including	micro-CHP							
Space heating - main s Space heating - second Water heating (other f Space and water heatin Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxid	ary uel) g	ate (DER)					Energy kWh/year 2159.0839 0.0000 2552.4964 381.0950 413.8547		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190 0.5190		Emissions g CO2/year 466.3621 0.0000 551.3392 1017.7013 197.7883 214.7906 1430.2802 14.4500	(261) (263) (264) (265) (267) (268) (272)
DER Total Floor Area Assumed number of occu CO2 emission factor in CO2 emissions from app CO2 emissions from occu Total CO2 emissions Residual CO2 emissions Residual CO2 emissions Resulting CO2 emission Net CO2 emissions	pants Table 12 for liances, equation king, equation offset from lectricity ge	r electricit ation (L14) on (L16) biofuel CHP eneration, k	y displaced Wh/m²/year	from grid			ON TECHNOLO	GIES		TFA N EF	14.4500 99.0000 2.7301 0.5190 15.2455 1.8639 31.5594 0.0000 0.0000 0.0000 31.5594	ZC2 ZC3 ZC4 ZC5 ZC6 ZC7





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 Volume (m3) 156.0000 (1b) - (3b) (m2) 65.0000 (1b) (m) 2.4000 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 34.0000 (1c) 2.7000 (2c) 91.8000 (1c) - (3c) 99.0000 2. Ventilation rate secondarv other total m3 per hour 0 * 40 = 0 * 20 = 3 * 10 = 0 * 10 = Number of chimneys Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0 0 0.0000 (6b) 30.0000 (7a) Air changes 30.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1211 (8) Pressure test Measured/design AP50 5.0000 0.3711 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] = (21) = (18) x (20) = 0.9250 (20) 0.3432 (21) (20) = 1 -Infiltration rate adjusted to include shelter factor Feb 5.0000 1.2500 Jul 3.8000 Aug 3.7000 0.9250 Dec 4.7000 (22) 1.1750 (22a) 5.1000 1.2750 4.9000 1.2250 Wind speed 1.1000 1.0750 1.0750 1.1250 Wind factor 0.9500 0.9500 1.0000 Adj infilt rate 3. Heat losses and heat loss parameter NetArea m2 2.3000 U-value W/m2K 1.0000 A x U W/K 2.3000 TER Opaque door TEK Opaque door
TER Opening Type (Uw = 1.40)
Heat Loss Floor 1
Heat Loss Floor 2
External Wall 1
Total not and 1 16.7700 1.3258 22.2330 (27)65.0000 0.1300 8.4500 (28a) Total net area of external elements Aum(A, m2) 177.0000 (31)48.9604 Fabric heat loss, $W/K = Sum (A \times U)$ (26)...(30) + (32) =(33) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss 250.0000 (35) 0.0000 (36) (33) + (36) = 48.9604 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan Feb Mar Apr May May 46.4536 Apr 46.7155 Aug 45.0085 Sep 45.7039 Dec 47.5374 (38) (38)m 48.7175 Heat transfer coeff 48.4134 46.9834 48.1154 45.2343 45.2343 46.4536 97.6779 Average = Sum(39)m / 12 97 3738 97 0757 95 6758 95 4139 94 1946 94 1946 93 9688 94 6643 95 4139 95.9438 96.4977 (39) 95.6746 (39) Feb Apr 0.9664 May 0.9638 Jun 0.9515 Aug 0.9492 Sep 0.9562 0.9866 0.9836 0.9806 0.9515 0.9638 0.9691 0.9747 (40) HLP (average) Days in month 0.9664 (40) 31 (41) 4. Water heating energy requirements (kWh/year) 2.7301 (42) 99.0393 (43) Assumed occupancy Average daily hot water use (litres/day) May Jan Feb Apr Jun Jul Aug Sep Nov Daily hot water use 108.9432 101.0200 97.0585 89.1353 97.0585 104.9816 141.3010 145.8100 127.1207 121.9753 105.2555 97.5346 111.9224 113.2591 131.9926 144.0803 156.4618 (45) 1558.2731 (45) Total = Sum (45) m = Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56) If cylinder contains dedicated solar storage





CALCULAT	ION OF	TARGET I	EMISSION	IS 09.	lan 2014								
Combi loss	0.0000 50.9589	0.0000 46.0274	0.0000 50.9589	0.0000 47.8644	0.0000 47.4412	0.0000 43.9571	0.0000 45.4224	0.0000 47.4412	0.0000 47.8644	0.0000 50.9589	0.0000 49.3151	0.0000 50.9589	
Total heat rec	uired for 212.5185	water heati 187.3284	ng calculat 196.7689	ed for each 174.9852	n month 169.4165	149.2126	142.9570	159.3636	161.1236	182.9515	193.3953	207.4207	(62)
Solar input Output from w/	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 ut (sum of	0.0000 months) = S		0.0000	,
output Irom w/		187.3284	196.7689	174.9852	169.4165	149.2126	142.9570			182.9515 h/year) = S			
Heat gains fro	m water he 66.4583		month 61.2216	54.2337	52.4171	45.9867	43.7859	49.0745	49.6248	56.6273	60.2355	64.7633	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gair), Watts					Jul		Con	Oct	Nov	Dec	
(66)m Lighting gains	136.5037	136.5037			May 136.5037 L9a), also		136.5037	Aug 136.5037	Sep 136.5037	136.5037	136.5037	136.5037	(66)
Appliances gai	ns (calcul	ated in App	endix L, eq	uation L13		lso see Tab		11.3587	15.2456	19.3578	22.5934	24.0855	
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or	218.6064 L15a), also	see Table	5					243.4628	
Pumps, fans Losses e.g. ev	3.0000	3.0000	3.0000	3.0000	36.6504 3.0000	36.6504	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	36.6504 3.0000	
	-109.2030	-109.2030			-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Total internal	89.3257		82.2870	75.3247	70.4531	63.8705	58.8520	65.9603	68.9233	76.1119	83.6604	87.0474	(72)
10001 1110011101		432.1469	416.8489	391.5954	365.5898	340.6932	325.0880	332.1735	345.6837	371.1634	399.8458	421.5468	(73)
6. Solar gains													
[Jan]			A		Solar flux Table 6a W/m2				FF data	Acce fact	or	Gains W	
									le 6c .7000	Table		00 2757	(76)
East West 			1.3	800	19.6403 19.6403		0.6300 0.6300	0	.7000	0.77 0.77		92.3757 8.2832	
Solar gains Total gains										233.6505 604.8139			
7. Mean interr												21 0000	(0.5)
Temperature du Utilisation fa					Table 9a)	Jun	Jul	Aug	Sep	Oct	Nov	21.0000 Dec	(85)
tau alpha	70.3844		70.8210 5.7214	71.8572	72.0545 5.8036	72.9872 5.8658	72.9872 5.8658		72.6251 5.8417	72.0545 5.8036	71.6566 5.7771	71.2452 5.7497	
util living ar		0.9967	0.9878	0.9459	0.8248	0.6270	0.4629	0.5229	0.8073	0.9771	0.9972	0.9992	(86)
MIT Th 2	19.9276 20.0945	20.0797	20.3388	20.6664	20.8942 20.1136	20.9830	20.9975	20.9952 20.1259	20.9315	20.6059	20.2057	19.9052 20.1044	
atil rest of h	ouse 0.9984	0.9956	0.9835	0.9276	0.7754	0.5490	0.3723	0.4266	0.7366	0.9662	0.9961	0.9989	(89)
MIT 2 Living area fr		18.8741	19.2519	19.7223	20.0131	20.1130	20.1231	20.1239		19.6486 Living are		18.6247 0.3434	(91)
MIT Pemperature ac		19.2881	19.6252	20.0465	20.3157	20.4118	20.4234	20.4231	20.3633			19.0645	
adjusted MIT	19.0889	19.2881	19.6252	20.0465	20.3157	20.4118	20.4234	20.4231	20.3633	19.9774	19.4585	19.0645	(93)
3. Space heati	ng require	ment											
Utilisation Useful gains Ext temp.					744.3626		Jul 0.4035 359.0765 16.6000	Aug 0.4598 375.8532 16.4000	Sep 0.7578 547.7843 14.1000	Oct 0.9641 583.1107 10.6000	Nov 0.9949 522.6911 7.1000	503.5206	(95)
Heat loss rate	1444.5498	1401.0286	1274.1344	1066.4523		547.4428 0.0000	360.1417 0.0000	378.0501 0.0000	592.9113 0.0000	894.7330 1.0000	1185.7235 1.0000	1434.3878 1.0000	
Space heating	kWh		407.2236		57.8054	0.0000	0.0000	0.0000	0.0000			692.5652	(98)
Space heating Space heating	per m2									(98) / (4) =	3256.9406 32.8984	
8c. Space cool	ing requir	ement											
Not applicable													
9a. Energy rec					cluding micr								



Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from sec Fraction of space heat from main Efficiency of main space heating Efficiency of secondary/supplement Space heating requirement	system(s) system 1 (in	%)	m (Table 11)						0.0000 1.0000 93.4000 0.0000 3487.0884	(202) (206) (208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 677.5323 521.18 Space heating efficiency (main h		191.3945	57.8054	0.0000	0.0000	0.0000	0.0000	231.8469	477.3834	692.5652	(98)
93.4000 93.40 Space heating fuel (main heating	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
725.4093 558.03		204.9192	61.8901	0.0000	0.0000	0.0000	0.0000	248.2301	511.1171	741.5045	(211)
0.0000 0.00	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 212.5185 187.32	196.7689	174.9852	169.4165	149.2126	142.9570	159.3636	161.1236	182.9515	193.3953	207.4207	
Efficiency of water heater (217)m 87.7642 87.49		85.2772	82.6491	80.3000	80.3000	80.3000	80.3000	85.6486	87.2365	80.3000 87.8533	
Fuel for water heating, kWh/mont 242.1470 214.13 Water heating fuel used		205.1957	204.9828	185.8189	178.0287	198.4603	200.6520	213.6072	221.6909	236.0990 2527.3793	
Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary	n									3487.0884 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, Electricity for lighting (calculated) Total delivered energy for all u	ated in Append	lix L)								30.0000 45.0000 75.0000 413.8547 6503.3224	(230e) (231) (232)
12a. Carbon dioxide emissions -	Individual hea	ting system	s including	micro-CHP							
Space heating - main system 1 Space heating - secondary Water heating (other fuel) Space and water heating						Energy kWh/year 3487.0884 0.0000 2527.3793		ion factor kg CO2/kWh 0.2160 0.0000 0.2160	ļ	Emissions cg CO2/year 753.2111 0.0000 545.9139 1299.1250	(263) (264) (265)
Pumps and fans Energy for lighting Total CO2, kg/m2/year Emissions per m2 for space and v Fuel factor (mains gas) Emissions per m2 for lighting Emissions per m2 for pumps and : Target Carbon Dioxide Emission I	ans	3.1225 * 1.	00) + 2.169	6 + 0.3932 ,	rounded to	75.0000 413.8547		0.5190 0.5190		38.9250 214.7906 1552.8406 13.1225 1.0000 2.1696 0.3932 15.6900	(268) (272) (272a) (272b) (272c)





Property Reference	E909-03				Issued on Date	11/05/2020
Assessment	E909-03			Prop Type Ref		
Reference						
Property	Flat 3, 1 Hillfield Road, N\	W6 1QD				
SAP Rating		83 B	DER	17.15	TER	18.60
Environmental		89 B	% DER <ter< th=""><th></th><th>7.78</th><th></th></ter<>		7.78	
CO₂ Emissions (t/yea	r)	0.76	DFEE	36.57	TFEE	42.32
General Requiremen	ts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>13.60</th><th></th></tfe<>	E	13.60	
	Mr. Jason Doherty, Doherty E ason@doherty-energy.co.uk	0,	l, Tel: 0148045	1569,	Assessor ID	L143-0001
Client						





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

REGULATIONS COM	PLIANCE REPORT - Approve	ed Document L1A, 2013 Edi	ition, England	
DWELLING AS DES	IGNED			
Ground-floor fl	at, total floor area 50	m²		
It is not a com	ers items included with	ons compliance.		
1a TER and DER				
Fuel factor:1.0 Target Carbon D	eating:Mains gas 0 (mains gas) Dioxide Emission Rate (TR Dioxide Emission Rate			
Target Fabric E Dwelling Fabric	nergy Efficiency (TFEE)	E)36.6 kWh/m²/yrOK		
2 Fabric U-valu	es			
Enternal mall	0 16 (mass 0 30)	Highest 0.16 (max. 0.70)	OK	
Party wall		-	OK	
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK OK	
Openings	0.09 (max. 0.20) 1.09 (max. 2.00)	1.20 (max. 3.30)	OK	
2a Thermal brid	ging	-specified y-value of 0.0		
3 Air permeabil Air permeabilit	ity y at 50 pascals:	3.00 (design value)		
Maximum		10.0		OK
4 Heating effic Main heating sy Data from datab	iency stem:	Boiler system with radi	iators or underflo	or - Mains gas
Vaillant ecoTEC Combi boiler	pro 24 VUW 246/5-3 (H-0	GB) R6		
Efficiency: 89. Minimum: 88.0%	5% SEDBUK2009	OK		
Secondary heati	ng system:	None		
5 Cylinder insu Hot water stora	lation ge	No cylinder		
6 Controls				
Space heating c	controls:	Time and temperature zo	one control	OK
Hot water contr	ols:	No cylinder		
Boiler interloc	k	Yes		OK
7 Low energy li				
	ixed lights with low-end	ergy fittings:100% 75%		OK
8 Mechanical ve Continuous supp Specific fan po	ly and extract system	0.66		
Maximum	wer.	0.66 1.5		OK
MVHR efficiency Minimum:	:	90% 70%		OK
		Medium		0к
Based on: Overshading:		Average		
Windows facing		2.88 m², No overhang		
Windows facing Windows facing		4.65 m ² , No overhang 3.52 m ² , No overhang		
Air change rate		4.00 ach		
Blinds/curtains	:			closed 100% of daylight hours
10 Key features				
Party wall U-va	lue	0.00 W/m²K		
Roof U-value Door U-value		0.09 W/m ² K 0.55 W/m ² K		
Air permeabilit	У	3.0 m ³ /m ² h		





CALCULATION C	F DWELLIN	IG EMISSI	ONS FOR	REGULAT	IONS CC	MPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKSHEET FO	OP New Build (Z	ue Designed)	(Version	9.92, Januar								
CALCULATION OF DWELL	NG EMISSIONS E	FOR REGULATION	ONS COMPLIAN	ICE 09 J	an 2014)							
1. Overall dwelling o							Area	Stor	ey height		Volume	
Ground floor							(m2) 50.0000		(m) 2.4000	(2b) =	(m3)	(1b) - (3b
Total floor area TFA Dwelling volume	= (1a)+(1b)+(1	.c) + (1d) + (1e))(1n)	5	0.000		(3a)+(3b)+(3c)	+(3d)+(3e)	(3n) =	120.0000	(4) (5)
2. Ventilation rate												
				main heating		econdary heating		other	tota	al m	n3 per hour	
Number of chimneys Number of open flues				0 0	++	0	++	0 =		0 * 40 = 0 * 20 =	0.0000	
Number of intermitter Number of passive ver Number of flueless ga	nts									0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000	(7b)
Number of fideress ga	is illes										es per hour	(70)
Infiltration due to o Pressure test Measured/design AP50	chimneys, flues	and fans	= (6a)+(6b)	+(7a)+(7b)+((7c) =				0.0000	/ (5) =	0.0000 Yes 3.0000	
Infiltration rate Number of sides shelt	ered										0.1500	
Shelter factor Infiltration rate ad-	insted to incl	ide shelter	factor					(20) = 1 -	[0.075 x 1) = (18) :		0.9250 0.1388	
												\ /
Wind speed 5.10 Wind factor 1.2		Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250		0ct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Adj infilt rate 0.17	769 0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283		0.1492	0.1561	0.1630	
Balanced mechanical If mechanical ventila If balanced with heat	ation:		-	or in-use fa	ctor (from	n Table 4h)	=				0.5000 76.5000	
Effective ac 0.29		0.2875	0.2701	0.2667	0.2493	0.2493	0.2458	0.2563	0.2667	0.2736	0.2805	
3. Heat losses and he												
Element			Gross	Openings	Net	Area	U-value	Ах		-value	AxK	
Door Window (Uw = 1.20)			m2	m2	2.	m2 .3000 .0500	W/m2K 0.5500 1.1450	W/ 1.265 12.652	0	kJ/m2K	kJ/K	(26) (27)
Heat Loss Floor 1 External Wall 1			74.0000	13.3500	19. 60.	.3000 .6500	0.1300 0.1600	2.509 9.704	0			(28a) (29a)
External Roof 1 Total net area of ext Fabric heat loss, W/F			4.0000			.0000 .3000 (26)(0.0900	0.360				(30) (31) (33)
Party Wall 1 Party Floor 1					30.	.2000 .7000	0.0000	0.000	0			(32) (32d)
Party Ceilings 1 Thermal mass parameter	er (TMP = Cm /	TFA) in kJ/r	n2K		40.	.0000					125.0000	(32b) (35)
Thermal bridges (User Total fabric heat los		e 0.060 * tot	tal exposed	area)					(33)	+ (36) =	5.8380 32.3287	
Ventilation heat loss Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m 11.65 Heat transfer coeff 43.98		11.3838	10.6970 43.0256	10.5596	9.8728	9.8728	9.7354 42.0641	10.1475 42.4762	10.5596	10.8343	11.1090 43.4377	
Average = Sum(39)m /		W	2	Maria	· · · ·	71		0	0-4	N	42.9913	(39)
HLP (average)	Feb 0.8770	Mar 0.8742	Apr 0.8605	May 0.8578	Jun 0.8440	Jul 0.8440	Aug 0.8413	Sep 0.8495	Oct 0.8578	Nov 0.8633	Dec 0.8688 0.8598	
Days in month	31 28	31	30	31	30	31	31	30	31	30		(41)
4. Water heating ener	ray requirement											
Assumed occupancy											1.6901	
Average daily hot wat	er use (litres Feb	s/day) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	74.3399 Dec	(43)
Daily hot water use 81.77	739 78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739	
Energy content (annual		109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135			117.4419 1169.6560	





	ION OF L	OWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
istribution :	loss (46)m 18.1902		45)m 16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)
ater storage stal storage	loss: loss												, .,
f cylinder co	0.0000 ontains dedi 0.0000	0.0000 icated sola 0.0000	0.0000 r storage 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
ombi loss otal heat red	41.6711	36.2697	38.6405	35.9276	35.6098	32.9947	34.0945	35.6098	35.9276	38.6405	38.8604	41.6711	
olar input			148.0870 0.0000			112.0005	107.3050	119.6200 0.0000	0.0000	0.0000	147.0086	159.1130	(63)
utput from w		142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	months) = S	147.0086		(64)
eat gains fro		ating, kWh/: 44.3331		40.7084	39.3448	34.5181	32.8661	Total po	er year (kW 37.2489	h/year) = S 42.6026	um (64) m = 45.6744	1615.5732 49.4672	
. Internal ga													
etabolic gair	ns (Table 5) Jan	, Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
56)m ighting gains	84.5050		84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66
opliances ga:	13.1288	11.6608	9.4832	7.1794	5.3667	4.5308		6.3636	8.5412	10.8450	12.6577	13.4936	(67
ooking gains	147.2339 (calculated	148.7618 d in Append	144.9117 lix L, equat:	136.7153 ion L15 or	126.3689 L15a), also	116.6447 see Table	110.1484 5	108.6205	112.4706	120.6670	131.0134	140.7376	
umps, fans	31.4505 3.0000	31.4505 3.0000	3.0000	3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	
osses e.g. e	-67.6040	-67.6040	-67.6040		-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71
ater heating	68.1982	le 5) 65.9718	61.8966	56.5395	52.8828	47.9418	44.1749	49.5105	51.7345	57.2615	63.4366	66.4882	(72
otal internal		277.7459	267.6431	251.7857	235.9699	220.4689	210.5705	215.8462	224.0979	240.1250	258.4593	272.0709	(73
. Solar gains	S												
Jan]			A:	rea m2	Solar flux Table 6a		g	Specific	FF	Acce		Gains W	
					W/m2	or '	Table 6b	or Tab		fact Table			
ast outh est				 800 500	W/m2	or '	Table 6b	or Tab: 0 0			00 00	19.7562 75.9307 24.1465	(76 (78
ast outh		210.2379	2.8	800 500 200 385.3108	W/m2 19.6403 46.7521 19.6403	or '	Table 6b 0.7200 0.7200 0.7200 0.7200 421.7991	or Tab.	le 6c .7000 .7000	Table 0.77 0.77 0.77	00 00	19.7562 75.9307	(76) (78) (80)
ast outh est olar gains otal gains . Mean intern	119.8334 399.7458	210.2379 487.9839	2.8 4.6 3.5 299.8432 567.4862	385.3108 637.0965	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345	438.3288 658.7977	0.7200 0.7200 0.7200 0.7200 0.7200 421.7991 632.3696	or Tab.	le 6c .7000 .7000 .7000 .7000	Table 0.77 0.77 0.77	6d 00 00 00 144.7453	19.7562 75.9307 24.1465	(76) (78) (80)
ast outh est olar gains otal gains . Mean inter emperature di	119.8334 399.7458 anal temperat	210.2379 487.9839 Lure (heati	2.8 4.6 3.5 299.8432 567.4862	385.3108 637.0965	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345	438.3288 658.7977	0.7200 0.7200 0.7200 0.7200 0.7200 421.7991 632.3696	or Tab.	le 6c .7000 .7000 .7000 .7000	Table 0.77 0.77 0.77	6d 00 00 00 144.7453	19.7562 75.9307 24.1465	(76 (78 (80 (83 (84
outh outh est clar gains otal gains . Mean inter emperature di tilisation fe	119.8334 399.7458 anal temperat	210.2379 487.9839 Lure (heati	2.8 4.6 3.5 299.8432 567.4862	385.3108 637.0965	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 om Table 9, 1 Table 9a) May	438.3288 658.7977	0.7200 0.7200 0.7200 0.7200 421.7991 632.3696	or Tab.	le 6c .7000 .7000 .7000 .7000	Table 0.77 0.77 0.77	6d 00 00 00 144.7453	19.7562 75.9307 24.1465 101.7146 373.7855	(76 (78 (80 (83 (84
ast outh est olar gains otal gains . Mean inter emperature di tilisation fa au lipha	119.8334 399.7458 all temperaturing heating actor for general Jan 39.4686 3.6312	210.2379 487.9839 	2.8 4.6 3.5 299.8432 567.4862 in the living area, 19 Mar 39.7166 3.6478	385.3108 637.0965 ang area fro nil, m (see Apr 40.3506 3.6900	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 om Table 9, 7 Table 9a) May 40.4799 3.6987	438.3288 658.7977 Chl (C) Jun 41.1387 3.7426	Jul 41.1387 3.7426	or Tab. 0 0 0 381.9935 597.8397 Aug 41.2730 3.7515	Sep 40.87248	Table 0.77 0.77 0.77 236.0359 476.1609	Nov 40.2222 3.6815	19.7562 75.9307 24.1465 101.7146 373.7855 21.0000 Dec 39.9678 3.6645	(76 (78 (80 (83 (84
outh outh est clar gains otal gains . Mean inter emperature ditilisation fe au lpha til living an	119.8334 399.7458 al temperaturing heating actor for ga Jan 39.4686 3.6312 rea 0.9468	210.2379 487.9839 ure (heati ng periods ains for li Feb 39.5922 3.6395 0.9018	2.8 4.6 3.5 299.8432 567.4862 	385.3108 637.0965 ag area fro nil, m (see Apr 40.3506 3.6900 0.7013	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 om Table 9, 1 Table 9a) May 40.4799 3.6987 0.5530	438.3288 658.7977 Ph1 (C) Jun 41.1387 3.7426 0.4012	Jul 41.1387 3.7426 0.2915	or Tab. 0 0 0 381.9935 597.8397 Aug 41.2730 3.7515 0.3205	Sep 40.8726 3.7248 0.5045	Table 0.77 0.77 0.77 236.0359 476.1609 Oct 40.4799 3.6987 0.7607	Nov 40.2222 3.6815 0.900	19.7562 75.9307 24.1465 101.7146 373.7855 21.0000 Dec 39.9678 3.6645 0.9560	(766 (78 (800 (833 (844 (855
ast outh cest out of the control of	119.8334 399.7458 anal temperat ruring heatir actor for garactor for g	210.2379 487.9839 	2.8 4.6 3.5 299.8432 567.4862 in the living area, 19 Mar 39.7166 3.6478	385.3108 637.0965 ag area fr nil,m (see Apr 40.3506 3.6900 0.7013	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 m Table 9, 1 Table 9a) May 40.4799 3.6987 0.5530 20.9134	438.3288 658.7977 Chl (C) Jun 41.1387 3.7426	Jul 41.1387 3.7426	or Tab. 0 0 0 381.9935 597.8397 Aug 41.2730 3.7515 0.3205 20.9935	Sep 40.87248	Table 0.77 0.77 0.77 236.0359 476.1609 Oct 40.4799 3.6987 0.7607 20.7146	Nov 40.222 3.6815 0.9101 20.2078	19.7562 75.9307 24.1465 101.7146 373.7855 21.0000 Dec 39.9678 3.6645 0.9560 19.7363	(76 (78 (80 (84 (85
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obth sest colar gains colar gains colar gains colar gai	119.8334 399.7458 nal temperat uring heatir actor for ga Jan 39.4686 3.6312 rea 0.9468 19.7959 20.1848 house 0.9391 8.5835 raction 19.2600 djustment 19.2600	210.2379 487.9839 200.000 200.1871 0.8889 19.6202 19.6202	2.8i 4.6i 3.5: 299.8432 567.4862 ing season) in the livin ving area, 1 Mar 39.7166 3.6478 0.8260 20.4407 20.1894 0.8052 19.4875 20.0194 20.0194	385.3108 637.0965 385.3108 637.0965 ang area frc nil,m (see Apr 40.3506 3.6900 0.7013 20.7488 20.2012 0.6704 19.9065 20.3765	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 m Table 9a) May 40.4799 3.6987 0.5530 20.9134 20.2035 0.5131 20.1128 20.5596 20.5596	438.3288 658.7977 201.1387 3.7426 0.4012 20.9803 20.2153 0.3547 20.1986 20.6348 20.6348	Jul 41.1387 3.7426 0.2915 20.9954 20.2125 20.6494 20.6494	or Tab. 0 0 0 0 381.9935 597.8397 Aug 41.2730 3.7515 0.3205 20.9935 20.2177 0.2672 20.2134 20.6487 20.6487	Sep 40.8726 3.7248 0.5045 20.9537 20.2106 0.4533 20.1685 fLA = 20.6067	Table 0.77 0.77 0.77 236.0359 476.1609 Oct 40.4799 3.6987 0.7607 20.7146 20.2035 0.7646 20.2035 1.8752 2.Living are 20.3436	Nov 40.2222 3.6815 0.9101 20.2078 20.1988 0.8960 19.1825 a / (4) = 19.7546	19.7562 75.9307 24.1465 101.7146 373.7855 21.0000 Dec 39.9678 3.6645 0.9560 19.7363 20.1941 0.9495 18.5051 0.5580 19.1921 0.0000	(76 (78 (80) (83) (84) (85) (86) (87) (88) (89) (91) (92)
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ast buth sest outh sest outh sest of a gains otal gains of a gains of a gains out of a gain of a gains out of a gain of a gains out of a gain of a gains out	119.8334 399.7458 al temperat uring heatin actor for ge Jan 39.4686 33.6312 rea 0.9468 19.7959 20.1848 house 0.9391 18.5835 raction 19.2600 dijustment 19.2600 ing requirem Jan 0.9287 371.2316	210.2379 487.9839 20.204 20.1000 20.1871 0.8889 19.0444 19.6202 19.6202	2.8i 4.6i 3.5i 299.8432 567.4862 ng season) in the livin ving area, 1 Mar 39.7166 3.6478 0.8260 20.4407 20.1894 0.8052 19.4875 20.0194 20.0194	385.3108 637.0965 385.3108 637.0965 385.3108 637.0965 20.3765 20.3765 20.3765 20.3765	W/m2 19.6403 46.7521 19.6403 439.3646 675.3345 om Table 9, 1 Table 9a) May 40.4799 3.6987 0.5530 20.9134 20.2035 0.5131 20.1128 20.5596 20.5596	438.3288 658.7977 2th1 (C) Jun 41.1387 3.7426 0.4012 20.9803 20.2153 0.3547 20.1986 20.6348 20.6348	Jul 41.1387 3.7426 0.2915 20.9954 20.2125 20.6494 20.6494 Jul 0.2688 169.9557	or Tab. 0 0 0 381.9935 597.8397 Aug 41.2730 3.7515 0.3205 20.9935 20.2177 0.2672 20.2134 20.6487 20.6487	Sep 40.8726 3.7248 0.5045 20.9537 20.2106 0.4533 20.1685 20.6067 20.6067	Table 0.77 0.77 0.77 0.77 236.0359 476.1609 Oct 40.4799 3.6987 0.7607 20.7146 20.2035 0.7268 19.8752 Living are 20.3436 20.3436	Nov 40.2222 3.6815 0.9101 20.2078 20.1988 0.8960 19.1825 a/(4) = 19.7546 19.7546	19.7562 75.9307 24.1465 101.7146 373.7855 21.0000 Dec 39.9678 3.6645 0.9560 19.7363 20.1941 0.9495 18.5051 0.5580 19.1921 0.0000 19.1921	(76 (78 (80 (83 (84 (85 (86 (87 (88 (89 (90 (91 (92 (93
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8c. Space cooling requirement

Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable 9a. Energy requirements - Individual heating systems, including micro-CHP Fraction of space heat from secondary/supplementary system (Table 11) Fraction of space heat from main system(s) Efficiency of main space heating system 1 (in %) Efficiency of secondary/supplementary heating system, % Space heating requirement 0.0000 (201) 1.0000 (202) 93.4000 (206) Feb Mar Apr May Jun J111 Aug Sep Oct Nov Dec 44.7855 15.7941 0.0000 51.2067 135.7383 223.1612 (98) 93.4000 93.4000 0.0000 93.4000 (210) 0.0000 0.0000 0.0000 93.4000 93.4000 Space heating fuel (main heating system) 228.4712 155.8990 108 108.9040 47.9502 16.9102 0.0000 0.0000 0.0000 0.0000 54.8251 145.3301 238.9307 (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 (215) 0.0000 Water heating Water heating requirement

162.9394 142.3318 148.0870 131.3457 127.1658 112.0005 107.3050 119.6200 120.9410 137.7155 147.0086 159.1130 (64)

80.3000 (216)

80.3000 (216) Efficiency of water heater (217)m 85.7313 85.1085 84.1272 82.6479 81.3036 80.3000 (216) 85.9028 (217) Fuel for water heating, kWh/month
190.0583 167.2356 176.0274 158.9219 156.4086
Water heating fuel used 185.2244 (219) 1946.1245 (219) 139.4776 133.6302 148.9663 150.6115 166.3077 173.2548 Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary 997 2205 (211) Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8250) mechanical ventilation fans (SFP = 0.8250) central heating pump 120.7800 (230a) 120.7800 (230a) 30.0000 (230c) 45.0000 (230e) 195.7800 (231) 231.8580 (232) 3370.9830 (238) main heating flue fan Total electricity for the above, kWh/year Electricity for lighting (calculated in Appendix L) Total delivered energy for all uses 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Energy Emission factor Emissions kWh/year 997.2205 kg CO2/kWh 0.2160 CO2/year 215.3996 (261) Space heating - main system 1 0.0000 (263) 420.3629 (264) 635.7625 (265) 101.6098 (267) 120.3343 (268) Space heating - secondary Water heating (other fuel) 1946.1245 0.2160 Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide Emission Rate (DER) 857.7066 (272) 17.1500 (273) 16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES 17.1500 ZC1 Total Floor Area 50.0000 1.6901 0.5190 17.4495 ZC2 TFA Total Fiber hied Assumed number of occupants CO2 emission factor in Table 12 for electricity displaced from grid CO2 emissions from appliances, equation (L14) CO2 emissions from cooking, equation (L16) 3.1912 ZC3 Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation 37.7908 ZC4 0.0000 ZC5 0.0000 ZC6 0.0000 ZC7 37.7908 ZC8 Net CO2 emissions





CALCULATION OF TARGET EMISSIONS 09	Jan 2	014
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SAP 2012 WORKSHEET FOR New Build (As Designed)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014 (Version 9.92, January 2014) 1. Overall dwelling dimensions Volume (m3) 120.0000 (1b) - (3b) (m) 2.4000 (2b) 50.0000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 50.0000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 120.0000 (5) main secondary total m3 per hour heating 0 0 Number of chimneys Number of open flues 0 * 40 = 0 * 20 = 2 * 10 = 0.0000 (6a) 0.0000 (6b) Number of intermittent fans Number of passive vents Number of flueless gas fires 20.0000 (7a) 0.0000 0 * 40 = Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1667 (8) Pressure test Measured/design AP50 0.4167 (18) Infiltration rate Number of sides sheltered 1 (19) - [0.075 x (19)] (21) = (18) x (20) Shelter factor Infiltration rate adjusted to include shelter factor May 4.3000 1.0750 Aug 3.7000 0.9250 Sep 4.0000 1.0000 5.1000 1.2750 5.0000 1.2500 4.9000 1.2250 4.4000 1.1000 4.3000 4.5000 1.1250 4.7000 (22) 1.1750 (22a) Wind speed Wind factor Adj infilt rate 0.4914 0.4818 0.4721 0.4240 0.4143 0.3661 0.3661 0.3565 0.3854 0.4143 0.4336 0.4529 (22b) Effective ac 0.6025 (25) 3. Heat losses and heat loss parameter A x U W/K 2.3000 13.5227 2.5090 Openings Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 m2 2.3000 (26) TER Opaque door TER Opening Type (Uw = 1.40) Heat Loss Floor 1 10.2000 19.3000 (27) (28a) 0.1300 Reat Book Floor F External Wall 1 External Roof 1 Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 61.5000 4.0000 97.3000 12.5000 0.1800 (29a) (26) . . . (30) + (32) = 29.9217 Thermal mass parameter (TMP = Cm / TFA) in $k_{\rm J}/m_{\rm 2}K$ Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss 250.0000 (35) 0.0000 (36) 29.9217 (37) (33) + (36) = Dec 23.8607 (38) Heat transfer coeff 54.5030 54.3174 54.1354 53.2806 53.1207 52.3762 52.3762 52.2383 52.6629 53.1207 53.4442 53.7824 (39) Average = Sum(39)m / 12 = Mar May 1.0624 Aug Sep 1.0533 1.0475 1.0756 (40) 1.0656 (40) 1.0901 1.0863 1.0827 1.0656 1.0475 1.0448 1.0624 1.0689 HLP (average) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 1.6901 (42) 74.3399 (43) Feb Jul Apr Мау Jun Aug Sep Oct Nov Dec Daily hot water use
81.7739
Energy conte 121.2683 78.8003 106.0620 81.7739 (44) 117.4419 (45) 1169.6560 (45) Energy content (annual) Distribution loss (46) Total = Sum(45)m = $(46) m = 0.15 \times (45) m$ 18.1902 15.9093 16.4170 14.3127 13.7334 11.8509 10.9816 12.6015 12.7520 14.8613 16.2222 17.6163 (46) Water storage loss: Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56) If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57) 0.0000



Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULAT	ION OF 1	TARGET E	MISSION	IS 09 J	lan 2014								
Combi loss Total heat req	41.6711	36.2697	38.6405	35.9276	35.6098	32.9947	34.0945	35.6098	35.9276	38.6405	38.8604	41.6711	(61)
Solar input			148.0870 0.0000			112.0005 0.0000	107.3050 0.0000	119.6200 0.0000 Solar inp	120.9410 0.0000	137.7155 0.0000 months) = Su	0.0000	159.1130 0.0000 0.0000	(63)
Output from w/		142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	137.7155 h/year) = Su	147.0086	159.1130	(64)
Heat gains fro	m water hea	ating, kWh/ 44.3331	month 46.0511	40.7084	39.3448	34.5181	32.8661	36.8358	37.2489	42.6026	45.6744	49.4672	
5. Internal ga	ins (see Ta	able 5 and	5a)										
Metabolic gain	s (Table 5) Jan), Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculate	ed in Appen	dix L, equa	tion L9 or		see Table 5		84.5050	84.5050	84.5050	84.5050	84.5050	
Appliances gai	ns (calcula	ated in App	endix L, eq	uation L13	5.3929 or L13a), a 126.3689	lso see Tab		6.3947	8.5829 112.4706	10.8980	12.7196 131.0134	13.5596 140.7376	
Cooking gains	(calculated		ix L, equat					31.4505	31.4505	31.4505	31.4505	31.4505	
Pumps, fans Losses e.g. ev	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	
Water heating	-67.6040	-67.6040			-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal		65.9718	61.8966	56.5395	52.8828	47.9418	44.1749	49.5105	51.7345	57.2615	63.4366	66.4882	
	279.9766	277.8029	267.6894	251.8208	235.9962	220.4910	210.5944	215.8773	224.1396	240.1780	258.5211	272.1368	(73)
6. Solar gains													
[Tom]					Colon fluu				P.P.	Acces		Coina	
[Jan]				rea m2	Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	facto Table 6	r	Gains W	
East South West			2.6 4.2 3.2	900 500	19.6403 46.7521 19.6403		0.6300 0.6300 0.6300	0	.7000 .7000 .7000	0.770 0.770 0.770	10	15.9662 61.2957 19.5075	(78)
Solar gains Total gains										190.6183 430.7963			,
7. Mean intern Temperature du												21.0000	(85)
Utilisation fa					Table 9a) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	, ,
tau alpha	63.7070 5.2471	63.9247 5.2616	64.1396 5.2760	65.1686 5.3446	65.3648 5.3577	66.2939 5.4196	66.2939 5.4196	66.4689 5.4313	65.9329 5.3955	65.3648 5.3577	64.9691 5.3313	64.5605 5.3040	
util living ar	ea 0.9943	0.9854	0.9615	0.8935	0.7588	0.5699	0.4159	0.4546	0.6961	0.9269	0.9868	0.9958	(86)
MIT Th 2	19.9828 20.0090	20.1763 20.0120	20.4395 20.0150	20.7298	20.9128	20.9851 20.0439	20.9977	20.9964	20.9582	20.7076 20.0316	20.2900	19.9513 20.0208	
util rest of h	ouse 0.9924	0.9809	0.9497	0.8634	0.7015	0.4906	0.3267	0.3623	0.6159	0.8989	0.9819	0.9944	(89)
MIT 2 Living area fr	18.6675 action	18.9493	19.3258	19.7304	19.9531	20.0348	20.0431	20.0448	20.0095 fLA =	19.7135 Living area	19.1266	18.6303 0.5580	(90) (91)
MIT Temperature ad				20.2881		20.5651	20.5758	20.5758		20.2683		19.3674	
adjusted MIT	19.4014	19.6339	19.9472	20.2881	20.4886	20.5651	20.5758	20.5758	20.5389	20.2683	19.7758	19.3674	(93)
8. Space heati	ng require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains Ext temp.	373.3361 4.3000	438.0629	0.9488 483.7184 6.5000			307.0712	0.3765 207.5729 16.6000	217.0450	0.6590	0.9066 390.5556 10.6000	0.9804 368.0405 7.1000	351.8583	(95)
Heat loss rate Month fracti	823.0744 1.0000	800.3080 1.0000	727.9710 1.0000	606.7630 1.0000		312.4275	208.2364		339.0916 0.0000	513.5839 1.0000	677.4471	815.7387 1.0000	
Space heating Space heating Space heating	334.6053	243.4288	181.7240	83.3327	26.5800	0.0000	0.0000	0.0000	0.0000	91.5330	222.7728	345.1270 1529.1036 30.5821	(98)
-													
8c. Space cool	ing require	ement											
Not applicable													
				ind									



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



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from second Fraction of space heat from main s Efficiency of main space heating s Efficiency of secondary/supplement Space heating requirement	system(s) system 1 (in	%)	m (Table 11)						0.0000 1.0000 93.4000 0.0000 1637.1559	(202) (206) (208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 334.6053 243.4288		83.3327	26.5800	0.0000	0.0000	0.0000	0.0000	91.5330	222.7728	345.1270	(98)
Space heating efficiency (main heat 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 s 358.2498 260.6304		89.2213	28.4583	0.0000	0.0000	0.0000	0.0000	98.0011	238.5147	369.5150	(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 162.9394 142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	137.7155	147.0086	159.1130	
Efficiency of water heater (217)m 86.8237 86.3908	85.5676	83.9404	81.8816	80.3000	80.3000	80.3000	80.3000	84.0494	86.0949	80.3000 86.9490	
Fuel for water heating, kWh/month 187.6670 164.7534 Water heating fuel used Annual totals kWh/year	173.0644	156.4749	155.3045	139.4776	133.6302	148.9663	150.6115	163.8507	170.7517	182.9956 1927.5479	
Space heating fuel - main system Space heating fuel - secondary										1637.1559 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, B Electricity for lighting (calculat Total delivered energy for all use	ed in Append	ix L)								30.0000 45.0000 75.0000 232.9906 3872.6945	(230e) (231) (232)
12a. Carbon dioxide emissions - Ir	dividual hea	ting system:	s including	micro-CHP							
						Energy kWh/year		ion factor	k	Emissions g CO2/year	
Space heating - main system 1 Space heating - secondary						1637.1559 0.0000		0.2160 0.0000		353.6257 0.0000	
Water heating (other fuel) Space and water heating						1927.5479		0.2160		416.3504 769.9760	
Pumps and fans						75.0000		0.5190		38.9250	(267)
Energy for lighting Total CO2, kg/m2/year						232.9906		0.5190		120.9221 929.8232	
Emissions per m2 for space and wat	er heating									15.3995	
Fuel factor (mains gas) Emissions per m2 for lighting										1.0000 2.4184	(272h)
Emissions per m2 for pumps and far Target Carbon Dioxide Emission Rat		5 2005 * 1	nn) ± 2 410	4 ± 0 7705	rounded to	2 d n				0.7785 18.6000	(272c)
rargee carbon browing Emrasion Rat	· (TEK) = (I	J.JJJJ 1.	UU, T 2.410	0.//00,	rounded to	. 2 u.p.				10.0000	(2/2)





Property Reference	E909-04				Issued on Date	11/05/2020			
Assessment	E909-04			Prop Type Ref					
Reference									
Property	Flat 4, 1 Hillfield Road, N	Flat 4, 1 Hillfield Road, NW6 1QD							
SAP Rating		84 B	DER	15.21	TER	16.86			
Environmental		88 B	% DER <ter< th=""><th></th><th colspan="4">9.77</th></ter<>		9.77				
CO ₂ Emissions (t/ye	ear)	0.98	DFEE	34.45	TFEE	42.30			
General Requireme	nts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th colspan="4">18.56</th></tfe<>	E	18.56				
Assessor Details	Mr. Jason Doherty, Doherty E jason@doherty-energy.co.uk	0.	l, Tel: 0148045	1569,	Assessor ID L143-000				
Client									





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

REGULATIONS COMPLIANCE REPORT - Approve		
DWELLING AS DESIGNED		
Ground-floor flat, total floor area 73	m²	
This report covers items included within It is not a complete report of regulation.	ons compliance.	
la TER and DER Fuel for main heating:Mains gas Fuel factor:1.00 (mains gas) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 16.86 kgCO□/m² DER) 15.21 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)4 Dwelling Fabric Energy Efficiency (DFEE	2.3 kWh/m²/yr)34.4 kWh/m²/yrOK	
2 Fabric U-values Element Average External wall 0.16 (max. 0.30)	Highest 0.16 (max. 0.70) OK - OK	
Openings 1.05 (max. 2.00)	0.09 (max. 0.35) OK 1.20 (max. 3.30) OK	
2a Thermal bridging Thermal bridging calculated using user-	specified y-value of 0.060	
3 Air permeability Air permeability at 50 pascals:	3.00 (design value) 10.0	ok
4 Heating efficiency	Boiler system with radiators or	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage	No cylinder	
6 Controls Space heating controls:	Time and temperature zone contro	
Hot water controls:	No cylinder	
Boiler interlock	Yes	ok
7 Low energy lights Percentage of fixed lights with low-ene Minimum	75%	ok
8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency:	0.81 1.5 89% 70%	ok ok
Minimum:		
9 Summertime temperature Overheating risk (Thames Valley): Based on:	Medium	OK
Overshading: Windows facing East: Windows facing South: Windows facing West: Air change rate:	Average 5.41 m², No overhang 2.53 m², No overhang 6.90 m², No overhang 4.00 ach	
		blind, closed 100% of daylight hours
10 Key features Party wall U-value Roof U-value Door U-value Air permeability	0.00 W/m ² K 0.09 W/m ² K 0.55 W/m ² K 3.0 m ³ /m ² h	





CALCULATIO	N OF D	WELLING	S EMISSI	ONS FOR	REGULAT	IONS CO	OMPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKSHEE					9.92, Januar NCE 09 J	ry 2014) Jan 2014							
. Overall dwelli	ng dimens	sions											
round floor otal floor area welling volume	TFA = (1a	a)+(1b)+(1c	:)+(1d)+(1e))(1n)	7	73.0000		Area (m2) 73.0000		ey height (m) 2.4000 +(3d)+(3e)		Volume (m3) 175.2000 175.2000	(4)
. Ventilation ra													
					main heating	se	econdary heating		other	tota	al m	13 per hour	
umber of chimney umber of open fl umber of intermi umber of passive umber of flueles	ues ttent far vents				ō 0	+ +	0 0	+ +	0 = 0 =		0 * 40 = 0 * 20 = 0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000 0.0000 0.0000	(6b) (7a) (7b)
nfiltration due ressure test easured/design A nfiltration rate	.P50	eys, flues	and fans	= (6a)+(6b))+(7a)+(7b)+((7c) =				0.0000	Air change / (5) =	0.0000 Yes 3.0000 0.1500	
umber of sides s helter factor nfiltration rate		to includ	io choltor :	factor					(20) = 1 -	[0.075 x 1) = (18)			(19)
	aujubccc		0.001001	240002					(2	1, (10, 1	(20)	0.1000	(21)
ind speed	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250		Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Balanced mechani f mechanical ven f balanced with	tilation:			-	0.1492 for in-use fa	0.1318	0.1318 n Table 4h)	0.1283	0.1388	0.1492	0.1561	0.1630 0.5000 75.6500	(23a)
	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848	
. Heat losses an	d heat lo	ss paramet	er										
lement oor indow (Uw = 1.20 xternal Wall 1 xternal Roof 1 otal net area of abric heat loss, arty Wall 1 arty Floor 1 arty Ceilings 1	external			Gross m2 83.0000 36.6000	Openings m2 19.2400	4. 14. 63. 36. 119.	EArea m2 .4000 .8400 .7600 .6000 (26)(.6000 .0000 .4000	U-value W/m2K 0.5500 1.1450 0.1600 0.0900 30) + (32) 0.0000	A x W/ 2.420 16.992 10.201 3.294 = 32.908 0.000	K 1 0 4 6 0	-value kJ/m2K	A x K kJ/K	
nermal mass para nermal bridges (area)							125.0000 7.1760	
otal fabric heat			+bl. (20) m	- 0 33 /	25) /5)					(33)	+ (36) =	40.0840	(37)
	Jan .7.2671	Feb 17.0666	Mar 16.8660	Apr 15.8633	25)m x (5) May 15.6627	Jun 14.6600	Jul 14.6600	Aug 14.4594	Sep 15.0611	Oct 15.6627	Nov 16.0638	Dec 16.4649	(38)
eat transfer coe	ff 7.3511	57.1505	56.9500	55.9472	55.7467	54.7439	54.7439	54.5434		55.7467	56.1478	56.5489 55.8971	(39)
	Jan 0.7856	Feb 0.7829	Mar 0.7801	Apr 0.7664	May 0.7637	Jun 0.7499	Jul 0.7499	Aug 0.7472	Sep 0.7554	Oct 0.7637	Nov 0.7691	Dec 0.7746 0.7657	
	31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heating	energy re	quirements	(kWh/year))									
ssumed occupancy verage daily hot	,							-				2.3167 89.2216	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
aily hot water u 9 nergy conte 14	8.1438	94.5749	91.0061	87.4372 114.5194	83.8683 109.8841	80.2995 94.8216	80.2995 87.8662	83.8683 100.8277		91.0061 118.9084	94.5749	98.1438	





	ION OF L	JVVELLIIV	G EMISSI	ONS FO	R REGULA	TIONS CO	MPLIAN	ICE 09	Jan 2014	4			
later storage	21.8317	19.0941	19.7034	17.1779	16.4826	14.2232	13.1799	15.1242	15.3048	17.8363	19.4697	21.1428	(46)
otal storage		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
f cylinder co ombi loss	0.0000 50.0130	icated sola: 0.0000 43.5304	r storage 0.0000 46.3757	0.0000 43.1197		0.0000 39.5997	0.0000 40.9197	0.0000 42.7384	0.0000 43.1197	0.0000 46.3757	0.0000 46.6397	0.0000	
otal heat red	quired for v 195.5574	water heatin 170.8244	ng calculate 177.7318	ed for each 157.6391	h month 152.6225	134.4214	128.7859	143.5661	145.1516	165.2841	176.4375	190.9650	(62)
olar input utput from w	0.0000 /h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 Solar inpu	0.0000 ut (sum of	0.0000 months) = S	0.0000 Sum(63)m =	0.0000	
	195.5574	170.8244	177.7318	157.6391	152.6225	134.4214	128.7859	143.5661 Total pe	145.1516 er year (kW	165.2841 Wh/year) = 8	176.4375 Sum (64) m =	190.9650 1938.9868	
eat gains fro	om water hea 60.8968	ating, kWh/r 53.2079	month 55.2698	48.8576	47.2211	41.4281	39.4454	44.2098	44.7055	51.1310	54.8177	59.3698	(65)
. Internal ga	ains (see Ta	able 5 and 5	5a)										
etabolic gair 56)m	Jan	Feb	Mar 115 8350	Apr 115 8350	May 115.8350	Jun 115 8350	Jul 115 8350	Aug 115.8350	Sep 115.8350	Oct 115.8350	Nov 115.8350	Dec 115.8350	(66)
		ed in Append		tion L9 or	L9a), also s		6.8251	8.8715	11.9073	15.1191	17.6462	18.8115	
	204.1952	206.3141	200.9745	189.6072	or L13a), a	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
ooking gains umps, fans	34.5835 3.0000	d in Append: 34.5835 3.0000	34.5835 3.0000	ion L15 or 34.5835 3.0000		see Table 5 34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	
osses e.g. e	aporation ((negative va		le 5)		-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	
ater heating	81.8505	le 5) 79.1784	74.2874	67.8578	63.4692	57.5391	53.0181	59.4218	62.0910	68.7244	76.1357	79.7981	(72)
otal internal	365.0990	362.4994	349.2330	328.2244	306.9594	286.3777	273.3558	279.6870	290.7316	311.9441	336.2317	354.5457	(73)
. Solar gains													
Jan]				rea m2		Specif or T	able 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
ast			5.4	100	19.6403		0.7200		.7000	0.77	700	37.1115	(76)
			2.5	300	46.7521		0.7200	0	.7000	0.77	00	41.3128	(78)
			6.9	000	19.6403		0.7200	0		0.77 0.77		41.3128 47.3326	
olar gains	125.7569 490.8559		358.2318	494.1713	19.6403 587.7532		0.7200 569.3332	499.7533	.7000 .7000	0.77			(83)
olar gains otal gains	125.7569 490.8559	232.8503 595.3497	358.2318 707.4648	494.1713 822.3957	19.6403 587.7532	595.4462 881.8239	0.7200 569.3332 842.6889	499.7533 779.4403	.7000 .7000 406.4319	0.77	154.2616	47.3326 105.1408	(80)
olar gains otal gains . Mean inter	125.7569 490.8559	232.8503 595.3497 ture (heating	358.2318 707.4648 ng season)	494.1713 822.3957	19.6403 587.7532 894.7126	595.4462 881.8239	0.7200 569.3332 842.6889	499.7533 779.4403	.7000 .7000 406.4319	0.77	154.2616	47.3326 105.1408	(80) (83) (84)
olar gains otal gains . Mean intern emperature di	125.7569 490.8559 mal temperaturing heating heating for ga	232.8503 595.3497 ture (heating periods ains for liver Feb	358.2318 707.4648 ng season) in the livir	494.1713 822.3957 ang area fr nil,m (see Apr	19.6403 587.7532 894.7126 om Table 9, 12 Table 9a) May	595.4462 881.8239 Ph1 (C) Jun	0.7200 569.3332 842.6889	499.7533 779.4403	.7000 .7000 406.4319 697.1635	0.77 268.9899 580.9340	154.2616 490.4933 Nov	47.3326 105.1408 459.6865 21.0000	(83) (84)
olar gains otal gains . Mean inter emperature du tilisation fa	125.7569 490.8559 all temperaturing heating for garanting for garanting 44.1966 3.9464	232.8503 595.3497 ture (heating periods: ains for ling Feb 44.3517	358.2318 707.4648 ng season) in the livin	494.1713 822.3957	19.6403 587.7532 894.7126 om Table 9, 1 Table 9a) May 45.4686	595.4462 881.8239	0.7200 569.3332 842.6889	499.7533 779.4403	.7000 .7000 406.4319 697.1635	0.77 268.9899 580.9340	154.2616 490.4933	47.3326 105.1408 459.6865	(83) (84)
olar gains otal gains . Mean inter	125.7569 490.8559 anal temperaturing heating detor for garder 44.1966 3.9464	232.8503 595.3497 ture (heating periods: a sins for live Feb 44.3517 3.9568 0.9287	358.2318 707.4648 ng season) in the livir ving area, 1 Mar 44.5079 3.9672 0.8553	494.1713 822.3957 ng area free nil,m (see Apr 45.3056 4.0204 0.7164	19.6403 587.7532 894.7126 m Table 9, 5 Table 9a) May 45.4686 4.0312 0.5506	595.4462 881.8239 Ph1 (C) Jun 46.3014 4.0868 0.3918	Jul 46.3014 4.0868 0.2846	Aug 46.4717 4.0981 0.3198	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004	Nov 45.1438 4.0096 0.9361	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707	(80) (83) (84) (85)
olar gains otal gains . Mean interremperature ditilisation for au lpha til living au	125.7569 490.8559 490.8559 anal temperatarring heating actor for garding Jan 44.1966 3.9464 rea 0.9638 19.8418 20.2658	232.8503 595.3497 ture (heating periods: ains for live Feb 44.3517 3.9568	358.2318 707.4648 ng season) in the livin ving area, 1 Mar 44.5079 3.9672	494.1713 822.3957 ang area franti,m (see Apr 45.3056 4.0204	19.6403 587.7532 894.7126 om Table 9, 17 Table 9a) May 45.4686 4.0312 0.5506 20.9378	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868	0.7200 569.3332 842.6889 Jul 46.3014 4.0868	499.7533 779.4403 Aug 46.4717 4.0981	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237	Nov 45.1438 4.0096 0.9361 20.2278	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916	(80) (83) (84) (85) (86) (87)
olar gains otal gains . Mean intern- emperature di tilisation fa au lpha til living an IT h 2 til rest of l	125.7569 490.8559 490.8559 anal temperatarring heating actor for garding Jan 44.1966 3.9464 rea 0.9638 19.8418 20.2658	232.8503 595.3497 ture (heating periods: ains for liv Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191	358.2318 707.4648 ng season) in the livin ving area, 1 Mar 44.5079 3.9672 0.8553 20.4717	494.1713 822.3957 ang area franti,m (see Apr 45.3056 4.0204 0.7164 20.7888	19.6403 587.7532 894.7126 om Table 9, Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868 0.3918 20.9881	0.7200 569.3332 842.6889 Jul 46.3014 4.0868 0.2846 20.9975	499.7533 779.4403 Aug 46.4717 4.0981 0.3198 20.9960	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236 20.9626	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 0.9257	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916	(85) (85) (86) (87) (88)
olar gains otal gains . Mean intern emperature ditilisation fa au lpha til living an IT h 2 til rest of h IT 2 iving area for	125.7569 490.8559 490.8559 anal temperaturing heating actor for general section of the section o	232.8503 595.3497 ture (heating periods: ains for liv Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191	358.2318 707.4648 707.4648 ng season) in the livin ving area, 144.5079 3.9672 0.8553 20.4717 20.2706 0.8376	494.1713 822.3957 ang area fr nil,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879	19.6403 587.7532 894.7126 om Table 9, 1 Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191	595.4462 881.8239 Ph1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504	Jul 46.3014 4.0868 0.2846 20.9975 20.2969	499.7533 779.4403 Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.2573	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 = Living are	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 0.9257 19.2736 24 / (4) =	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288	(80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
olar gains otal gains otal gains . Mean internmemperature dutilisation for au lpha til living au lit living au til rest of lit rest of li	125.7569 490.8559 anal temperat actor for ga Jan 44.1966 3.9464 rea 0.9638 19.8418 20.2658 nouse 0.9585 18.7077 raction 19.1877	232.8503 595.3497 ture (heating periods sains for live Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.1081	358.2318 707.4648 707.4648 ng season) in the livin ving area, 1 Mar 44.5079 3.9672 0.8553 20.4717 20.2706 0.8376 19.5985	494.1713 822.3957 ag area fr nil,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321	19.6403 587.7532 894.7126 m Table 9, 5 Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233	595.4462 881.8239 Ph1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867	Jul 46.3014 4.0868 0.2846 20.9975 20.2969 0.2396 20.2953	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719 20.2967	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.2573 fLA =	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 = Living are 20.2834	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 19.2736 2a / (4) = 19.6775	105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288 0.0000	(86) (83) (84) (85) (86) (87) (88) (90) (91) (92)
olar gains otal gains otal gains . Mean inter	125.7569 490.8559 490.8559 anal temperation of the control for graduate for for graduate for the control for t	232.8503 595.3497 ture (heating periods: Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.1081 19.5371	358.2318 707.4648 ng season) in the livin ving area, 1 44.5079 3.9672 0.8553 20.4717 20.2706 0.8376 19.5985 19.9681	494.1713 822.3957 ang area frinii,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321 20.3524	19.6403 587.7532 894.7126 om Table 9, 17 Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233 20.5233	595.4462 881.8239 Ph1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867 20.5836	Jul 46.3014 4.0868 0.2846 20.9975 20.2969 20.5926	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719 20.2967 20.5927	Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.2573 fLA = 20.5559	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 = Living are 20.2834	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 19.2736 2a / (4) = 19.6775	105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288 0.0000	(86) (83) (84) (85) (86) (87) (88) (90) (91) (92)
olar gains otal gains otal gains . Mean intermemperature ditilisation for au lpha till living an au lpha till rest of lill rest of lil	125.7569 490.8559 490.8559 all temperate raining heating tector for get and 44.1966 3.9464 rea 0.9638 19.8418 20.2658 house 0.9585 18.7077 raction 19.1877 dijustment 19.1877	232.8503 595.3497 ture (heating periods : ains for liv Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.1081 19.5371 19.5371	358.2318 707.4648 707.4648 ng season) in the living area, 19 44.5079 3.9672 0.8553 20.4717 20.2706 0.8376 19.5985 19.9681	494.1713 822.3957 ang area fr nil,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321 20.3524	19.6403 587.7532 894.7126 om Table 9, Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233 20.5233	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867 20.5836 20.5836	Jul 46.3014 4.0868 0.2846 20.9975 20.2969 0.2396 20.2953 20.5926	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719 20.2967 20.5927	Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.2573 fLA = 20.5559	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 = Living are 20.2834	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 19.2736 2a / (4) = 19.6775	105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288 0.0000	(86) (83) (84) (85) (86) (87) (88) (90) (91) (92)
olar gains otal gains otal gains . Mean inter	125.7569 490.8559 490.8559 al temperatarring heating	232.8503 595.3497 ture (heating periods: Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.5371 19.5371	358.2318 707.4648 ng season) in the livinying area, Mar 44.5079 3.9672 0.8553 20.4717 20.2706 0.8376 19.5985 19.9681 19.9681	494.1713 822.3957 494.1713 822.3957 ang area fr. nil,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321 20.3524 20.3524	19.6403 587.7532 894.7126 om Table 9, Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233 20.5233	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867 20.5836 20.5836	Jul 46.3014 4.0968 0.2846 20.9975 20.2969 0.2396 20.2953 20.5926	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719 20.2967 20.5927 Aug 0.2920	Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.2573 fLA = 20.5559	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 Eliving are 20.2834 20.2834	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 0.9257 19.2736 20 / (4) = 19.6775	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288 0.0000 19.1288	(85) (86) (87) (88) (89) (90) (91) (92) (93)
olar gains otal gains otal gains otal gains . Mean inter	125.7569 490.8559 490.8559 all temperat raring heatin actor for ge Jan 44.1966 3.9464 rea 0.9638 19.8418 20.2658 nouse 0.9585 18.7077 reaction 19.1877 djustment 19.1877 djustment 19.1877 Jan 0.9489 465.7538 4.3000 EW 853.8272	232.8503 595.3497 ture (heating periods: ains for liv Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.1081 19.5371 19.5371 19.5371 ment Feb 0.9079 540.4985 4.9000 836.5201	358.2318 707.4648 707.4648 707.4648 707.4648 707.4648 707.4648 70.8296 70.8296 70.8296 70.8296 70.8296 70.8296 70.8296	494.1713 822.3957 ang area frinil,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321 20.3524 20.3524 Apr 0.6908 568.1040 8.9000 640.7311	19.6403 587.7532 894.7126 om Table 9, 17 Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233 20.5233	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867 20.5836 20.5836	Jul 46.3014 4.0868 0.2846 20.9975 20.2969 0.2396 20.2953 20.5926 Jul 0.2586 217.9161 16.6000	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 0.2719 20.2967 20.5927 20.5927 20.5927	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.5559 20.5559	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 Living are 20.2834 20.2834 Oct 0.7708 447.7839 10.6000	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 0.9257 19.2736 2a / (4) = 19.6775 19.6775	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 0.4233 19.1288 0.0000 19.1288	(85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96)
otal gains	125.7569 490.8559 490.8559 all temperates aring heating tector for get and temperates are seen as a seen a	232.8503 595.3497 ture (heating periods: ains for liv Feb 44.3517 3.9568 0.9287 20.1217 20.2682 0.9191 19.1081 19.5371 19.5371 19.5371 19.5371 Feb 0.9079 540.4985 4.9000 836.5201 1.0000	358.2318 707.4648 707.4648 10	494.1713 822.3957 ang area from 11,m (see Apr 45.3056 4.0204 0.7164 20.7888 20.2825 0.6879 20.0321 20.3524 20.3524 Apr 0.6908 568.1040 8.9000 640.7311 1.0000	19.6403 587.7532 894.7126 om Table 9, Table 9a) May 45.4686 4.0312 0.5506 20.9378 20.2849 0.5140 20.2191 20.5233 20.5233 May 49.45404 40.9878 11.7000 491.8715	595.4462 881.8239 Th1 (C) Jun 46.3014 4.0868 0.3918 20.9881 20.2969 0.3504 20.2867 20.5836 20.5836	Jul 46.3014 4.0868 0.2846 20.9975 20.2969 0.2396 20.2953 20.5926 Jul 0.2586 217.9161 16.6000 218.5685	Aug 46.4717 4.0981 0.3198 20.9960 20.2994 20.5927 20.5927 20.5927 20.5927 20.6205 16.4000 228.6842	.7000 .7000 406.4319 697.1635 Sep 45.9647 4.0643 0.5236 20.9626 20.2921 0.4757 20.5559 20.5559 20.5559	0.77 268.9899 580.9340 Oct 45.4686 4.0312 0.8004 20.7237 20.2849 0.7709 19.9602 Eliving are 20.2834 20.2834 Oct 0.7708 447.7839 10.6000 539.8176 1.0000	Nov 45.1438 4.0096 0.9361 20.2278 20.2802 0.9257 19.2736 20 / (4) = 19.6775 19.6775	47.3326 105.1408 459.6865 21.0000 Dec 44.8236 3.9882 0.9707 19.7916 20.2754 0.9663 18.6423 3.94238 0.0000 19.1288 Dec 0.9576 440.2081 4.2000 844.2046 1.0000	(80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (93)





CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

9a. Energy requirements -												
Fraction of space heat fr Fraction of space heat fr Efficiency of main space Efficiency of secondary/s Space heating requirement	com seconda com main sy heating sy supplementa	ry/suppleme vstem(s) vstem 1 (in	ntary syste %)								0.0000 1.0000 93.4000 0.0000 1331.5291	(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	198.9265	133.9929	52.2915	15.5375	0.0000	0.0000	0.0000	0.0000	68.4731	185.1266	300.5734	(98)
Space heating efficiency 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)
	212.9834	rstem) 143.4614	55.9866	16.6354	0.0000	0.0000	0.0000	0.0000	73.3116	198.2083	321.8131	(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 195.5574	170.8244	177.7318	157.6391	152.6225	134.4214	128.7859	143.5661	145.1516	165.2841	176.4375	190.9650	
Efficiency of water heate (217)m 86.0305	85.4354	84.3509	82.5987	81.1376	80.3000	80.3000	80.3000	80.3000	83.0169	85.1723	80.3000 86.1884	
Fuel for water heating, k 227.3117 Water heating fuel used		210.7052	190.8494	188.1033	167.3990	160.3810	178.7872	180.7617	199.0969	207.1536	221.5670 2332.0616	
Annual totals kWh/year Space heating fuel - main Space heating fuel - seco											1331.5291	
mechanical ventilation central heating pump main heating flue fan Total electricity for the Electricity for lighting Total delivered energy fo	e above, kW	Wh/year ed in Append									216.4158 30.0000 45.0000 291.4158 323.2335 4278.2399	(230c) (230e) (231) (232)
12a. Carbon dioxide emiss												
							Energy	Emiss	ion factor		Emissions	
Space heating - main syst Space heating - secondary Water heating (other fuel Space and water heating Pumps and fans	7						kWh/year 1331.5291 0.0000 2332.0616 291.4158		kg CO2/kWh 0.2160 0.0000 0.2160	k	cg CO2/year 287.6103 0.0000 503.7253 791.3356 151.2448	(261) (263) (264) (265) (267)
Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide E	Emission Ra	ate (DER)					323.2335		0.5190		167.7582 1110.3385 15.2100	(272)
DER Total Floor Area Assumed number of occupan CO2 emissions from applia CO2 emissions from applia CO2 emissions from cookin Total CO2 emissions Residual CO2 emissions of Additional allowable elec Resulting CO2 emissions o Net CO2 emissions	nts hble 12 for ances, equa ng, equation ffset from ctricity ge	electricit ation (L14) on (L16) biofuel CHP eneration, k	y displaced Wh/m²/year	from grid			ON TECHNOLO	GIES		TFA N EF	15.2100 73.0000 2.3167 0.5190 16.5756 2.3918 34.1774 0.0000 0.0000 0.0000 34.1774	ZC2 ZC3 ZC4 ZC5 ZC6 ZC7





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014 (Version 9.92, January 2014) 1. Overall dwelling dimensions Volume (m3) 175.2000 (1b) - (3b) (m) 2.4000 (2b) 73.0000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 73.0000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 175.2000 (5) main secondary total m3 per hour heating 0 0 0 * 40 = 0 * 20 = 0.0000 (6a) 0.0000 (6b) Number of chimneys Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 3 * 10 = 30.0000 (7a) 0.0000 0 * 40 = Air changes per hour 30.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1712 (8) Pressure test Measured/design AP50 5.0000 0.4212 (18) Infiltration rate Number of sides sheltered 1 (19) - [0.075 x (19)] (21) = (18) x (20) Shelter factor Infiltration rate adjusted to include shelter factor 0.9250 (20) May 4.3000 1.0750 Aug 3.7000 0.9250 Sep 4.0000 1.0000 5.1000 1.2750 5.0000 1.2500 4.9000 1.2250 4.4000 1.1000 3.8000 4.3000 4.5000 1.1250 4.7000 (22) 1.1750 (22a) Wind speed Wind factor Adj infilt rate 0.4968 0.4871 0.4773 0.4286 0.4189 0.3702 0.3702 0.3604 0.3896 0.4189 0.4383 0.4578 (22b) Effective ac 0.6048 (25) 3. Heat losses and heat loss parameter Openings A x U W/K 4.4000 Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 m2 4.4000 (26) TER Opaque door TER Opening Type (Uw = 1.40) External Wall 1 13.8500 64.7500 18.3617 (27) (29a) 83.0000 18.2500 0.1800 11.6550 External Mail I External Roof 1 Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 36.6000 0.1300 4.7580 (30) 39.1747 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss 250.0000 (35) (33) + (36) = Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan
(38)m 36.0425
Heat transfer coeff Feb 35.7655 Apr 34.2185 Aug 32.6632 35.4939 32.8689 34.9673 (38) 74.9402 73.3932 73.1546 72.0436 72.0436 71.8379 73.1546 75.2173 Average = Sum(39)m / 12 74.6687 73.6373 74.1420 (39) 73.3921 (39) Aug 0.9841 Nov 1.0087 Jan 1.0304 Feb 1.0266 May 1.0021 Jun 0.9869 Dec 1.0156 (40) Sep 0.9928 0.9869 1.0229 1.0021 HLP (average) 1.0054 (40) Days in month 31 30 31 31 30 31 (41) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 2.3167 (42) 89.2216 (43) Jul Feb Jun Sep Oct Apr May Aug Nov Daily hot water use 98.1438
Energy conte 145.5444
Energy content (annual) 91.0061 87.4372 83.8683 80.2995 80.2995 87.4372 94.5749 98.1438 (44) 140.9520 (45) 1403.8037 (45) 118.9084 129.7978 Total = Sum (45) m = Distribution loss (46)m = 0.15 x (45)m 21.8317 19.0941 19.7034 Water storage loss: Total storage loss 0.0000 21.1428 (46) 17.1779 16.4826 14.2232 13.1799 15.1242 15.3048 17.8363 19.4697 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56) If cylinder contains dedicated solar storage 0.0000 (57) 50.0130 (61) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Combi loss



Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULAT	ION OF	TARGET E	MISSION	IS 09.	Jan 2014								
Total heat req		water heati 170.8244 0.0000		ed for each 157.6391 0.0000	n month 152.6225 0.0000	134.4214	128.7859	0.0000	145.1516 0.0000 ut (sum of	165.2841 0.0000 months) = Su	176.4375 0.0000 mm(63)m =	190.9650 0.0000 0.0000	(63)
Output from w/		170.8244	177.7318	157.6391	152.6225	134.4214	128.7859			165.2841 h/year) = Su		190.9650	
Heat gains fro	m water he 60.8968	ating, kWh/ 53.2079	month 55.2698	48.8576	47.2211	41.4281	39.4454	44.2098	44.7055	51.1310	54.8177	59.3698	
5. Internal ga													
Metabolic gain	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculat	ed in Appen	115.8350 dix L, equa	115.8350 tion L9 or	115.8350 L9a), also	115.8350 see Table 5		115.8350	115.8350	115.8350	115.8350	115.8350	
Appliances gai	ns (calcul	ated in App	endix L, eq	uation L13		lso see Tab		8.9423	12.0023	15.2397	17.7870	18.9617	
Cooking gains		d in Append	ix L, equat	ion L15 or		see Table	5	150.6432	155.9828	167.3501	181.6993	195.1856	
Pumps, fans	34.5835	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	34.5835 3.0000	
Losses e.g. ev			alues) (Tab. -92.6680		-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating	gains (Tab 81.8505		74.2874	67.8578	63.4692	57.5391	53.0181	59.4218	62.0910	68.7244	76.1357	79.7981	(72)
Total internal	gains 365.2451	362.6291	349.3385	328.3042	307.0191	286.4281	273.4102	279.7578	290.8267	312.0648	336.3725	354.6958	(73)
6. Solar gains													
[Jan]				rea m2		Speci or	g fic data Table 6b	or Tab		Acces facto Table 6	r	Gains W	
East South West			5.00 2.3 6.4	500 600 400	19.6403 46.7521 19.6403		0.6300 0.6300 0.6300	0 0 0	.7000 .7000 .7000	0.770 0.770 0.770	10	30.3117 33.7198 38.6549	(78)
Solar gains Total gains	102.6864 467.9315	190.1377 552.7668	292.5291 641.8677	403.5471 731.8514	479.9747 786.9938	486.2596 772.6877	464.9339 738.3441	408.1084 687.8662	331.8929 622.7195	219.6507 531.7155	125.9627 462.3353	85.8518 440.5476	
7. Mean intern													
Temperature du Utilisation fa						Th1 (C)						21.0000	(85)
tau	Jan 67.3973	Feb 67.6465	Mar 67.8925	Apr 69.0724	May 69.2977	Jun 70.3663	Jul 70.3663	Aug 70.5678	Sep 69.9508	Oct 69.2977	Nov 68.8434	Dec 68.3748	
alpha util living ar	5.4932 ea	5.5098	5.5262	5.6048	5.6198	5.6911	5.6911	5.7045	5.6634	5.6198	5.5896	5.5583	
	0.9972	0.9926	0.9766	0.9175	0.7809	0.5836	0.4273	0.4766	0.7436	0.9557	0.9935	0.9980	(86)
MIT Th 2	19.9617 20.0581	20.1342 20.0612	20.3996 20.0643	20.7139 20.0788	20.9131 20.0816	20.9865 20.0943	20.9980 20.0943	20.9965 20.0966	20.9510 20.0894	20.6659 20.0816	20.2549 20.0761	19.9372 20.0703	
util rest of h	0.9963	0.9902	0.9690	0.8926	0.7268	0.5067	0.3405	0.3850	0.6670	0.9367	0.9910	0.9973	
MIT 2 Living area fr	18.6730 action	18.9262	19.3103	19.7553	20.0018	20.0858	20.0936	20.0952	20.0531 fLA =	19.7029 Living area	19.1142	18.6462 0.4233	
MIT Temperature ad	19.2185	19.4375	19.7714	20.1610	20.3875	20.4671	20.4764	20.4767	20.4331	20.1105	19.5970	19.1926 0.0000	(92)
adjusted MIT		19.4375	19.7714	20.1610	20.3875	20.4671	20.4764	20.4767	20.4331	20.1105	19.5970	19.1926	(93)
8. Space heati	ng require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp.	0.9952	0.9881	0.9660	0.8951 655.0762 8.9000	0.7458 586.9347	0.5389 416.3934 14.6000	0.3773	0.4239	0.6974	0.9374	0.9893	0.9965 438.9930	(95)
Heat loss rate	W	1089.4458		826.4827		422.6862		292.8634		695.7382		1111.5854	
	1.0000	1.0000	1.0000	1.0000		0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	
Space heating Space heating	488.3894	365.0555	275.9388	123.4126	36.1564	0.0000	0.0000	0.0000	0.0000	146.7914	333.2692	500.4088 2269.4222 31.0880	(98)
8c. Space cool	ing requir	ement											
Not applicable													
9a. Energy req													





		0.0000 (2 1.0000 (2 93.4000 (2 0.0000 (2 2429.7882 (2	202) 206) 208)
Aug	Sep Oct	Nov Dec	
0.0000	0.0000 146.7914	333.2692 500.4088 (9	98)
0.0000	0.0000 93.4000	93.4000 93.4000 (2	210)
0.0000	0.0000 157.1642	356.8193 535.7696 (2	211)
0.0000	0.0000 0.0000	0.0000 0.0000 (2	215)
9 143.5661	145.1516 165.2841	176.4375 190.9650 (6	64)
80.3000	80.3000 84.7540	80.3000 (2 86.6283 87.3648 (2	
0 178.7872	180.7617 195.0161	203.6718 218.5834 (2	219)
		2304.2197 (2	219)
		2429.7882 (2 0.0000 (2	
		30.0000 (2 45.0000 (2 75.0003 (2 325.8135 (2 5134.8214 (2	230e) 231) 232)
Energy kWh/year 2429.7882 0.0000 2304.2197 75.0000 325.8135	Emission factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190 0.5190	Emissions kg CO2/year 524.8342 (2 0.0000 (2 497.7115 (2 1022.5457 (2 38.9250 (2 169.0972 (2 1230.5679 (2 1.0000 2.3164 (2 0.5332 (2	263) 264) 265) 267) 268) 272) 272a) 272b) 272c)
	0 0.0000 0 0.0000 0 0.0000 0 0.0000 9 143.5661 0 80.3000 0 178.7872 Energy kWh/year 2429.7882 0.0000 2304.2197	DO 0.0000 0.0000 146.7914 0 0.0000 0.0000 93.4000 0 0.0000 0.0000 157.1642 0 0.0000 0.0000 0.0000 9 143.5661 145.1516 165.2841 0 80.3000 80.3000 84.7540 0 178.7872 180.7617 195.0161 Energy kWh/year kg CO2/kWh 2429.7882 0.2160 0.0000 2304.2197 0.2160 75.0000 0.5190 325.8135 0.5190	1.0000 (93.4000 (0.0000) 2429.7882 (Aug Sep Oct Nov Dec 0 0.0000 0.0000 146.7914 333.2692 500.4088 (0 0.0000 0.0000 93.4000 93.4000 93.4000 (0 0.0000 0.0000 157.1642 356.8193 535.7696 (0 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (9 143.5661 145.1516 165.2841 176.4375 190.9650 (80.3000 80.3000 84.7540 86.6283 87.3648 (0 178.7872 180.7617 195.0161 203.6718 218.5834 (2304.2197 (2429.7882 (0.0000 (325.8135 (314.8214 (2304.2197 0.2160 524.8342 (75.0000 0.0000 0.0000 0.0000 0.0000 (2304.2197 0.2160 497.7115 (75.0000 0.5190 38.9250 (1230.5679 (14.0075 (1.0000 2.3164 (0.05332 (0.05332 (0.05332 (0.05332 (0.05000 0.0000 0.0000 0.0000 0.0000 (0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000





Property Reference	E909-05				Issued on Date	11/05/2020			
Assessment	E909-05			Prop Type Ref					
Reference									
Property	Flat 5, 1 Hillfield Road, N	Flat 5, 1 Hillfield Road, NW6 1QD							
SAP Rating		83 B	DER	17.49	TER	19.46			
Environmental		89 B	% DER <ter< th=""><th></th><th colspan="4">10.14</th></ter<>		10.14				
CO₂ Emissions (t/ye	ear)	0.77	DFEE	38.22	TFEE	45.84			
General Requireme	nts Compliance	Pass	% DFEE <tfe< th=""><th>Е</th><th colspan="4">16.63</th></tfe<>	Е	16.63				
Assessor Details	Mr. Jason Doherty, Doherty E jason@doherty-energy.co.uk	0.	l, Tel: 0148045	Assessor ID L143-					
Client	ent								





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

REGULATIONS COMPLIANCE REPORT - Approve	d Document L1A, 2013 Edition	on, England	
DWELLING AS DESIGNED			
Ground-floor flat, total floor area 50	m ²		
This report covers items included withi			
It is not a complete report of regulati	ons compliance.		
la TER and DER Fuel for main heating:Mains gas Fuel factor:1.00 (mains gas) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (DER) 17.49 kgCOU/m²OK 		
2 Fabric U-values	Highest		
External wall 0.16 (max. 0.30) Party wall 0.00 (max. 0.20) Floor (no floor) Roof 0.09 (max. 0.20)	0.16 (max. 0.70)	OK	
Roof 0.09 (max. 0.20) Openings 1.01 (max. 2.00)	0.09 (max. 0.35) 1.20 (max. 3.30)	OK OK	
2a Thermal bridging			
Thermal bridging calculated using user-			
Maximum	3.00 (design value) 10.0		OK
4 Heating efficiency Main heating system: Data from database Vaillant ecoTEC pro 24 VUW 246/5-3 (H-G Combi boiler Efficiency: 89.5% SEDBUK2009 Minimum: 88.0%	Boiler system with radiate	ors or underfloor - Mai	ns gas
	None		
5 Cylinder insulation			
	No cylinder		
6 Controls Space heating controls:	Time and temperature zone	control	OK
Hot water controls:	No cylinder		
Boiler interlock	Yes		OK
7 Low energy lights Percentage of fixed lights with low-ene	ergy fittings:100%		OK
8 Mechanical ventilation Continuous supply and extract system Specific fan power:	0.66		
Maximum MVHR efficiency:	1.5		OK
Minimum:	70%		OK
9 Summertime temperature Overheating risk (Thames Valley): Based on:	Medium		OK
Overshading: Windows facing North: Windows facing East: Windows facing West: Air change rate: Blinds/curtains:	Average 2.53 m², No overhang 5.41 m², No overhang 2.53 m², No overhang 4.00 ach Light-coloured curtain or	roller blind, closed 1	00% of daylight hour
10 Key features			
Party wall U-value Roof U-value	0.00 W/m ² K 0.09 W/m ² K		
Door U-value	0.55 W/m ² K 3.0 m ³ /m ² h		
Air permeability	m / m 11		





CALCULATION OF I	DWELLING	G EMISSI	ONS FOR	REGULAT	IONS CC	OMPLIAN	CE 09	Jan 2014				
AP 2012 WORKSHEET FOR N				9.92, Januar	 ry 2014) Jan 2014							
LCOLATION OF DWELLING	EMISSIONS FO	JR REGULATIO	ONS COMPLIAN									
Overall dwelling dime							Area	Store	ey height		Volume	
round floor otal floor area TFA = (welling volume	la)+(lb)+(lc	c)+(1d)+(1e)	(1n)	5	50.0000		(m2) 50.0000		(m) 2.4000		(m3) 120.0000 120.0000	(4)
. Ventilation rate												
				main heating		econdary heating		other	tota		3 per hour	
umber of chimneys umber of open flues umber of intermittent f umber of passive vents umber of flueless gas f				0	+ +	0	+ +	0 = 0		0 * 40 = 0 * 20 = 0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000 0.0000	(6b) (7a) (7b)
nfiltration due to chim	neys, flues	and fans	= (6a)+(6b)	+(7a)+(7b)+((7c) =					Air change / (5) =	s per hour 0.0000	(8)
ressure test easured/design AP50 nfiltration rate umber of sides sheltere	d										Yes 3.0000 0.1500	
helter factor nfiltration rate adjust	ed to includ	de shelter f	actor					(20) = 1 - (2)	[0.075 x 1) = (18) >		0.9250 0.1388	
Jan ind speed 5.1000 ind factor 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250		Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
lj infilt rate 0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)
Balanced mechanical ven f mechanical ventilatio f balanced with heat re	n:		-	for in-use fa	ictor (from	m Table 4h)	=				0.5000 76.5000	
ffective ac 0.2944	0.2909	0.2875	0.2701	0.2667	0.2493	0.2493	0.2458	0.2563	0.2667	0.2736	0.2805	(25)
. Heat losses and heat	loss paramet	ter										
Lement			Gross m2	Openings m2	Net	m2 .4000	U-value W/m2K 0.5500	A x 1 W/1 2.420	K k	-value kJ/m2K	A x K kJ/K	
oor indow (Uw = 1.20) xternal Wall 1			74.6000	14.8700	10.	.4700 .4700 .7300	1.1450	11.988 9.556	5			(26) (27) (29a)
xternal Roof 1 otal net area of extern			13.9000			.9000 .5000	0.0900	1.251				(30)
<pre>bric heat loss, W/K = rty Wall 1 rty Floor 1 rty Ceilings 1</pre>	Sum (A x U)				50.	(26)(3 .6000 .0000 .1000	30) + (32) 0.0000	= 25.216 0.000				(33) (32) (32d) (32b)
mermal mass parameter (mermal bridges (User de otal fabric heat loss				area)					(33)	+ (36) =	125.0000 5.3100 30.5263	(36)
entilation heat loss ca Jan	lculated mor	nthly (38)m Mar	= 0.33 x (2	25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
38)m 11.6585 eat transfer coeff 42.1848	11.5211 42.0475	11.3838	10.6970 41.2233	10.5596 41.0859	9.8728 40.3991	9.8728 40.3991	9.7354 40.2618		10.5596 41.0859	10.8343	11.1090 41.6354	
verage = Sum(39)m / 12	=										41.1890	
Jan 0.8437 LP (average) ays in month	Feb 0.8409	Mar 0.8382	Apr 0.8245	May 0.8217	Jun 0.8080	Jul 0.8080	Aug 0.8052		Oct 0.8217	Nov 0.8272	Dec 0.8327 0.8238	(40)
31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heating energy	requirements	s (kWh/year)										
ssumed occupancy verage daily hot water	use (litres/	/day)									1.6901 74.3399	
Jan aily hot water use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
81.7739 nergy conte 121.2683	78.8003 106.0620	75.8267 109.4465	72.8531 95.4181	69.8795 91.5560	66.9059 79.0058	66.9059 73.2105	69.8795 84.0101			78.8003 108.1481 am(45)m =	81.7739 117.4419	(45)





	ION OF E)WELLIN	G EMISSI	ONS FO	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	l .			
later storage	18.1902 loss:	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)
otal storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
f cylinder co ombi loss	0.0000 41.6711	0.0000 36.2697	0.0000 38.6405	0.0000 35.9276	35.6098	0.0000 32.9947	0.0000 34.0945	0.0000 35.6098	0.0000 35.9276	0.0000 38.6405	0.0000 38.8604	0.0000 41.6711	
otal heat recolors	quired for w 162.9394 0.0000		ng calculat 148.0870 0.0000	ed for eac 131.3457 0.0000	127.1658	112.0005	107.3050	119.6200 0.0000	120.9410	137.7155 0.0000	147.0086 0.0000	159.1130 0.0000	
itput from w		142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	Solar inpu	120.9410	months) = S 137.7155		0.0000	
eat gains fro											um (64) m =		,
	50.7395	44.3331	46.0511	40.7084	39.3448	34.5181	32.8661	36.8358	37.2489	42.6026	45.6744	49.4672	(65)
. Internal ga	ains (see Ta	able 5 and 5	5a)										
etabolic gain			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
66)m .ghting gain:	84.5050	84.5050	84.5050	84.5050		84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
pliances ga:	ins (calcula		endix L, eq	uation L13	or L13a), al			6.3810	8.5646	10.8747	12.6924	13.5306	,
oking gains	(calculated	d in Append:	ix L, equat	ion L15 or	126.3689 L15a), also	see Table 5	5	108.6205	112.4706	120.6670	131.0134	140.7376	
umps, fans	31.4505	31.4505	31.4505 3.0000	31.4505		31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	
osses e.g. e	-67.6040	-67.6040	-67.6040		-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
otal internal	68.1982	65.9718	61.8966	56.5395	52.8828	47.9418	44.1749	49.5105	51.7345	57.2615	63.4366	66.4882	(72)
	279.9484	277.7779	267.6690	251.8054	235.9846	220.4813	210.5839	215.8636	224.1213	240.1547	258.4939	272.1079	(73)
. Solar gain:	3												
Jan]			A	rea m2	Solar flux Table 6a W/m2	Specif or 5	g Fic data Table 6b	Specific or Tab		Acce fact Table	or	Gains W	
orth				300	10.6334 19.6403		0.7200 0.7200	0	.7000 .7000	0.77		9.3963 37.1115	
est			2.5	300	19.6403		0.7200	0	.7000	0.77		17.3553	
olar gains otal gains		124.5053	205.9832		379.6541	391.7368	371.6480	314.9104		147.8040	79.5052	52.6240	(83)
	343.8114	402.2832	473.6523	556.7300	615.6387		582.2319	530.7740	464.8869	387.9587	337.9991	324.7319	(84)
					615.6387	612.2181			464.8869	387.9587		324.7319	(84)
. Mean intern	nal temperat	cure (heating	ng season)	ng area fr	om Table 9, 1	612.2181			464.8869	387.9587		324.7319 21.0000	
. Mean internet of the control of th	nal temperat uring heatin actor for ga	ure (heating periods :	ng season) in the livi	ng area fr nil,m (see Apr	om Table 9, 1 Table 9a) May	612.2181	Jul	Aug	Sep	Oct	337.9991 Nov	21.0000 Dec	
. Mean intern emperature di tilisation fa au lpha	nal temperat 	ture (heating periods in the feb 41.2893	ng season) in the livi	ng area fr	om Table 9, 1 Table 9a) May 42.2556	612.2181					337.9991	21.0000	
. Mean internemperature ditilisation for au lpha til living as	al temperaturing heating actor for garan 41.1549 3.7437 rea 0.9639	ure (heating periods: sins for liv Feb 41.2893 3.7526 0.9372	in the livi ving area, Mar 41.4246 3.7616 0.8757	ng area fr nil,m (see Apr 42.1148 3.8077	Table 9, T Table 9a) May 42.2556 3.8170	fh1 (C) Jun 42.9740 3.8649 0.4135	Jul 42.9740 3.8649 0.3031	Aug 43.1206 3.8747 0.3451	Sep 42.6837 3.8456 0.5661	Oct 42.2556 3.8170 0.8288	Nov 41.9749 3.7983 0.9406	21.0000 Dec 41.6980 3.7799 0.9698	(85)
. Mean inter:	nal temperatiring heatir actor for ga Jan 41.1549 3.7437 area 0.9639 19.7234 20.2156	ture (heating periods: ins for liv Feb 41.2893 3.7526	ng season) in the livi ving area, Mar 41.4246 3.7616	ng area fr nil,m (see Apr 42.1148 3.8077	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783	612.2181 Ph1 (C) Jun 42.9740 3.8649	Jul 42.9740 3.8649	Aug 43.1206 3.8747	Sep 42.6837 3.8456	Oct 42.2556 3.8170 0.8288 20.6355	Nov 41.9749 3.7983 0.9406 20.1158	21.0000 Dec 41.6980 3.7799	(85) (86) (87)
. Mean interneemperature dutilisation fa au lpha til living a: IT h 2 til rest of l	nal temperat pring heatin actor for ge Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584	ng periods : ins for liv Feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389	612.2181 Ph1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674	Jul 42.9740 3.8649 0.3031 20.9956 20.2464	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902	Sep 42.6837 3.8456 0.5661 20.9396 20.2417	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003	Nov 41,9749 3.7983 0.9406 20.1158 20.2298 0.9305	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251	(85) (86) (87) (88) (89)
. Mean intern- emperature ditilisation for au lpha till living a: IT h 2 till rest of 1 IT 2 iving area f:	nal temperat actor for ga Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584 18.5023 raction	rure (heating periods: ins for liver feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281 18.8601	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761	ng area fri nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910	m Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393	Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA =	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) =	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880	(85) (86) (87) (88) (89) (90) (91)
Mean inter- lemperature distilisation for the second secon	nal temperat ring heating dator for gr Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 house 0.9584 18.5023 raction 19.0982	rure (heating periods: 10 peri	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761 19.8458	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910	m Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155	Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA = 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
. Mean inter- memperature di tilisation for au lpha til living a: IT h 2 til rest of l IT 2 iving area for IT IT Emperature de	nal temperat ring heating dator for gr Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 house 0.9584 18.5023 raction 19.0982	rure (heating periods: ins for liver feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281 18.8601	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761	ng area fri nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910	m Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155	Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA =	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
. Mean intern- emperature di tilisation for au lpha til living a: IT h 2 til rest of l IT iving area for IT IT adjusted MIT . Space heat:	nal temperat pring heating actor for ge Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584 18.5023 raction 19.0982 dijustment 19.0982	ng periods : ins for live Feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281 18.8601 19.4030 19.4030	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761 19.8458	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910 20.2923 20.2923	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155	012.2181 Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968 20.5968	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095 20.6095	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA = 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
. Mean internmemperature ditilisation for au lipha till living a: IT h 2 till rest of lill rest	nal temperat arring heatin actor for ge Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584 18.5023 reaction 19.0982 ijustment 19.0982	nure (heating periods: sins for liv Feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281 18.8601 19.4030 19.4030	ng season) in the livi ving area, Mar 41,4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761 19.8458	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910 20.2923 20.2923	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155 20.5155	012.2181 Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968 20.5968	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095 20.6095	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 20.5533 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000 19.0476	(85) (86) (87) (88) (90) (91) (92) (93)
. Mean internment per	nal temperataring heating factor for general factor fact	19 Periods: 19 periods: 19 periods: 10 per	ng season)	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910 20.2923 20.2923	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155 20.5155	Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968 20.5968	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095 20.6095	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA = 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000 19.0476	(85) (86) (87) (88) (89) (90) (91) (92) (93)
. Mean internmemperature ditilisation for au lipha till living at till rest of lipha till rest of lipha au lipha till rest of lipha au lipha till rest of lipha au li	nal temperat arring heatin actor for ge Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584 18.5023 reaction 19.0982 dijustment 19.0982 digustment 19.0982	rure (heating periods: sins for livered fo	ng season) in the livi ving area, Mar 41,4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761 19.8458 19.8458	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910 20.2923 20.2923 Apr 0.7200 400.8217 8.9000	Om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155 20.5155	012.2181 Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968 20.5968 Jun 0.3890 0.3890 0.381499 14.6000 242.2637	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095 20.6095 Aug 0.3167 168.0925 16.4000	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 20.5533 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 19.8036 Living are 20.2096 20.2096	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845 19.5845 Nov 0.9205 311.1368 7.1000 516.3668	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000 19.0476	(85) (86) (87) (88) (90) (91) (92) (93) (93)
. Mean inter- emperature ditilisation for au lpha til living a: IIT h 2 til rest of l IIT 2 iving area for living area for l	al temperat aring heatin actor for ge Jan 41.1549 3.7437 rea 0.9639 19.7234 20.2156 nouse 0.9584 18.5023 raction 19.0982 dijustment 19.0982 dijustment 19.0982 action 20.9488 326.2134 4.3000 eW 624.2586 1.0000 kWh	nure (heating periods sins for live Feb 41.2893 3.7526 0.9372 19.9727 20.2180 0.9281 18.8601 19.4030 1	ng season) in the livi ving area, Mar 41.4246 3.7616 0.8757 20.3386 20.2203 0.8590 19.3761 19.8458 19.8458	ng area fr nil,m (see Apr 42.1148 3.8077 0.7464 20.7133 20.2322 0.7176 19.8910 20.2923 20.2923 Apr 0.7200 400.8217 8.9000 469.6283 1.0000	om Table 9, 1 Table 9a) May 42.2556 3.8170 0.5783 20.9101 20.2345 0.5389 20.1393 20.5155 20.5155	Th1 (C) Jun 42.9740 3.8649 0.4135 20.9812 20.2464 0.3674 20.2303 20.5968 20.5968 Jun 0.3890 238.1499 14.6000	Jul 42.9740 3.8649 0.3031 20.9956 20.2464 0.2521 20.2437 20.6106 20.6106	Aug 43.1206 3.8747 0.3451 20.9929 20.2488 0.2902 20.2441 20.6095 20.6095	Sep 42.6837 3.8456 0.5661 20.9396 20.2417 0.5134 20.1852 fLA = 20.5533 20.5533	Oct 42.2556 3.8170 0.8288 20.6355 20.2345 0.8003 10.917 10.6000 394.8187 1.0000	Nov 41.9749 3.7983 0.9406 20.1158 20.2298 0.9305 19.0781 a / (4) = 19.5845 19.5845 Nov 0.9205 311.1368 7.1000	21.0000 Dec 41.6980 3.7799 0.9698 19.6793 20.2251 0.9651 18.4455 0.4880 19.0476 0.0000 19.0476 0.0000 19.0563 310.5540 4.2000 618.1853 1.0000	(85) (86) (87) (88) (90) (91) (92) (93) (93) (94) (95) (96) (97) (97a





CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

9a. Energy requirem	ments - Individu	al heating s	ystems, inc	luding micr	o-CHP							
Fraction of space h Fraction of space h Efficiency of main Efficiency of secon Space heating requi	neat from second neat from main s space heating s ndary/supplement	ary/suppleme ystem(s) ystem 1 (in	ntary syste %)								0.0000 1.0000 93.4000 0.0000 1076.3039	(202) (206) (208)
Ja	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requi	rement .7456 161.8770	116.5469	49.5407	15.8775	0.0000	0.0000	0.0000	0.0000	63.0369	147.7656	228.8777	(98)
Space heating effic		ting system		93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	
Space heating fuel	(main heating s .4150 173.3158		53.0415	16.9995	0.0000	0.0000	0.0000	0.0000	67.4913	158.2072	245.0510	(211)
Water heating requi			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating												
Water heating requi		140 0070		107 1650	110 0005	107 2050			100 0155		150 1100	
162. Efficiency of water	.9394 142.3318 heater	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	137.7155	147.0086	159.1130 80.3000	
(217)m 85. Fuel for water heat		84.4556	82.8347	81.3083	80.3000	80.3000	80.3000	80.3000	83.2195	85.0641	85.9658	(217)
189. Water heating fuel	.8452 166.7121 used	175.3429	158.5637	156.3995	139.4776	133.6302	148.9663	150.6115	165.4846	172.8209	185.0887 1942.9432	
Annual totals kWh/y Space heating fuel Space heating fuel	- main system										1076.3039	
Electricity for pum (BalancedWithHe mechanical venti central heating main heating flu Total electricity for lig Electricity for lig Total delivered ene	Patraction fans (SF pump are fan for the above, kynting (calculat	P = 0. Wh/year ed in Append	8250)	1.2500, SFP	= 0.8250)						120.7800 30.0000 45.0000 195.7800 232.4927 3447.5198	(230c) (230e) (231) (232)
12a. Carbon dioxide Space heating - mai Space heating - sec	e emissions - In	dividual hea	ting system	s including	micro-CHP				ion factor kg CO2/kWh 0.2160 0.0000		Emissions g CO2/year 232.4816 0.0000	(261)
Water heating (other	er fuel)						1942.9432		0.2160		419.6757	(264)
Space and water hear Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dic	_	ate (DER)					195.7800 232.4927		0.5190 0.5190		652.1574 101.6098 120.6637 874.4309 17.4900	(267) (268) (272)
DER Total Floor Area Assumed number of c CO2 emission factor CO2 emissions from Total CO2 emissions Residual CO2 emissions Residual CO2 emissions Resulting CO2 emiss Net CO2 emissions	occupants in Table 12 fo appliances, equ cooking, equati sons offset from the electricity g	r electricit ation (L14) on (L16) biofuel CHP eneration, k	y displaced Wh/m²/year	from grid			ON TECHNOLO	GIES		TFA N EF	17.4900 50.0000 1.6901 0.5190 17.4495 3.1912 38.1308 0.0000 0.0000 0.0000 38.1308	ZC2 ZC3 ZC4 ZC5 ZC6 ZC7





CALCULATION OF TARGET EMISSIONS	09 Ian 2014
CALCULATION OF LARGET FIVILS SIGNS	U9 Ian 7014

	TARGET EM	ISSIONS	09 Jan 20	14 	9.92, Januar								
1. Overall dwel													
Ground floor Total floor are Dwelling volume		la)+(1b)+(1c	c) + (1d) + (1e)(1n)	5	50.0000		Area (m2) 50.0000		rey height (m) 2.4000 +(3d)+(3e)		Volume (m3) 120.0000	(1b) - (3b (4) (5)
2. Ventilation													
					main	se	econdary		other	tot	al m	3 per hour	
Number of chimn Number of open Number of inter Number of passi Number of fluel	flues mittent fa ve vents				heating 0 0	+ +	heating 0 0	+ +	0 =		0 * 40 = 0 * 20 = 2 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 20.0000 0.0000	(6b) (7a) (7b)
Infiltration du Pressure test Measured/design Infiltration ra Number of sides	AP50		and fans	= (6a)+(6b)	+(7a)+(7b)+((7c) =				20.0000	Air change / (5) =	0.1667 Yes 5.0000 0.4167	
Shelter factor Infiltration ra	te adjuste	ed to includ	de shelter	factor					(20) = 1 -	[0.075 x 21) = (18)	(19)] = x (20) =	0.9250 0.3854	
Wind speed Wind factor	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250	Sep 4.0000 1.0000	Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Adj infilt rate Effective ac	0.4914 0.6207	0.4818 0.6161	0.4721 0.6115	0.4240 0.5899	0.4143 0.5858	0.3661 0.5670	0.3661 0.5670	0.3565 0.5635	0.3854 0.5743	0.4143 0.5858	0.4336 0.5940	0.4529 0.6025	
3. Heat losses	e (Uw = 1	.40)		Gross m2 74.6000 13.9000	Openings m2 12.5100	4. 8. 62. 13.	m2 .4000 .1100 .0900 .9000	U-value W/m2K 1.0000 1.3258 0.1800 0.1300 30) + (32)	A x W/ 4.400 10.751 11.176 1.807	/K 00 19 52	-value kJ/m2K	A x K kJ/K	(26) (27) (29a) (30) (31) (33)
Thermal mass pa Thermal bridges Total fabric he	(Sum(L x									(33)	+ (36) =	250.0000 0.0000 28.1351	(36)
Ventilation hea	Jan 24.5813	lculated mor Feb 24.3956	Mar 24.2137	Apr	25)m x (5) May 23.1989	Jun 22.4544	Jul 22.4544	Aug 22.3166	Sep 22.7412	Oct 23.1989	Nov 23.5225	Dec 23.8607	(38)
Heat transfer c Average = Sum(3	52.7164	52.5307	52.3487	51.4940	51.3340	50.5895	50.5895	50.4517	50.8763	51.3340	51.6576	51.9958 51.4932	
HLP HLP (average)	Jan 1.0543	Feb 1.0506	Mar 1.0470	Apr 1.0299	May 1.0267	Jun 1.0118	Jul 1.0118	Aug 1.0090	Sep 1.0175	Oct 1.0267	Nov 1.0332	Dec 1.0399 1.0299	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4. Water heatin	g energy :	requirements	(kWh/year)									
Assumed occupan Average daily h		use (litres/	'day)									1.6901 74.3399	
Daily hot water	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content	81.7739 121.2683 (annual)	78.8003 106.0620	75.8267 109.4465	72.8531 95.4181	69.8795 91.5560	66.9059 79.0058	66.9059 73.2105	69.8795 84.0101	72.8531 85.0135	75.8267 99.0750 Total = S	78.8003 108.1481 um(45)m =	81.7739 117.4419 1169.6560	(45)
Distribution lo Water storage 1 Total storage 1	18.1902 oss:	= 0.15 x (4 15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163	(46)
If cylinder con	0.0000 tains ded			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Combi loss	0.0000 41.6711	0.0000 36.2697	0.0000 38.6405	0.0000 35.9276	0.0000 35.6098	0.0000 32.9947	0.0000 34.0945	0.0000 35.6098	0.0000 35.9276	0.0000 38.6405	0.0000 38.8604	0.0000 41.6711	





CALCULATION OF T												
otal heat required for v												
162.9394 Solar input 0.0000	142.3318 0.0000			127.1658 0.0000	112.0005 0.0000	107.3050 0.0000	0.0000	120.9410 0.0000	137.7155 0.0000 months) = Si	0.0000	159.1130 0.0000 0.0000	(63)
Output from w/h 162.9394	142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	137.7155	147.0086	159.1130	(64)
Heat gains from water hea	ting, kWh/r 44.3331	month 46.0511	40.7084	39.3448	34.5181	32.8661	36.8358	r year (kw. 37.2489	42.6026	am (64) m = 45.6744	1615.5732 49.4672	
5. Internal gains (see Ta	ble 5 and 5	5a)										
Metabolic gains (Table 5)	, Watts							Con	Oat	Non	Daa	
Jan (66)m 84.5050 Lighting gains (calculate		Mar 84.5050 dix L, equa		May 84.5050 L9a), also s		Jul 84.5050	Aug 84.5050	Sep 84.5050	Oct 84.5050	Nov 84.5050	Dec 84.5050	(66)
13.6576 Appliances gains (calcula							6.6199	8.8852	11.2818	13.1676	14.0371	, ,
Cooking gains (calculated	l in Appendi	ix L, equat	ion L15 or		see Table !	5	108.6205	112.4706	120.6670	131.0134	140.7376	
31.4505 Pumps, fans 3.0000 Cosses e.g. evaporation	31.4505 3.0000 negative va	31.4505 3.0000 alues) (Tab	31.4505 3.0000 le 5)	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505 3.0000	31.4505	31.4505 3.0000	
	-67.6040		-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
68.1982 Total internal gains	65.9718		56.5395	52.8828	47.9418	44.1749	49.5105	51.7345	57.2615	63.4366	66.4882	
280.4412	278.2156	268.0250	252.0749	236.1861	220.6514	210.7677	216.1025	224.4419	240.5618	258.9691	272.6144	(73)
5. Solar gains												
[Jan]			rea m2	Solar flux Table 6a		g fic data	Specific	FF data	Acce:		Gains W	
				W/m2				.e 6c	Table	5d		
North East West		1.9 4.1 1.9	900 600	10.6334 19.6403 19.6403		0.6300 0.6300 0.6300	0.	7000 7000 7000	0.77 0.77 0.77	00	6.3694 25.1497 11.7645	(76)
Solar gains 43.2837 Total gains 323.7249		139.6068	206.6656	257.3148 493.5009			213.4338		100.1753	53.8852 312.8544	35.6664 308.2808	
7. Mean internal temperat	ure (heatir	ng season)										
Temperature during heatin Utilisation factor for ga	ins for liv	ving area,	nil,m (see	Table 9a)							21.0000	(85)
Jan 65.8661 alpha 5.3911	Feb 66.0989 5.4066	Mar 66.3287 5.4219	Apr 67.4297 5.4953	May 67.6398 5.5093	Jun 68.6352 5.5757	Jul 68.6352 5.5757	Aug 68.8227 5.5882	Sep 68.2483 5.5499	Oct 67.6398 5.5093	Nov 67.2161 5.4811	Dec 66.7789 5.4519	
util living area 0.9971	0.9941	0.9838	0.9432	0.8320	0.6412	0.4769	0.5322	0.8024	0.9678	0.9940	0.9978	
MIT 19.9341	20.0717	20.3146	20.6344	20.8716	20.9768	20.9962	20.9933	20.9230	20.6078	20.2188	19.9152	(87)
Th 2 20.0383 util rest of house 0.9962	20.0414	0.9782	20.0585	0.7817	20.0735	20.0735	0.4295	20.0688	20.0612 0.9530	20.0558	20.0502 0.9971	
MIT 2 18.6183 Living area fraction	18.8208	19.1745	19.6344	19.9390	20.0586	20.0721	20.0731	20.0088	19.6082 Living area	19.0467	18.5994	(90)
MIT 19.2604 Temperature adjustment	19.4312	19.7309	20.1224	20.3941	20.5067	20.5231	20.5221	20.4549			19.2416 0.0000	(92)
adjusted MIT 19.2604	19.4312	19.7309	20.1224	20.3941	20.5067	20.5231	20.5221	20.4549	20.0960	19.6187	19.2416	(93)
3. Space heating requirem	nent											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9905 359.1693 4.9000			395.2182	0.5983 290.8577 14.6000	0.4268 197.4514 16.6000	0.4798 206.0901	0.7614 295.1234	0.9536 324.9408 10.6000			(95)
	763.3370 1.0000			446.3032	298.8153				487.4671		782.0977	
Space heating kWh	1.0000		1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	
Space heating Space heating per m2										/ (4) =	1703.3014 34.0660	(98)
'c Space conline rom-i												
3c. Space cooling require												





CALCULATION OF TARGET I	EMISSION	IS 09 J	an 2014								
Fraction of space heat from seconda Fraction of space heat from main sy Efficiency of main space heating sy Efficiency of secondary/supplementa Space heating requirement	rstem(s) rstem 1 (in	%)	m (Table 11)						0.0000 1.0000 93.4000 0.0000 1823.6632	(202) (206) (208)
Jan Feb Space heating requirement	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
347.0829 271.6007	219.3186	110.4326	38.0073	0.0000	0.0000	0.0000	0.0000	120.9196	242.5499	353.3900	(98)
Space heating efficiency (main heat 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 sy 371.6091 290.7930	rstem) 234.8164	118.2362	40.6930	0.0000	0.0000	0.0000	0.0000	129.4642	259.6894	378.3619	(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 162.9394 142.3318	148.0870	131.3457	127.1658	112.0005	107.3050	119.6200	120.9410	137.7155	147.0086	159.1130	(64)
Efficiency of water heater (217) m 86.9078 86.6524	86.0382	84.6181	82.4189	80.3000	80.3000	80.3000	80.3000	84.7256	86.3036	80.3000 87.0026	
Fuel for water heating, kWh/month 187.4854 164.2561	172.1178	155.2217	154.2921	139.4776	133.6302	148.9663	150.6115	162.5428	170.3389	182.8830	(219)
Water heating fuel used Annual totals kWh/year										1921.8234	(219)
Space heating fuel - main system Space heating fuel - secondary										1823.6632 0.0000	
										0.0000	(213)
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, kW Electricity for lighting (calculate Total delivered energy for all uses	d in Append	ix L)								30.0000 45.0000 75.0000 241.1968 4061.6833	(230e) (231) (232)
12a. Carbon dioxide emissions - Ind											
Space heating - main system 1 Space heating - secondary Water heating (other fuel) Space and water heating						Energy kWh/year 1823.6632 0.0000 1921.8234		ion factor kg CO2/kWh 0.2160 0.0000 0.2160	ŀ	Emissions cg CO2/year 393.9112 0.0000 415.1138 809.0251	(263) (264) (265)
Pumps and fans Energy for lighting Total CO2, kg/m2/year Emissions per m2 for space and wate Fuel factor (mains gas) Emissions per m2 for lighting Emissions per m2 for pumps and fans		C 1005 + 1	00) + 0 503	6 1 0 7705		75.0000 241.1968		0.5190 0.5190		38.9250 125.1811 973.1312 16.1805 1.0000 2.5036 0.7785	(268) (272) (272a) (272b) (272c)
Target Carbon Dioxide Emission Rate	(TEK) = (I	0.1803 ^ 1.	00) + 2.303	o + U.//85,	rounaea to	∠ a.p.				19.4600	(2/3)





Property Reference	E909-06				Issued on Date	11/05/2020			
Assessment	E909-06			Prop Type Ref					
Reference									
Property	Flat 6, 1 Hillfield Road, N	N6 1QD							
SAP Rating		85 B	DER	13.94	TER	15.24			
Environmental		87 B	% DER <ter< th=""><th></th><th colspan="5">8.54</th></ter<>		8.54				
CO₂ Emissions (t/ye	ear)	1.43	DFEE	40.93	TFEE	47.07			
General Requireme	nts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>13.04</th><th></th></tfe<>	E	13.04				
Assessor Details	Mr. Jason Doherty, Doherty E jason@doherty-energy.co.uk	0.	l, Tel: 0148045	1569,	Assessor ID	L143-0001			
Client									





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

REGULATIONS COMPLIANCE REPORT - Approve	ed Document L1A, 2013 Ed	ition, England	
DWELLING AS DESIGNED			
Top-floor flat, total floor area 118 m ²	2		
This report covers items included with: It is not a complete report of regulat:			
la TER and DER Fuel for main heating:Mains gas Fuel factor:1.00 (mains gas) Target Carbon Dioxide Emission Rate (Ti Dwelling Carbon Dioxide Emission Rate	ER) 15.24 kgCO□/m² (DER) 13.94 kgCO□/m²OK		
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) Dwelling Fabric Energy Efficiency (DFEI			
2 Fabric U-values			
Element Average External wall 0.16 (max. 0.30) Party wall 0.00 (max. 0.20) Floor (no floor) Roof 0.09 (max. 0.20)	Highest 0.16 (max. 0.70)	OK OK	
Roof 0.09 (max. 0.20) Openings 1.16 (max. 2.00)	0.09 (max. 0.35) 1.20 (max. 3.30)	OK OK	
2a Thermal bridging Thermal bridging calculated using user-		 nen	
3 Air permeability Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0		OK
4 Heating efficiency Main heating system: Data from database	Boiler system with rad	iators or underfloor	- Mains gas
Vaillant ecoTEC pro 24 VUW 246/5-3 (H-C Combi boiler Efficiency: 89.5% SEDBUK2009 Minimum: 88.0%	OK		
	None		
	No cylinder		
5 Cylinder insulation	No cylinder		OK
5 Cylinder insulation Hot water storage 6 Controls	No cylinder		
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls:	No cylinder Time and temperature z No cylinder	one control	OK OK
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock	No cylinder Time and temperature z No cylinder Yes ergy fittings:100%	one control	OK OK
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-eneminimum 8 Mechanical ventilation Continuous supply and extract system	No cylinder Time and temperature z No cylinder Yes ergy fittings:100%	one control	OK OK
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-eneminimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum Maximum	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5	one control	OK OK
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-eneminimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Moinimum:	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70%	one control	OK OK
5 Cylinder insulation Hot water storage	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70%	one control	OK OK
5 Cylinder insulation Hot water storage	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average	one control	OK OK OK
5 Cylinder insulation Hot water storage	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.70 m², No overhang 23.73 m², No overhang	one control	OK OK OK
5 Cylinder insulation Hot water storage	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.70 m², No overhang 23.73 m², No overhang 4.00 ach Light-coloured curtain	one control	OK OK OK OK OK OK OK OK OK OK
5 Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-eneminimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing South: Windows facing South: Windows facing West: Air change rate: Blinds/curtains:	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.70 m², No overhang 23.73 m², No overhang 4.00 ach Light-coloured curtain	one control	OK OK OK OK OK OK OK OK OK OK
S Cylinder insulation Hot water storage 6 Controls Space heating controls: Hot water controls: Boiler interlock 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing South: Windows facing South: Windows facing West: Air change rate: Blinds/curtains:	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.70 m², No overhang 23.73 m², No overhang 4.00 ach Light-coloured curtain 0.00 W/m²K	one control	OK OK OK OK OK OK OK OK OK OK
5 Cylinder insulation Hot water storage	No cylinder Time and temperature z No cylinder Yes ergy fittings:100% 75% 0.81 1.5 89% 70% Medium Average 15.70 m², No overhang 23.73 m², No overhang 4.00 ach Light-coloured curtain	one control	OK OK OK OK OK OK OK OK OK OK





CALCULATI	ON OF E	WELLIN	G EMISSI	ONS FOR	REGULAT	TIONS C	OMPLIAN	ICE 09	9 Jan 2014				
SAP 2012 WORKS					9.92, Janua NCE 09	ry 2014) Jan 2014							
1. Overall dwe													
Ground floor First floor Total floor ar Dwelling volume	ea TFA = (1				1	18.0000		Area (m2) 88.0000 30.0000	(1b) x	rey height (m) 2.4000 2.7000 1+(3d)+(3e)	(2c) =		(1b) - (3b (1c) - (3c (4) (5)
2. Ventilation	rate												
Number of chim Number of open Number of inte Number of pass Number of flue	flues rmittent fa ive vents				main heating 0 0		heating 0 0	+ +	other 0 = 0 =	tot = =	0 * 40 = 0 * 20 = 0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000 0.0000 0.0000	(6b) (7a) (7b)
Infiltration de Pressure test Measured/design Infiltration r. Number of side:	ue to chimr n AP50 ate	neys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				0.0000	Air changes	0.0000 Yes 3.0000 0.1500	(8)
Shelter factor Infiltration ra	ate adjuste	ed to inclu	de shelter :	factor					(20) = 1 -	- [0.075 2 21) = (18)		0.9250 0.1388	
Wind speed Wind factor	Jan 5.1000 1.2750	Feb 5.0000 1.2500	Mar 4.9000 1.2250	Apr 4.4000 1.1000	May 4.3000 1.0750	Jun 3.8000 0.9500	Jul 3.8000 0.9500	Aug 3.7000 0.9250		Oct 4.3000 1.0750	Nov 4.5000 1.1250	Dec 4.7000 1.1750	
Adj infilt rate Balanced mech If mechanical	0.1769 anical vent			0.1526 overy	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	
If balanced wi	0.2987	0.2952	iciency in 9	% allowing 0.2744	for in-use f 0.2709	0.2536	om Table 4h)	0.2501	0.2605	0.2709	0.2778	75.6500 0.2848	
3. Heat losses Element Door Window (Uw = 1 External Wall External Roof	.20)			Gross m2 169.6000 88.0000	Openings m2 41.7300	Ne 2 39 127	m2 .3000 .4300 .8700	U-value W/m2K 0.5500 1.1450 0.1600 0.0900	A x W, 1.265 45.148 20.455 7.920	/K 50 39 92	K-value kJ/m2K	A x K kJ/K	(26) (27) (29a) (30)
Total net area Fabric heat los Party Floor 1	of externa			00.0000		257	.6000	30) + (32)					(31) (33) (32d)
Thermal mass partnermal bridge: Total fabric he	s (User dei				area)					(33)	+ (36) =	125.0000 15.4560 90.2491	(36)
Ventilation head (38) m	at loss cal Jan 28.7982	culated mo Feb 28.4637	onthly (38)m Mar 28.1293	= 0.33 x (Apr 26.4569	25)m x (5) May 26.1224	Jun 24.4500	Jul 24.4500	Aug 24.1155	Sep 25.1190	Oct 26.1224	Nov 26.7914	Dec 27.4603	(38)
Heat transfer Average = Sum (119.0473	118.7128	118.3783	116.7059	116.3715	114.6991	114.6991	114.3646	115.3680	116.3715	117.0404	117.7094 116.6223	
HLP HLP (average)	Jan 1.0089	Feb 1.0060	Mar 1.0032	Apr 0.9890	May 0.9862	Jun 0.9720	Jul 0.9720	Aug 0.9692	Sep 0.9777	Oct 0.9862	Nov 0.9919	Dec 0.9975 0.9883	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4. Water heati	ng energy 1	equirement	s (kWh/year))									
Assumed occupations Average daily	ncy											2.8552 102.0120	
Daily hot wate		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content	(annual)	108.1328 145.5424	150.1867	99.9718 130.9364	95.8913 125.6366	91.8108 108.4148	91.8108 100.4623	95.8913 115.2819		104.0523 135.9545 Total = 8	108.1328 148.4050 Sum(45)m =	112.2133 161.1582 1605.0468	(45)
Distribution 1	24.9614	= 0.15 x (21.8314	(45) m 22.5280	19.6405	18.8455	16.2622	15.0693	17.2923	17.4988	20.3932	22.2608	24.1737	(46)





CALCULAT	ION OF I	OWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014	!			
later storage :													
If cylinder co	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
ombi loss	0.0000	0.0000 46.0274	0.0000	0.0000 49.3012	0.0000 48.8652	0.0000 45.2766	0.0000 46.7858	0.0000 48.8652	0.0000 49.3012	0.0000 50.9589	0.0000 49.3151	0.0000 50.9589	
otal heat req	uired for	water heati		ed for each	month	153.6914	147.2481	164.1471	165.9599	186.9135	197.7201	212.1171	
olar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 Solar inp	0.0000 out (sum of	0.0000 months) = Si	0.0000 am(63)m =	0.0000	
utput from w/		191.5698	201.1456	180.2376	174.5018	153.6914	147.2481		165.9599		197.7201	212.1171	
eat gains fro	m water he	ating, kWh/ 59.8997	month 62.6768	55.8616	53.9905	47.3671	45.1002	50.5475	51.1143	7h/year) = St 57.9446	61.6734	2192.6199	
. Internal ga	ins (see T	able 5 and	5a)										
etabolic gain	s (Table 5), Watts							_				
56) m					May 142.7622			Aug 142.7622	Sep 142.7622	Oct 142.7622	Nov 142.7622	Dec 142.7622	(66)
ighting gains	25.1928	22.3760	18.1974	13.7766	10.2982	8.6941	9.3943	12.2111	16.3897	20.8105	24.2889	25.8929	(67)
opliances gai	282.5862	285.5185	278.1291	262.3978	242.5399	223.8763	211.4078	208.4755	215.8649	231.5962	251.4541	270.1177	(68)
ooking gains	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000		37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	37.2762 3.0000	
mps, fans osses e.g. ev	aporation	(negative v	ralues) (Tab	le 5)	-114.2098			-114.2098		-114.2098			
ater heating			84.2430	77.5856	72.5678	65.7876	60.6185	67.9402	70.9921	77.8825	85.6576	89.1463	
otal internal	gains	465.8596	449.3981	422.5887	394.2345	367.1867	350.2493	357.4554	372.0754	399.1179	430.2292	453.9856	
	400.1003	400.0000	440.0001	422.5007	334.2343	307.1007	330.2433	337.4334	372.0734	333.1173	430.2232	403.3030	(75)
Solar gains													
Jan]				rea	Solar flux		g		FF	Acces	ss	Gains	
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data	facto Table	or	W	
outh est			15.7 23.7	300	46.7521 19.6403		0.7200 0.7200	C	.7000 .7000	0.770 0.770		256.3682 162.7829	
olar gains otal gains					1567.2414 1961.4759					830.7173 1229.8352	506.8550 937.0842	355.3905 809.3761	
. Mean intern	al tempera	ture (heati	ng season)										
emperature du tilisation fa						Th1 (C)						21.0000	(85)
au	Jan 34.4168	Feb 34.5137	Mar 34.6113	Apr	May 35.2081	Jun 35.7215	Jul 35.7215	Aug 35.8260	Sep 35.5144	Oct 35.2081	Nov 35.0069	Dec 34.8080	
lpha til living ar	3.2945	3.3009	3.3074		3.3472	3.3814	3.3814	3.3884	3.3676	3.3472	3.3338	3.3205	
	0.9599	0.9067	0.8147	0.6711	0.5152	0.3707	0.2695	0.3025	0.4881	0.7638	0.9258	0.9689	(86)
T 2	19.4380 20.0759	19.8726 20.0783	20.3289 20.0807	20.7101 20.0925	20.9008 20.0949	20.9757 20.1067	20.9937 20.1067	20.9907 20.1091	20.9388 20.1020	20.6249 20.0949	19.9507 20.0901	19.3539 20.0854	
il rest of h	0.9535	0.8935	0.7916	0.6369	0.4726	0.3217	0.2157	0.2454	0.4322		0.9129		
IT 2 iving area fra IT	action	18.6155	19.2470 19.5642	19.7583		20.0868	20.1031	20.1034		Living area	a / (4) =	0.2932	(91)
emperature ad				20.0373	20.2595	20.3475	20.3642	20.3636	20.3091		19.0980	0.0000	
djusted MIT	18.4204	18.9841	19.5642	20.0373	20.2595	20.3475	20.3642	20.3636	20.3091	19.9484	19.0980	18.3148	(93)
. Space heati	ng require	ment											
_ _	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9385 832.7071	1053.3855	0.7773	0.6347 1137.3486	0.4805	0.3351 647.6922		0.2618 449.6234	0.4454	0.7207 886.3398		0.9507 769.4833	
seful gains	4.3000		6.5000		11.7000	14.6000	16.6000			10.6000	7.1000	4.2000	
seful gains kt temp.	· VV	1671 9620	1546.5200		996.0860 1.0000	659.2288 0.0000	431.7529 0.0000	453.2913 0.0000	716.3330 0.0000	1087.8827 1.0000	1404.2517	1661.4397 1.0000	
seful gains xt temp. eat loss rate			1.0000										
seful gains ext temp. eat loss rate onth fracti pace heating	1680.9911 1.0000 kWh	1.0000	278.1763	116.9612	39.8476	0.0000	0.0000	0.0000	0.0000	149.9479	406.8518	663.6155	
seful gains xt temp. eat loss rate	1.0000 kWh 631.1233	1.0000		116.9612	39.8476	0.0000	0.0000	0.0000	0.0000		406.8518	663.6155 2702.2070 22.9001	(98)
seful gains ext temp. eat loss rate onth fracti bace heating	1680.9911 1.0000 kWh 631.1233 per m2	1.0000 415.6834	278.1763						0.0000			2702.2070	(98)





CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

9a. Energy req	quirements -	Individua	l heating sy	stems, inc	luding micr	o-CHP							
Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	pace heat from main space heat from main space heat from main space heat secondary/su	om seconda om main sy neating sy	ry/supplemen stem(s) stem 1 (in ^s	ntary syste								0.0000 1.0000 93.4000 0.0000 2893.1552	(202) (206) (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	631.1233	415.6834	278.1763		39.8476	0.0000	0.0000	0.0000	0.0000	149.9479	406.8518	663.6155	(98)
Space heating	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	675.7209	445.0572	stem) 297.8333	125.2262	42.6633	0.0000	0.0000	0.0000	0.0000	160.5438	435.6015	710.5091	(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													
Efficiency of		£		180.2376	174.5018	153.6914	147.2481	164.1471		186.9135	197.7201	212.1171 80.3000	(216)
Fuel for water		¶h/month		83.9931	82.0032	80.3000	80.3000	80.3000	80.3000	84.5025	86.8283	87.7273	
Water heating Annual totals		220.3220	234.2506	214.5862	212.7988	191.3965	183.3725	204.4173	206.6749	221.1927	227.7138	241.7914 2606.7157	
Space heating Space heating												2893.1552 0.0000	
	WithHeatRecover ventilation atting pump ag flue fan wity for the or lighting	fans (SFP above, kW	= 1.0 h/year d in Append:)125)	1.2500, SFP	= 1.0125)						360.9401 30.0000 45.0000 435.9401 444.9120 6380.7230	(230c) (230e) (231) (232)
12a. Carbon di	.oxide emissi												
Space heating Space heating Water heating Space and wate Pumps and fans Energy for lig Total CO2, kg/ Dwelling Carbo	- main syste - secondary (other fuel) r heating s phting	em 1						Energy kWh/year 2893.1552 0.0000 2606.7157 435.9401 444.9120		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190	k	Emissions g CO2/year 624.9215 0.0000 563.0506 1187.9721 226.2529 230.9093 1645.1344 13.9400	(261) (263) (264) (265) (267) (268) (272)
16 CO2 EMISSIC DER Total Floor Ar Assumed number CO2 emission f CO2 emissions Total CO2 emis Residual CO2 e Additional all Resulting CO2 Net CO2 emissi	ea cof occupant factor in Tak from appliar from cooking sions emissions off owable electemissions of	cs ole 12 for nces, equa g, equatio	electricity tion (L14) n (L16) biofuel CHP neration, kN	y displaced Wh/m²/year	from grid		TY GENERATI	ON TECHNOLO	GIES		TFA N EF	13.9400 118.0000 2.8552 0.5190 14.1911 1.5892 29.7203 0.0000 0.0000 0.0000 29.7203	ZC2 ZC3 ZC4 ZC5 ZC6 ZC7





OF TARGET EMISSIONS	09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014 (Version 9.92, January 2014) 1. Overall dwelling dimensions Volume (m3) 211.2000 (1b) - (3b) (m2) 88.0000 (1b) (m) 2.4000 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 30.0000 (1c) 2.7000 (2c) 81.0000 (1c) - (3c) 118.0000 2. Ventilation rate secondary total other m3 per hour heating heating 0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = Number of chimneys Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0 0 0.0000 (6b) 40.0000 (7a) Air changes 40.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1369 (8) Pressure test Measured/design AP50 5.0000 0.3869 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] = (21) = (18) x (20) = (20) = 1 -0.9250 (20) 0.3579 (21) Infiltration rate adjusted to include shelter factor Jul 3.8000 Aug 3.7000 0.9250 Dec 4.7000 (22) 1.1750 (22a) 5.1000 1.2750 4.9000 1.2250 Wind speed 1.2500 1.1000 1.0750 1.1250 Wind factor 0.9500 0.9500 1.0000 1.0750 Adj infilt rate 3. Heat losses and heat loss parameter NetArea m2 2.3000 27.2000 U-value W/m2K 1.0000 A x U W/K 2.3000 TER Opaque door
TER Opening Type (Uw = 1.40)
External Wall 1
External Roof 1
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U) (26) 1.3258 36.0606 (27) 140.1000 88.0000 257.6000 169.6000 29.5000 0.1800 (29a) (26) . . . (30) + (32) = 75.0186 Thermal mass parameter (TMP = Cm / TFA) in $k_{\rm J}/m_{\rm 2}K$ Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss 250.0000 (35) 0.0000 (36) 75.0186 (37) (33) + (36) = Jul 53.7858 Dec 56.7382 (38) Heat transfer coeff 133.2696 132.8799 132.4978 130.7032 130.3674 128.8044 128.8044 128.5150 129.4065 130.3674 131.0467 131.7568 (39) Average = Sum(39)m / 12 = May 1.1048 Aug 1.1077 1.0967 1.1166 (40) 1.1076 (40) 1.1294 1.1261 1.1229 1.0891 1.1048 1.1106 1.0916 1.0916 HLP (average) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 2.8552 (42) 102.0120 (43) Feb Jul Apr May Jun Aug Sep Oct Nov Daily hot water use
112.2133
Energy conte 166.4090 104.0523 150.1867 99.9718 116.6588 Energy content (annual) Distribution loss (46) Total = Sum(45)m = 1605.0468 (45) $(46)m = 0.15 \times (45)m$ 24.9614 21.8314 22.5280 19.6405 18 8455 16.2622 15.0693 17 2923 17.4988 20.3932 22.2608 24.1737 (46) Water storage loss: Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56) If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)



Regs Region: England Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.12r02



CALCULAT	ION OF 1	TARGET I	EMISSION	NS 09 J	lan 2014								
Combi loss	50.9589	46.0274	50.9589	49.3012	48.8652	45.2766	46.7858	48.8652	49.3012	50.9589	49.3151	50.9589	(61)
Total heat rec		191.5698 0.0000	201.1456 0.0000	180.2376 0.0000		153.6914 0.0000	147.2481 0.0000	0.0000	165.9599 0.0000	186.9135 0.0000 months) = S	197.7201 0.0000 um(63)m =	212.1171 0.0000 0.0000	(63)
Output from w/		191.5698	201.1456	180.2376	174.5018	153.6914	147.2481	164.1471	165.9599	186.9135 Th/year) = S	197.7201	212.1171	(64)
Heat gains fro			month 62.6768	55.8616	53.9905	47.3671	45.1002	50.5475	51.1143	57.9446	61.6734	66.3248	(65)
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gair	s (Table 5		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	(calculat	ed in Apper	ndix L, equa	tion L9 or		see Table 5	i		142.7622	142.7622	142.7622	142.7622	
Appliances gai			endix L, eq	uation L13	10.2982 or L13a), a 242.5399			12.2111	16.3897 215.8649	20.8105	24.2889 251.4541	25.8929 270.1177	
Cooking gains	(calculate			ion L15 or				37.2762	37.2762	37.2762	37.2762	37.2762	
Pumps, fans Losses e.g. ev	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	
Water heating	gains (Tab	le 5)			-114.2098								
Total internal	gains		84.2430	77.5856	72.5678	65.7876	60.6185	67.9402	70.9921	77.8825	85.6576	89.1463	
	468.1005	465.8596	449.3981	422.5887	394.2345	367.1867	350.2493	357.4554	372.0754	399.1179	430.2292	453.9856	(73)
6. Solar gains													
[Jan]			А	irea	Solar flux		g	0	FF	Acce		Gains	
				m2		or		Specific or Tab	le 6c	fact Table		W	
South West					46.7521 19.6403				.7000 .7000	0.77 0.77		154.7395 98.2580	
Solar gains Total gains					945.9888 1340.2233						305.9352 736.1644		
7. Mean intern													
Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9,							21.0000	(85)
Utilisation fa	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct 62.8565	Nov	Dec	
tau alpha util living ar	61.4877 5.0992	61.6681 5.1112	61.8459 5.1231	62.6951 5.1797	62.8565 5.1904	63.6193 5.2413	63.6193 5.2413	63.7626 5.2508	63.3233 5.2216	5.1904	62.5307 5.1687	62.1937 5.1462	
ucii iiving ai	0.9978	0.9926	0.9756	0.9193	0.7937	0.6066	0.4463	0.4949	0.7515	0.9564	0.9945	0.9985	(86)
MIT Th 2	19.7968 19.9769	20.0131 19.9796	20.3129 19.9822	20.6525 19.9946	20.8807 19.9969	20.9772 20.0077	20.9962 20.0077	20.9936 20.0097	20.9331 20.0036	20.6031 19.9969	20.1266 19.9922	19.7620 19.9873	
util rest of h	0.9971	0.9902 18.6903	0.9675 19.1236	0.8937	0.7374	0.5216	0.3477	0.3919	0.6702	0.9370	0.9922	0.9980	
MIT 2 Living area fr MIT	18.3736 action 18.7909	19.0781	19.1236	19.6026 19.9104	19.8872 20.1785	19.9935	20.0064	20.0072		19.5488 Living are 19.8579		18.3302 0.2932 18.7500	(91)
Temperature ac adjusted MIT	ljustment		19.4723		20.1785	20.2820	20.2966	20.2965	20.2413		19.2358	0.0000	
aajaocca 1111	10.7303	13.0701	13.1723	13.3101	2011700	20.2020	20.2300	20.2300	2012113	13.0073	13.2300	10.7000	(33)
8. Space heati	ng require	ment											
We (1)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	/C *:
Utilisation Useful gains Ext temp.	718.1162		0.9624 1047.7821 6.5000						0.6911 744.6253 14.1000		0.9899 728.7210 7.1000	666.5700	(95)
	1931.1967		1718.8017 1.0000		1105.3189	731.8615 0.0000	476.1390 0.0000	500.7533	794.7267 0.0000	1206.9342	1590.3527 1.0000		
Space heating	kWh		499.2386			0.0000	0.0000	0.0000		272.4146		930.3681	(98)
Space heating Space heating	per m2									(98) / (4) =	4196.9518 35.5674	
8c. Space cool													
Not applicable													
9a. Energy rec	uirements	– Individua	al heating s	vstems. inc	cludina micr	o-CHP							



CALCULATION OF TARGET EMISSIONS 09 Jan 2014



Emissions kg CO2/year 970.6013 (261) 0.0000 (263) 558.0734 (264) 1528.6747 (265) 38.9250 (267) 230.9093 (268) 1798.5090 (272) 12.9549 (272a) 1.0000 1.9569 (272b) 0.3299 (272c) 15.2400 (273)

Fraction of s Fraction of s Efficiency of Efficiency of Space heating	pace heat fr main space secondary/s	om main sys heating sys supplementa:	stem(s) stem 1 (in	₹)	(0.0000 1.0000 93.4000 0.0000 4493.5244	(202) (206) (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	requirement 902.5319	661.3396	499.2386	234.5874	76.0968	0.0000	0.0000	0.0000	0.0000	272.4146	620.3748	930.3681	(00)
Space heating					70.0300	0.0000	0.0000	0.0000	0.0000	272.4140	020.3740	930.3001	(90)
,	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													
Water heating	966.3082	708.0724	534.5167	251.1643	81.4741	0.0000	0.0000	0.0000	0.0000	291.6645	664.2129	996.1114	(211)
water meating	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		201.1456	180.2376	174.5018	153.6914	147.2481	164.1471	165.9599	186.9135	197.7201	212.1171	(64)
Efficiency of												80.3000	
(217) m	88.2457	87.9163	87.2484	85.7157	83.1200	80.3000	80.3000	80.3000	80.3000	85.9984	87.7330	88.3371	(217)
Fuel for wate Water heating Annual totals	246.3214 fuel used		230.5437	210.2738	209.9396	191.3965	183.3725	204.4173	206.6749	217.3453	225.3656	240.1223 2583.6731	
Space heating Space heating	fuel - mair											4493.5244 0.0000	
Electricity f central he main heati Total electri Electricity f Total deliver	ating pump ng flue fan city for the or lighting	above, kWl	d in Append	ix L)								30.0000 45.0000 75.0000 444.9120 7597.1096	(230e) (231) (232)

	Energy kWh/year	Emission factor kg CO2/kWh
pace heating - main system 1	4493.5244	0.2160
pace heating - secondary	0.0000	0.0000
ater heating (other fuel)	2583.6731	0.2160
pace and water heating		
umps and fans	75.0000	0.5190
nergy for lighting	444.9120	0.5190
otal CO2, kg/m2/year		
missions per m2 for space and water heating		
uel factor (mains gas)		
missions per m2 for lighting		
missions per m2 for pumps and fans		
arget Carbon Dioxide Emission Rate (TER) = (12.9549 * 1.00) + 1.9569 +	0.3299, rounded to 2 d.p.	





Appendix B – Water Calculations

					10)			
Project Details								
Adress/Reference Number of Bedrooms	Land Betwee		use and South	h Mansions	Case Reference Occupancy for Calculati	E909 ion Purposes		
"		•						
Appliance/Useage [Faps (Excluding Kit		٠,			Showers			
aps (Excluding Kil	Flow Rate	Quantity	Total per		Shower fitting	Flow Rate	Quantity	Total per
	Litres/Min	(No.)	Fitting type		Туре	Litres/Min	(No.)	Fitting ty
Mixer Tap	3.00	2	6.00 0.00		Thermostatic Shower	8.00	0 1	3 (
			0.00					1 6
			0.00					
			0.00					(
otal No. of Fittings (No	p.)	2	•		Total No. of Fittings (N	lo.)	1	4
otal Flow (I/s) Maximum Flow (I/s)			6.00 3.00		Total Flow (I/s) Maximum Flow (I/s)			3
verage Flow (I/s)			3.00		Average Flow (I/s)			8
Veighted Average Flow			2.10 3.00		Weighted Average Flo Flow for Calculation (I			{
low for Calculation (I/s	>)		3.00			15)		•
Baths		• "			WCs			0
ath Type	Capacity to Overflow	(No.)	Total per Fitting type		WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
ath	175.00		175.00		Dual WC	6.00		
			0.00					
			0.00					
otal No. of Fittings (No	p.)	1	475.00		Total number of fifth			
otal Capacity (I) Maximum Capacity (I)			175.00 175.00		Total number of fitting Average effective flush			
Average Capacity (I)			175.00			•		
Veighted Average Capa Capacity for Calculation			122.50 175.00					
Dishwashers	11 (1)		170.00		Washing Machine			
	I Di	0	Tatalana		Washing Machines		0	T.4.1
ishwasher Type	L per Place Setting	(No.)	Total per Fitting type		Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total pe Fitting t
		ì	0.00		,	T .	T] (
	1					_		-
Total No. of Fittings (No	0.)	0	0.00		Total No. of Fittings (N	lo.)	0	
Fotal No. of Fittings (No Fotal Consumption (I)		0	1.25		Total No. of Fittings (N Total Consumption (I)		0] (
Total Consumption (I) Maximum Consumption	n (l)	0	1.25 1.25		Total Consumption (I) Maximum Consumption	on (I)	0	j (
otal Consumption (i) Maximum Consumption Average Consumption (Veighted Average Cons	n (I) (I/s) sumption (I)	0	1.25 1.25 1.25 0.88		Total Consumption (I) Maximum Consumption Average Consumption Weighted Average Con	on (I) I (I/s) Insumption (I)	0] ({ { { { {
otal Consumption (i) Maximum Consumption Average Consumption (Veighted Average Cons	n (I) (I/s) sumption (I)	0	1.25 1.25 1.25		Total Consumption (I) Maximum Consumption Average Consumption	on (I) I (I/s) Insumption (I)	0] (
otal Consumption (I) Maximum Consumption Average Consumption (Veighted Average Consumption for Calcu	n (I) (I/s) sumption (I) lation (I/s)	0	1.25 1.25 1.25 0.88		Total Consumption (I) Maximum Consumption Average Consumption Weighted Average Con	on (I) I (I/s) Insumption (I)	0] ({ { { { {
otal Consumption (I) flaximum Consumption (I) verage Consumption (Veighted Average Consumption for Calcu (I)	n (I) (I/s) sumption (I) lation (I/s)	Quantity	1.25 1.25 1.25 0.88 1.25		Total Consumption (I) Maximum Consumption Average Consumption Weighted Average Con Consumption for Calc Other Fittings Waste Disposal Y/N	on (I) I (I/s) Insumption (I)	0 N] ({ { { { {
Total Consumption (I) Maximum Consumption (Verage Consumption (Veighted Average Consumption for Calcu Citchen Taps Tap Fitting Type	n (I) (I/s) sumption (I) lation (I/s)	Quantity (No.)	1.25 1.25 1.25 0.88 1.25		Total Consumption (I) Maximum Consumptic Average Consumption Weighted Average Con Consumption for Calc Other Fittings	on (I) (I/s) nsumption (I) ulation (I/s)] ({ { { { {
Total Consumption (I) Maximum Consumption (Verage Consumption (Veighted Average Consumption for Calculation of	(I/s) sumption (I) lation (I/s) Flow Rate Litres/Min	Quantity (No.)	1.25 1.25 1.25 0.88 1.25 Total per Fitting type 8.00		Total Consumption (I) Maximum Consumptic Average Consumption Weighted Average Cot Consumption for Calc Other Fittings Waste Disposal Y/N Water softner Consumption beyond	on (I) I (I/s) Insumption (I) I ulation (I/s) 4% I/p/d	N	
Total Consumption (I) Maximum Consumption (I) Maximum Consumption (I) Weighted Average Consumption for Calcu Consumption for Calcu Kitchen Taps Tap Fitting Type Kitchen Tap	(I/s) sumption (I) lation (I/s) Flow Rate Litres/Min 8.00	Quantity (No.)	1.25 1.25 1.25 0.88 1.25 Total per Fitting type 8.00		Total Consumption (I) Maximum Consumption Average Consumption Weighted Average Con Consumption for Calc Other Fittings Waste Disposal Y/N Water softner	on (I) I (I/s) Insumption (I) I ulation (I/s) 4% I/p/d	N	
Total Consumption (I) Ilaximum Consumption for Calcu	(I/s) sumption (I) lation (I/s) Flow Rate Litres/Min 8.00	Quantity (No.)	1.25 1.25 1.25 0.88 1.25 Total per Fitting type 8.00 0.00		Total Consumption (I) Maximum Consumptic Average Consumption Weighted Average Cot Consumption for Calc Other Fittings Waste Disposal Y/N Water softner Consumption beyond	on (I) on (I/s) ensumption (I) ulation (I/s) 4% I/p/d and harvest	N] (
Total Consumption (I) Aaximum Consumption (I) Aaximum Consumption (I) Average Consumption (I) Veighted Average Consumption for Calcu Kitchen Taps Tap Fitting Type Total No. of Fittings (Notational Flow (I/s) Maximum Flow (I/s)	(I/s) sumption (I) lation (I/s) Flow Rate Litres/Min 8.00	Quantity (No.)	1.25 1.25 1.25 0.88 1.25 Total per Fitting type 8.00 0.00 0.00 8.00 8.00		Total Consumption (I) Maximum Consumption Average Consumption Weighted Average Con Consumption for Calc Other Fittings Waste Disposal Y/N Water softner Consumption beyond Use of grey water Total Grey water from Total Availble Grey Wa	on (I) (I/s) nsumption (I) ulation (I/s) 4% I/p/d and harvest WHB taps (I)	ed rainwate]
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