





Outline Energy Statement St James Group Limited

Milton Keynes East

Final

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March 2021

DOCUMENT CONTROL RECORD

REPORT STATUS: FINAL

Version	Date	Reason for issue	Author	Checked by	Approved for Issue by Project Manager
v.1	12.03.21	Draft	J Peck	D Sinclair	D Sinclair
v.2	26.03.21	Final	J Peck	D Sinclair	D Sinclair
v.3	29.03.21	Final	J Peck		D Sinclair

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Executive Summary

The purpose of this Energy Statement is to demonstrate the ambition of St James Group Ltd for the Milton Keynes (MK) East site. It is anticipated that the site will be subject to advancing energy standards over time, with St James recognising the importance of considering these changes at the outset.

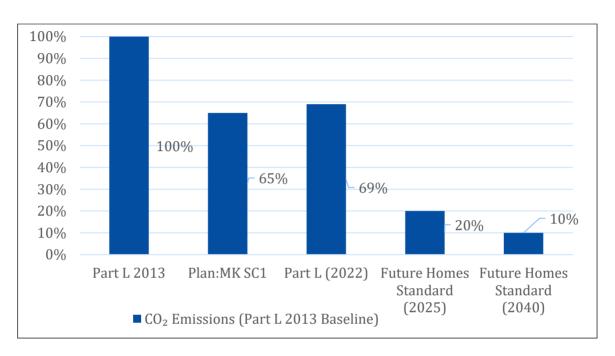
The site will deliver approximately 4,000 homes up to a maximum of 4,600, with the first predicted to be completed in 2024 and the last in 2048. A significant provision of non-residential space is also proposed, including schools, a community hub, and industrial units. During this prolonged build timeline, policies and regulations are expected to escalate, enabling low-carbon developments to be delivered and the impacts of climate change to be mitigated.

This Outline Energy Statement aims to ensure a standards-based approach is adopted, as well as accounting for a development timeline that is likely to span multiple changes in regulation and policy. As such, a prescriptive energy strategy to be adhered to across the site is not set out. Nonetheless, key future-proofing measures which will provide flexibility for the site to meet varying standards are set. For instance, no new home will be connected to the natural gas grid, with all heating requirements to originate from low or zero carbon sources. The most likely solution is the use of heat pumps, however alternatives may arise through future technological developments which later phases of the site could incorporate. Parameters for indicative specifications that are compliant with potential increases in standards are also provided, in order to demonstrate the long-term vision St James have for this site. Delivery against these potential standards with key future-proofing measures means an excellent level of energy performance will be obtained from the outset. Each development phase will detail a specific energy strategy through a Reserved Matters Energy Statement which intends to tie into the principles set out in this report.

The summary graph shown below outlines the improving carbon performance of a development complying with the escalating standards which are expected to come into effect. The presence of low or zero carbon heating in all homes should enable all initial MK East homes to significantly exceed the CO₂ reduction requirements of Policy SC1 of Plan:MK and the incoming Part L 2021 update (expected in 2022). For homes completed following the adoption of the Future Homes Standard (adoption planned for 2025) further uplifts in the build specification may be required. Indicative specifications have been used within this Energy Statement to provide an indication of the performance that could be achieved across these time periods.

Further regulatory and policy changes are anticipated into the 2030s. It is difficult to ascertain what these may be, however the Energy Statement does outline some possible directions these could take. The Summary Graph has added a potential carbon performance with the FHS specification but with BEIS 2040 CO_2 emission factors. Additionally, the site may look to explore a number of ambitious energy infrastructure concepts, which will be outlined within this report.

St James are keen to demonstrate their commitment to building in low and zero carbon principles from the outset at MK East. Recently introduced Berkeley Group science-based targets align with Milton Keynes' Sustainability Strategy, both of which commit to adopting measures which assist in limiting warming to 1.5°C (as set out in the Paris Climate Agreement, 2015).



Summary Graph: Enhancing Carbon Performance of Site

The Summary Table below demonstrates how the indicative specifications within this document will enable substantial reductions in CO_2 emissions beyond the current build standards, achieving all policy and Part L standards. For clarity, Part L 2021 calculations have utilised SAP 10.1 emission factors, with FHS calculations using BEIS 2030 projected emission factors. The BEIS 2040 factors are only illustrative for the Summary Graph. Any remaining site CO_2 emissions will be offset via the Councils offsetting fund, to be calculated at the time of each Reserved Matters application.

Summary Table: Site CO₂ Performance	e								
	Regula	ited	Total						
Residential									
Baseline (Part L 2013)	7,696,	400	13,777	,500					
	Part L (2021)	FHS (2025)	Part L (2021)	FHS (2025)					
Indicative Site Emissions	135,900	1,019,000	239,800	1,928,100					
	1,154,	900	2,167,900						
Reduction (%) over Baseline	85%	ó	84%						
	Non-Resider	itial							
Baseline (Part L 2013)	409,4	.00	1,365,	500					
	Part L (2021)	FHS (2025)	Part L (2021)	FHS (2025)					
Indicative Site Emissions	69,400	37,300	138,200	57,300					
	106,7	00	195,5	00					
Reduction (%) over Baseline	74%	6	86%	o o					



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1. INTRODUCTION

- 1.1 This Outline Energy Statement for the proposed development at the Milton Keynes East site has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development.
- 1.2 By considering energy and carbon emissions at this early concept stage and integrating them into the masterplan, a development and community with high levels of sustainability can be achieved. This document will consider appropriate measures which could be included in line with relevant adopted and emerging policies and regulations that will change over time.
- 1.3 The outline energy strategy for the site is to be formulated to address a number of key objectives:
 - > To ensure a close association with the Council's ambitious and developing climate initiatives for the full duration of the site's development. At the centre of this sits the aim of assisting limiting warming to 1.5°C through the application of a progressive agenda of energy and sustainability measures at MK East;
 - > To provide high-quality homes and non-residential spaces, taking into account specific site characteristics that link to the energy strategy, such as acoustics, thermal comfort, and air quality;
 - > To lock in low carbon design principles right from the beginning, in order to assist in the delivery of a rapidly evolving and diversifying set of standards (both regulatory and planning). The objective of this Outline Energy Statement is to provide a framework of standards and potential approaches, rather than to prescribe specific strategies;
 - > To ensure a resilient supply of low carbon and reasonably-priced energy is available to residents and businesses alike. Opportunities to utilise the site as a generator of clean power as well as a consumer will be investigated.
- 1.4 Policy and regulation for housing standards are currently changing. It is anticipated that over time there will be changes in technology and understanding which will result in changes to national and local requirements. To align with these requirements this development will build to the standards prevalent at the time of construction.
- 1.5 St James have also set a number of ambitious group sustainability targets. These will be set out within this report.
- By delivering to these tightening requirements as the site timeline progresses this will enable the development to contribute to the UK's commitment to reduce carbon emission by 100% (from a 1990 baseline) by 2050 as set out in the Climate Change Act (2008), as well as align with the UN's 1.5°C warming limit.



2. DEVELOPMENT OVERVIEW

Site Location

2.1 The proposed development site at Milton Keynes East is located to the north east of Milton Keynes town centre, as shown in Figure below.



Figure 1: Site Location - Map data © 2021 Google

Proposed Development

2.2 The proposed development is described as follows:

"Hybrid planning application encompassing: (i) outline element (with all matters reserved) for a large-scale mixed-use urban extension (creating a new community) comprising: residential development; employment including business, general industry and storage/distribution uses; a secondary school and primary schools; a community hub containing a range of commercial and community uses; a new

linear park along the River Ouzel corridor; open space and linked amenities; new redways, access roads and associated highways improvements; associated infrastructure works; and (ii) detailed element for strategic highway and multi-modal transport infrastructure, including: new road and redway extensions; a new bridge over the M1 motorway; a new bridge over the River Ouzel; works to the Tongwell Street corridor between Tongwell roundabout and Pineham roundabout including new bridge over the River Ouzel; alignment alterations to A509 and Newport Road; and associated utilities, lighting, earthworks and drainage works."

2.3 The proposed site layout is shown in the submitted Parameter Plans and Design and Access Statement.

3. RELEVANT PLANNING POLICY

3.1 The following planning policies and requirements have informed the sustainable design of the proposed development.

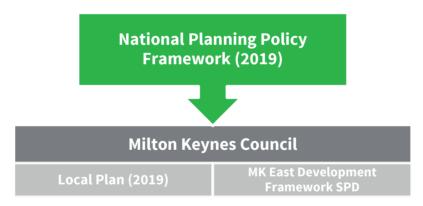


Figure 2: Relevant Planning Policy Documents

National Policy: NPPF

- 3.2 The revised National Planning Policy Framework (NPPF) was published on the 19th June 2019 and sets out the Government's planning policies for England.
- 3.3 The NPPF provides a framework for achieving sustainable development, which has been summarised as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Resolution 42/187 of the United National General Assembly). At the heart of the framework is a **presumption in favour of sustainable development**.



- 3.4 The document states that the planning system has three overarching objectives which are interdependent and need to be pursued in mutually supportive ways:
 - a) An economic objective to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
 - b) A social objective to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
 - c) An environmental objective to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Local Policy: Milton Keynes Council

Plan: MK Local Plan

- 3.5 Milton Keynes Council Local Plan document 'Plan:MK' was adopted in March 2019.
- The key requirement set out in **Policy SC1 Sustainable Construction** concerning energy carbon relates to clause K:
 - 'Development proposals for 11 or more dwellings and non-residential development with a floor space of 1,000 sqm or more will be required to submit an Energy and Climate Statement that demonstrates how the proposal will achieve the applicable requirements below:
 - 1. Achieve a 19% carbon reduction improvement upon the requirements within Building Regulations Approved Document Part L 2013, or achieve any higher standard than this that is required under new national planning policy or Building Regulations.
 - 2. Provide on-site renewable energy generation, or connection to a renewable or low carbon community energy scheme, that contributes to a further 20% reduction in the residual carbon emissions subsequent to (1) above.
 - 3. Make financial contributions to the Council's carbon offset fund to enable the residual carbon emissions subsequent to the (1) and (2) above to be offset by other local initiatives.

- 4. Calculate Indoor Air Quality and Overheating Risk performance for proposed new dwellings.
- 5. Implement a recognised quality regime that ensures the 'as built' performance (energy use, carbon emissions, indoor air quality and overheating risk) matches the calculated design performance of all dwellings in (4) above.
- 6. Put in place a recognised monitoring regime to allow the assessment of energy use, indoor air quality and overheating risk for 10% of the proposed dwellings for the first five years of their occupancy and ensure that the information recovered is provided to the applicable occupiers and the planning authority.'

3.7 Policy SC2 Community Heat Networks and Large Scale Renewable Energy Schemes states that:

- > Proposals for over 100 homes and non-residential developments of over 1,000 sqm will be expected to consider the integration of community energy networks in the development. This consideration should form part of development proposals and take into account the site's characteristics and the existing cooling, heat and power demands on adjacent sites.
- > All new developments in proximity of an existing or proposed combined heat and power (CHP), combined cooling, heat, and power (CCHP) station or local energy network will be expected to connect to the network unless it can be demonstrated that a better alternative for reducing carbon emissions can be achieved; heating and/or cooling loads of the scheme do not justify a CHP connection; or the cost of achieving this would make the proposed development unviable.

Milton Keynes East Development Framework SPD (2020)

The Milton Keynes East Development Framework was adopted in March 2020. The SPD provides guidance on how the allocated of Milton Keynes East within Plan:MK should be planned and developed. The site has been allocated to deliver around 5,000 new homes, 105 ha of employment land, a comprehensive transport network and supporting social and green infrastructure.

MK Sustainability Strategy (2019-2050)

- **3.9** Milton Keynes Council's Sustainability Strategy is the long-term vision to create a sustainable city which embraces innovation, creates high quality jobs and recognises it has a vital role in tackling the global challenges of climate change.
- **3.10** The main Sustainable Principles are:
 - > Green Energy Maximise the use of renewable energy, reducing carbon and providing resilience to the grid.
 - > Circular Economy Increasing the efficient use of resources to reuse materials, use less water and ensure the best use of land.



- > Low Emissions Reducing the level of emissions from transport, industry and agriculture and ensure clean air.
- 3.11 The strategy aligns its ambitions with the 1.5°C limiting warming target as defined by the UN (Paris Agreement, 2015).

Sustainable Construction SPD (Draft)

- 3.12 A consultation on the new Sustainable Construction SPD was ran though November and December 2020. An Adoption date is as of yet unclear, although it predominantly aims to build on the key energy and sustainability related policies set out in Plan:MK.
- **3.13** Further detail is provided on the carbon offsetting arrangements (Annex E). The proposed methodology is to include both regulated and unregulated CO₂ emissions, with a set one-off carbon price of £200 to apply to both residential and non-residential proposals.

4. PART L & BERKELEY TARGETS

Building Regulations (Part L)

Part L (2021)

- Building Regulations Part L 2013 currently sets the minimum requirements for new developments.
 However, a comprehensive update has been consulted upon and is due for introduction in 2022.
 This is prior to the first plots are expected to be started on at the proposed Milton Keynes East site.
- The Part L (2021) standard aims to future proof new dwellings for low-carbon heating systems and takes a significant step towards the proposed Future Homes standard. Key areas to address include the rapid decarbonisation of the electricity grid, and the corresponding inertia to do the same in the gas grid. This aligns with the Government's proposed intentions to seek for new dwellings not to be connected to the gas grid from 2025.
- 4.3 The baseline will represent a 31% improvement over the Part L 2013 baseline. In addition to the enhanced carbon and Fabric Energy Efficiency (FEE) targets, a Primary Energy metric will be introduced. This will ensure designers pay as much attention to energy as they do carbon.
- The new Part L will adopt an updated version of the Standard Assessment Procedure (SAP). The latest iteration is SAP 10.1 but there is expected to be a further update prior to adoption within the Building Regulations.

- 4.5 The emission factors within current Part L 2013 (SAP 2012) are no longer reflective of the proportion of renewable power flowing onto the grid. The updated emission factors will give a more accurate estimate of the carbon dioxide emissions of a development.
- **4.6** Table 1, below, shows how carbon emission factors are predicted to change over time, with a significant reduction in the electrical factor and very little movement in the gas factor.

Table 1: Carbon emission factors												
	SAP 2012	SAP 10.1	BEIS Predicted 2030	BEIS Predicted 2040	BEIS Predicted 2050							
Gas (kg.CO ₂ /kWh)	0.216	0.210	0.210	0.210	0.210							
Electricity (kg.CO ₂ /kWh)	0.519	0.136	0.083	0.041	0.028							

4.7 New homes will therefore benefit significantly from sourcing heating needs from the electricity grid. This is the current intention for all homes at the Milton Keynes East site, which aim to utilise highly efficiency heat pumps. For homes planned for the later phases, a role may develop for hydrogen should sufficient technological and economic progress occur at a national level. This will be kept under review as the site develops, but is considered too experimental to build into the energy strategy now.

Future Homes Standard (2025)

- 4.8 Only very limited information currently exists as to the uplift sought between the Part L (2021update and the Future Homes Standard in 2025. A sperate consultation is proposed in 2023. It is stated within the Part L (2021) consultation document that a 75-80% reduction in carbon emissions beyond the current Part L 2013 baseline is anticipated, which is a significant enhancement beyond the 31% reduction expected for Part L 2021 over Part L 2013.
- 4.9 Nonetheless, the current intention to seek for new dwellings not to connect to the gas grid from 2025 aligns with the adoption of the Future Homes Standard, as should be seen as a fulcrum of the standard. The proposed use of heat pumps for much of the site's heating needs will lock in substantial CO₂ reductions and ensure the Primary Energy demands are kept low.

Berkeley Group Standards

4.10 All developments, including Milton Keynes East, will aim to reduce their impact on climate change by achieving Berkeley Group's science-based targets. These have been developed to align with the same 1.5°C warming limiting target as is followed in the MK Sustainability Strategy. They include:



- > A 40% reduction in operational energy use by 2030 over a 2019 baseline (set to be the average Dwelling Emission Rate (DER) across the Berkeley Homes portfolio). This exceeds the requirements of Policy SC1 within Plan: MK, and as a result of the Part L updates is expected to be achieved well before 2030;
- > A 40% reduction in whole life carbon by 2030 over a calculated 2019 baseline;
- > All domestic appliances will achieve a minimum A to A++ energy efficiency rating.
- **4.11** Further Berkeley homes standards are set out within the accompanying Sustainability Statement.

Calculation Methodology

- 4.12 The estimated annual energy demand for dwellings has been calculated using Standard Assessment Procedure methodology (SAP). SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items. The unregulated energy demands for appliances and cooking are taken from BRE standard occupancy calculations.
- **4.13** Outputs have then been extracted and converted to align with the changing carbon emission factors as shown in Table 1. Part L (2021) calculations have been processed against the SAP 10.1 emission factors, with Future Homes Standard calculations against the BEIS 2030 predicted values. Attention has also been paid to performance against the new Primary Energy metric which is to be introduced.
- **4.14** Calculations have been performed on sample dwelling types from similar sites. These encompass an array of house and flats types which differ in orientation and take account of the impact of exposed floors, mid floors dwelling, and roof areas. The selected dwellings therefore represent a fair aggregation of the likely proposed unit mix.
- 4.15 The estimated annual energy demand for the proposed non-residential aspects has been calculated using Simplified Building Energy Model methodology. The unregulated energy demands for appliances and cooking are taken from additional SBEM output documents. A calculation process similar to that of the SAP outputs has been followed in order to understand the impact of future standards.
- 4.16 The indicative build timeline for the site envisages the vast majority of homes and non-residential spaces to be delivered after the planned introduction of the Future Homes Standard in 2025. It is worth noting that the Part L (2021) update incoming in 2022 was originally planned for 2020, so it would not be unreasonable to anticipate a similar delay in the adoption of a further enhancement in the shape of the Future Homes Standard. The calculations reflected within this report have thus assumed a breakdown as outlined in Table 2.

Table 2: Accommodation Split

	Part L (2021)	Future Homes Standard
No. of Homes	300	4,300
Non-Residential (m²)	14,500m ²	33,800m ²

4.17 It is acknowledged that as much of the site's timeline extends into the 2040s it is highly unlikely that the Future Homes Standard will remain the live regulatory standard by that point. Discussion as to how this could evolve is provided in Section 6 of this report, however calculations have not been undertaken on the basis that little information on this is available.

Baseline Emissions

4.18 A Part L (2013) baseline has been calculated for the homes and non-residential areas. The fuel factor (1.55 for electricity) as set out in SAP 2012 has been removed to allow for a clearer comparison with the site's potential emissions.

Table 3: Baseline Emissions

	Regulated	Total
	Residential	
Baseline (Part L 2013)	7,696,400	13,777,500
	Non-Residential	
Baseline (Part L 2013)	409,400	1,365,500



5. FUTURE-PROOFED DESIGN

- As outlined earlier, the scope of potential development for the site will result in a trajectory of changing energy standards across different build phases. The most appropriate approach given the substantial changes incoming, and the incomplete information currently available to exactly what some of these changes are, is for St James to embed key future-proofing principles into the design of all buildings. This retains flexibility for the site so that the most appropriate technology at the time of delivery can be provided to meet the changing policy and regulatory requirements.
- **5.2** Section 5 of this report outlines how St James will lay the groundwork for enhancing standards from the outset.

Build Form & Fabric Efficiency

- 5.3 The development of an energy efficient building can be assisted significantly by design fundamentals such as shape, complexity, and orientation. This is discussed within this section.
- 5.4 St James are conscious of the need to promote individual building aesthetics, in order to establish a site character and enhance social value, but to do so in such a way which does not encourage unnecessary construction complexity in the build form which could result in a loss in energy performance. Designs which unnecessarily increase the surface area of the thermal envelope or push for extensive or elaborate detailing would not be maximising the energy efficiency from the build form.
- The focus on not embedding an overly complex design will particularly assist in minimising heat losses from thermal bridges. In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges, which occur when highly conductive elements (e.g. metal studs) in the wall construction enable a low resistance escape route for heat. Some key starting points to ensure the design progresses on the right track from an early stage are set out below:
 - > Cantilevered balconies, where provided, are to be provided with structural thermal breaks;
 - > The insulation line is to be kept as continuous and unbroken as possible;
 - > Where highly conductive materials must penetrate the main insulation line for structural reasons, thermal pads will be utilised to mitigate heat transfer;
 - > No plot shall encounter significant insulation omissions, such as with exposed concrete floors or floor perimeters.
- 5.6 Bespoke modelling will be undertaken on key junction types such as window surrounds, balconies, parapets, and intermediate floors for all plot iterations. This will ensure an inadequate design does not become an inadequate junction.

- 5.7 Outline principles such as maximising passive solar gains through carefully orienting buildings and minimising expansive glazed areas on facades which benefit least from this will be considered from the outset. As a general rule of thumb expansive glazed areas are best reserved for southerly facing orientations, but with the provision of sufficient shading to counteract summer overheating. Passive solar gains effectively provide 'free' heat, which is particularly beneficial within the winter months, and thus reduces the demands on the building heating system.
- 5.8 High standards of fabric efficiency will be targeted in all buildings, with all element U-values exceeding the expected minimum performance standards in the respective Part L iterations which apply at the time of build. Indicative specifications have been used in this Outline Energy Statement, with the targeted U-values set out in the table below.

Part L (2021) **Future Homes** Standard Homes **External Walls** $0.18 \text{ W/m}^2.\text{K}$ $0.15 \text{ W/m}^2.\text{K}$ **Party Walls** $0.00 \text{ W/m}^2.\text{K}$ $0.00 \text{ W/m}^2.\text{K}$ **Ground Floors** $0.16 \, \text{W/m}^2.\text{K}$ $0.10 \text{ W/m}^2.\text{K}$ **Upper Floors (Exposed)** $0.10 \text{ W/m}^2.\text{K}$ $0.16 \, \text{W/m}^2.\text{K}$ **Roofs (Pitched)** $0.11 \, \text{W/m}^2.\text{K}$ $0.10 \text{ W/m}^2.\text{K}$ Roofs (Flat) $0.16 \text{ W/m}^2.\text{K}$ $0.10 \text{ W/m}^2.\text{K}$ Glazing $1.40 \text{ W/m}^2.\text{K}$ $1.20 \text{ W/m}^2.\text{K}$ **Non-Residential External Walls** $0.18 \text{ W/m}^2.\text{K}$ $0.12 \text{ W/m}^2.\text{K}$ **Ground Floors** $0.13 \text{ W/m}^2.\text{K}$ $0.10 \text{ W/m}^2.\text{K}$ Roofs (Flat) $0.16 \text{ W/m}^2.\text{K}$ $0.10 \text{ W/m}^2.\text{K}$ Glazing $1.40 \text{ W/m}^2.\text{K}$ $1.10 \text{ W/m}^2.\text{K}$

Table 4: Indicative Build Specifications

Heating

- In addition to high standards of fabric efficiency, St James are committed to the delivery of low carbon heating systems in all buildings. The technological development of heating systems is fast-paced, and as such it would be inappropriate to specify a specific type for the full site at this stage. St James nonetheless recognise the need to future-proof all buildings for the deployment of low carbon heating. All dwellings will therefore be provided with low temperature wet heating systems, and crucially no home shall be heated using natural gas.
- **5.10** Space within all plots for the location of a hot water cylinder will also be allowed for as a future-proofing measure.



Heat Pumps

- 5.11 The most likely heat source for the provision of low carbon heating in homes is air source heat pumps (ASHPs), and it is anticipated that at least in the initial years of the site this will be utilised in all homes. ASHPs are also expected to deliver the vast majority of heating needs to the non-residential spaces. In this way the decarbonisation progress of the grid is locked into the site from the beginning, with highly efficient heat pumps enabling a much greater CO₂ and Primary Energy performance than direct electric systems.
- ASHPs generate heat via compression of a refrigerant which has extracted ambient heat from the external air. The compressive action raises the temperature of the refrigerant and allows it to provide very efficient heating. The use of ground source heat pumps (GSHPs) will also be investigated, as certain benefits related to operational efficiencies could be demonstrable. However, these are more location specific than ASHPs and it may prove that the more complex and intrusive installation works mean it cannot be accommodated in most areas of the site. Each Reserved Matters energy strategy will determine this.
- 5.13 There are several variants of the ASHP set-up. The most conventional arrangement can be delivered either in a monobloc or split form, with the former housing all heat pump equipment (minus the hot water cylinder) in an outside unit and the latter requiring an additional unit internally as well.
- An exhaust air heat pump (EAHP) provides an alternative set-up to this arrangement. The central advantage of this system is that it requires no external plant, with all equipment housed within the home. EAHPs also act as a centralised ventilation system, removing the need to install a separate system for this. They are, however, a much more uncommon presence within the UK due to the more specialised nature of the equipment and limited supply chain. They would be unlikely to be used in houses or non-residential spaces, but may present an option in some flats were siting an external unit is proving difficult.
- 5.15 The images below represent the EAHP (on the left) and the more conventional monobloc/split systems (to the right). In both instances the internal units are relatively large. The EAHP has no external unit, however it does require the installation of ducting which may require additional ceiling space compared with other systems.





Figure 3: EAHP (e.g. NIBE) and split system (e.g. Daikin Alterma).

Heat Network

- The potential for a site heat network as per Policy SC2 will also be investigated. Whilst St James are aware of the role that heat networks have to play in the delivery of low carbon heating, it is important that their rollout is applied sensibly to those sites which would benefit clearly from this form of heat distribution. Typically, these are of medium to high density with a medium to high heat demand. This is because density brings efficiencies in both costs (capital and operational) and energy performance (large pipe runs increase heat losses).
- 5.17 Whilst the site will have a medium to high heat demand due to the number of buildings proposed, it will only have a low density. Most of the dwellings are expected to be houses, with the apartments only low-rise in nature. Heating demands will also be reduced by the excellent standards of energy efficiency across the site. Much of the non-residential provision is also industrial, with correspondingly low heating requirements. A heat network is therefore not considered to be appropriate for the whole site.



- 5.18 St James are nonetheless keen to stress that a heat network operating in the higher density community hub region of the site has not been ruled out. The most likely area would be central hub of the site, where the apartments are located close to two schools and a number of other commercial uses.
- 5.19 Importantly, it is reiterated that the provision of low temperature wet distribution systems in all dwellings across the site will not rule out the possibility of a heat network connection at a later date. Therefore, dwellings can be future-proofed both for low carbon heating and the possibility of a heat network. The appropriateness of the latter would be subject to an in-depth feasibility study to ensure residents would not be incurring unreasonable heating costs and that the network could be ran efficiently.

Ventilation & Air Tightness

- **5.20** The air tightness of the buildings will be greatly assisted by the build form and fabric efficiency principles which St James will embed into all designs. Ensuring a high level of air tightness is beneficial for the following reasons:
 - > Reduces heat loss as a result of draughts through gaps in the building fabric;
 - > Prevents infiltration of humidity from internal warm air into cooler external building fabric.
- 5.21 Often the greatest risk to a high level of air tightness in a building comes during construction, where e.g. fixings between fabric elements tend to result in the air tightness layer becoming compromised.St James will ensure close monitoring of site contractors to minimise this risk.
- 5.22 As the fabric efficiency standards improve further with time, it is also expected that air tightness will do the same. The table below outlines how this could be followed at MK East.

Table 5: Indicative Air Permeability Targets

	Part L (2021)	Future Homes Standard
Houses	5.0 m ³ /h.m ²	3.0 m ³ /h.m ²
Flats	3.0 m ³ /h.m ²	3.0 m ³ /h.m ²
Non-Residential	5.0 m ³ /h.m ²	2.0 m ³ /h.m ²

5.23 Mechanical Ventilation Heat Recovery (MVHR) is expected to be installed in all apartments. These systems will remove stale air and odours from kitchens and wet rooms, whilst retaining the heat within the home. The performance of these systems will be assisted by the higher levels of air tightness which are achievable in apartments.

- The provision of MVHR to houses will be investigated, however it may be determined that natural ventilation or decentralised mechanical extract ventilation (dMEV) could provide the ventilation needs more efficiently whilst still enabling the appropriate energy and carbon standards to be achieved.
- 5.25 Space within ceilings could be reserved in all houses to allow for centralised systems to be installed should it be shown to be beneficial in terms of energy and running cost savings. The indicative specification for FHS compliance in this report has assumed MVHR will be present for houses, but that it may not be required for Part L 2021 compliance.

Thermal Comfort

- 5.26 Minimising the risk of overheating is important so as to ensure that buildings are adapted to climate change and remain comfortable to occupy in the future. Principles identified through focusing on build form and thermal mass will prevent excesses heat building up in periods of extreme heat. Further measures are also to be considered to reduce any risk further still. An Overheating Mitigation Strategy report has also been undertaken for this application, outlining the framework within which this is considered. Further detail on thermal comfort can be found within this report, however a few examples which find relevance in the energy strategies have been set out as follows:
 - > Solar control glazing. A g-value of 0.45 has been assumed in the calculations for the homes in this Outline Energy Statement, with a g-value of 0.32 assumed for the non-residential spaces.
 Bespoke modelling will be undertaken as part of each Reserved Matters application to refine this value. Importantly, it is recognised that a balanced approach which ensures carbon and comfort are not siloed but instead work together needs to be followed. Ideally, this g-value should not be so low as to offset energy efficiency gains from the fabric specification (due to stilting passive winter heat gains), but should also not be so high as to result in uncomfortable summer conditions.
 - > Positioning of bedrooms. These are the most sensitive rooms to overheating risk, and so orienting them away from a southerly direction where possible will be investigated;
 - > Shading to a significant proportion of the windows from the presence of balconies for apartments. The balconies will provide solar shading during the summer months when the sun is high in the sky, but allow the beneficial winter solar gains when the sun is lower in the sky;
 - > High performance MVHR systems to all apartments will assist in background ventilation. Cross ventilation should be achievable in most houses;
 - > Openable windows to allow for purging of internal heat.
- **5.27** Separate mechanical cooling systems will only be considered if the combination of passive measures are insufficient to alleviate any overheating risk.



Renewables

- 5.28 The low carbon heating systems which are likely to be providing heating and hot water to all buildings will contribute a substantial renewables capacity to the site.
- 5.29 Photovoltaic (PV) panels may also be installed to appropriate roof spaces across the site to allow buildings to generate their own renewable power. This power could then have a variety of uses, including (but not limited to):
 - > Being used within the building at the time of generation;
 - > Being stored within the building, either through a mechanism (such as a PV diverter) which enables excess power to be stored as heat in the hot water cylinder, or through other means such as a battery. The stored energy would likely then be used later in that day when demand in the building was higher;
 - > Being sold to the mains grid, under the Smart Export Tariff scheme (or a similar arrangement).
- **5.30** The potential for using PV generation in other buildings on site is examined in Section 6.

Appliances & Smart Technology

- 5.31 It is expected that smart technology will play an increasing role in the efficient operation of future buildings. With an increasing number of devices coming with connectivity features, energy consumption can be managed more efficiently ensuring that wastage is minimised.
- 5.32 It is expected that smart technology will be increasingly integrated into domestic appliances. These could be coupled with time-of-use energy tariffs to enable energy consumption to occur at times when grid carbon content is low e.g. dishwashers running automatically during the night.
- 5.33 As technology advances, increasingly efficient appliances will be available to the market. By installing high efficiency appliances in dwellings e.g. induction hobs for cooking, unregulated energy demand (and the associated carbon emissions) will be reduced.
- 5.34 All white goods are expected to have high energy efficiency ratings that will reduce energy consumption. Berkeley Group have a target for all domestic appliances to achieve a minimum A to A++ energy efficiency rating.

Potential CO₂ Reductions

5.35 The table below outlines how the adoption of the indicative specifications would translate to savings in CO₂ emissions against the current Part L (2013) baseline. As outlined earlier, SAP 10.1 emission factors and BEIS 2030 projected factors have been used for the calculating the prospective

emissions reductions from the Part L (2021) and FHS specifications, respectively. Further detail on the calculations can be found in Appendices A, B, and C.

Regulated Total Residential Baseline (Part L 2013) 7,696,400 13,777,500 Part L (2021) FHS (2025) Part L (2021) FHS (2025) **Indicative Site Emissions** 135,900 1,019,000 239,800 1,928,100 1,154,900 2,167,900 Reduction (%) over Baseline 85% 84% **Non-Residential** Baseline (Part L 2013) 409,400 1,365,500 Part L (2021) FHS (2025) Part L (2021) FHS (2025) **Indicative Site Emissions** 69,400 37,300 138,200 57,300 106,700 195,500 Reduction (%) over Baseline 74% 86%

Table 6: Emissions Reductions

Offsetting

- 5.36 Any residual CO₂ emissions will be offset, in line with Policy SC1 and the draft Sustainable Construction SPD. The proposed methodology within the draft SPD is currently to include both regulated and unregulated CO₂ emissions, with a set one-off carbon price of £200 (indexed) to apply to both residential and non-residential proposals. This is to be calculated for each Reserved Matters energy strategy.
- 5.37 It should be noted that should any of the concepts raised in Section 6 be delivered, emissions reduced from these activities may show a reduction on-site equivalent to 100% (or more), therefore no longer requiring an offsetting contribution.

Employment Area

5.38 ASHPs have been highlighted as the most likely heating system for homes and most of the non-residential spaces on site. The exception to this is the treatment of the larger employment units on the southern edge of the development. These are very large spaces and are unlikely to require heating to the same comfort criteria as the other non-residential uses. It is therefore considered unsuitable for the installation of ASHPs to be responsible for meeting these differing heating requirements.



- 5.39 Large units of the type proposed at MK East are often only heated to temperatures sufficient to avoid condensation or frost problems. It is likely that these buildings would qualify for the low energy exemptions within Part L2A of the Building Regulations, meaning that the compliance metrics that the other non-residential spaces must achieve do not apply. The cleanest form of heating is the heat that is never generated in the first place, so the low heating needs of these buildings demonstrates an important low carbon principle.
- 5.40 Nonetheless, St James are aware of the other energy requirements that these buildings are likely to still have. Electrical demands from lighting and machinery are likely to be significant. Plant and lighting installations with high efficiencies and a strong track record of reliability will therefore be prioritised. The provision of rooflights covering up to 15% of the total roof area will assist in reducing lighting demands. Further natural lighting concepts such as translucent cladding are often provided on units of these types. Many of these aspects have been adopted on the nearby Magnitude 314 warehouse, which can be seen as the leading example of a net zero building of this type.
- 5.41 Where these units have accompanying office space, these areas will utilise low or zero carbon heating sources and meet the requirements of the applicable standards and policies at the time of build. Insulating standards for these areas are expected to be similar to those proposed for other non-residential buildings across the site. Any glazed areas will be specified appropriately to balance both energy and overheating considerations.
- 5.42 The provision of large roof spaces from these employment units also presents an opportunity to install sizeable arrays of PV panels, an opportunity St James fully intend to maximise by offering this endeavour to all prospective tenants. It is a central element of the energy strategy for these buildings that the roofspace is utilised as much as possible and actively contributes to the performance of the building. No usable area of the roof shall remain without some secondary purpose, either to act as a provider of natural light into the building or to house renewable generating plant. Because of this, it may be possible for these buildings to be not only operationally zero carbon, but possibly carbon negative.
- 5.43 Sophisticated energy monitoring of the units will allow for analysis of how energy is used following completion of the building. This will assist in minimising any performance gap identified and ensure users are interacting positively with the building.
- 5.44 It is recognised that a significant proportion of a buildings carbon emissions is linked to construction and the procurement of materials. The volume of cement and steelworks within buildings of this type requires particular attention, with St James committed to ensuring all design and construction practices can quantify embodied carbon effectively and provide methods of reducing this outlay. As an example of what can be done under strong leadership, the Magnitude 314 building was certified by the UKGBC as the first net zero carbon building for construction of its kind. Material passports were developed to enable the design team to track the sourcing of specification items as well as understanding the proportion of recycled content in them and how straightforward it would be to recycle them in future. Specialist sustainability champions were also appointed to ensure this was monitored throughout the design and build timescale.

6. CONCEPTS & LONG-TERM SCENARIOS

- The size and large timescales of the proposed development of the MK East site allow St James to appraise the feasibility of a number of ambitious infrastructural concepts. All concepts will require bespoke feasibility studies if considered to be taken further, however the fact that they have been raised and will be considered demonstrates the visionary thinking of St James for this site. It is worth stating that all Building Regulations and MK policy standards will be met at all stages of the build and do not depend on the presence of any of the concepts introduced in this section.
- This section will also outline a potential longer-term trajectory for the Part L standards, beyond the Future Homes Standard.

Concepts

6.3 From discussions within the project team and with Milton Keynes' sustainability officers, four concepts have emerged which may be explored in further detail as the site develops. This number should not be considered exhaustive, and St James will routinely evaluate opportunities for the site throughout the build programme.

Water Source Heat Pump & Biogas From Sewage Treatment Works

- 6.4 Located on the other side of the M1 Motorway to the site is the Cotton Valley sewage treatment works, ran by Anglian Water. The outflow water leaving the works is understood to be warmer than the water system it is discharged into. This therefore represents a potential opportunity to harness this waste heat via a water source heat pump (WSHP) and use it in nearby buildings, such as on the MK East site.
- engine(s) on the site may already be utilising at least some of this. Any CHP engine would be producing heat as part of its operation, and this heat may not be currently harnessed. This would therefore represent an additional opportunity to capture zero carbon heat for MK East. It is also unclear whether any installed engines are burning off all biogas from the treatment works, or whether a sizeable proportion is still being emitted. Additional CHP capacity could therefore be installed to provide both zero carbon electricity and more heat.
- A commercial benefit both to the MK East site and the treatment works could also be established if CHP electricity could be directed (via a private wire arrangement) to any installed WSHPs. Further information on the current installed plant, potential availability of additional biogas, and waste heat at the works has been requested from Anglian Water.



Depending on the capacity of heat that could be reliably extracted from the treatment works, this may prove to be the most feasible of the concepts set out in this chapter.

Hydrogen

- The potential use of hydrogen for heating has been brought into the public consciousness following its inclusion as a central component of the Government's 10 Point Plan (November 2020), which sets out a roadmap for bringing online cleaner energy and transport infrastructure.
- There are a number of very significant technical and commercial challenges which will need to be overcome before hydrogen can become a widely available heating fuel source. Even taking an optimistic view that they will be overcome with time, it is highly unlikely to be providing a significant contribution to heating UK buildings at any point in the 2020s.
- 6.10 At the scale of a closed microgrid for specific sites, it may present a more feasible option. A number of projects across the UK are running closed microgrids on an increased share of hydrogen in the overall gas mix. St James will monitor the progress of clean hydrogen deployment and will consider its inclusion in the site energy strategy at a point in time if a detailed case can be made for it. It is worth noting that it would cause compatibility difficulties with buildings which had already been delivered using heat pumps.

Wind Power

- 6.11 Wind power from large turbines (generally 1MW turbines upwards) provides the largest contribution to the UK renewables mix in terms of capacity and generation. Large turbines are also a more efficient form of generation than for instance PV panels, with capacity factors (actual generation over a prolonged time period vs maximum potential generation) for large turbines in the 30-40% range, compared to only 10-20% for PV panels. A 1MW turbine could be expected to generate around 3,000 MWh/yr, which could contribute up to 15% of the site's total energy requirements when fully built out (excluding transport). However, as a result of planning rules introduced from 2015 the uptake of onshore wind turbines has largely stopped, with almost all deployment now offshore.
- The size and proposals for the MK East site may present an opportunity to investigate the application of wind power on the site. Any installation would be sited away from homes, such as on or near the employment land close to the M1, in order to minimise visual impacts. Alternatively, St James could assist with installation of wind power at a more appropriate off-site location. Any prospective installation would be subject to detailed feasibility studies.

PV Generation - Surplus Supply

6.13 The application of PV panels across appropriate areas of the site will be assessed. The indicative specifications outlined in Section 5 do not require their inclusion for the Part L or MK policy targets to be met, with the likely use of heat pumps providing the significant energy and CO₂ savings needed. Nonetheless, further changes in standards may necessitate their use. Outside of the

- considerations of Part L and policy, other advantages could be realised with the installation of PV arrays. These could include energy security and running cost savings across wider utility needs.
- 6.14 The buying and selling of electricity is strictly regulated. As such it would be very challenging to implement a set-up where surplus electricity generated from PV arrays on commercial and communal roofspaces could be sold to individual dwellings. However, an opportunity to use this in landlord areas or to sell to other commercial customers at MK East may arise. St James will evaluate whether a case could be made for installing large arrays on communal or commercial roofspaces in order to enable this to occur.

Future Standards

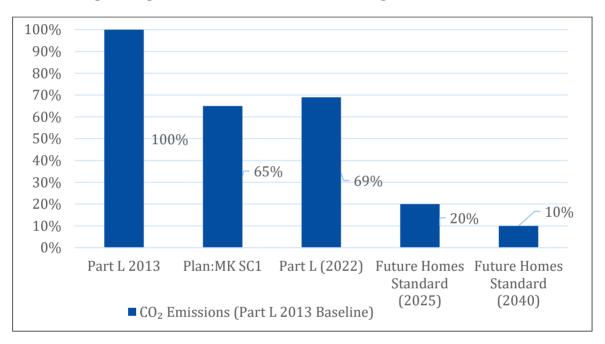
- 6.15 Whilst a pathway for the development of standards throughout the 2020s can be followed, the nature of further evolutions into the 2030s and 2040s are only speculative at this point. Changes in technologies and sciences may point both regulation and policy in a very different direction.
- 6.16 Nonetheless, it can be said that the principle of passive design is likely to remain a central element to whatever standards do emerge. The UK Green Building Council (UKGBC) have proposed a target of 15kWh/m²/yr for space heating demands in dwellings as a barometer of what a Zero Carbon home could be. This target is challenging, particularly in houses, and further enhancements beyond those outlined within the indicative Future Homes Standard specification in Section 5 would likely be required.
- 6.17 A consultation on incorporating the installation of electric vehicle (EV) charging points into the Building Regulations was also ran last year, with a response and update still awaited from this. Exemptions under certain criteria are permitted, however should this progress it is expected that the majority of homes at MK East would be required to be fitted with an EV charging point as part of the delivered home.



7. SUMMARY

- 7.1 The purpose of this Energy Statement is to demonstrate the ambition of St James Group Ltd for the Milton Keynes (MK) East site. It is anticipated that the site will be subject to advancing energy standards over time, with St James recognising the importance of considering these changes at the outset.
- 7.2 The site approximately 4,000 homes up to a maximum of 4,600, with the first predicted to be completed in 2024 and the last in 2048. A significant provision of non-residential space is also proposed, including schools, a community hub, and industrial units. During this prolonged build timeline, policies and regulations are expected to escalate, enabling low-carbon developments to be delivered and the impacts of climate change to be mitigated.
- 7.3 This Outline Energy Statement aims to ensure a standards-based approach is adopted, as well as accounting for a development timeline that is likely to span multiple changes in regulation and policy. As such, a prescriptive energy strategy to be adhered to across the site is not set out. Nonetheless, key future-proofing measures which will provide flexibility for the site to meet varying standards are set. For instance, no new home will be connected to the natural gas grid, with all heating requirements to originate from low or zero carbon sources. The most likely solution is the use of heat pumps, however alternatives may arise through future technological developments which later phases of the site could incorporate. Parameters for indicative specifications that are compliant with potential increases in standards are also provided, in order to demonstrate the long-term vision St James have for this site. Delivery against these potential standards with key future-proofing measures means an excellent level of energy performance will be obtained from the outset. Each development phase will detail a specific energy strategy through a Reserved Matters Energy Statement which intends to tie into the principles set out in this report.
- 7.4 The summary graph shown below outlines the improving carbon performance of a development complying with the escalating standards which are expected to come into effect. The presence of low or zero carbon heating in all homes should enable all initial MK East homes to significantly exceed the CO₂ reduction requirements of Policy SC1 of Plan:MK and the incoming Part L 2021 update (expected in 2022). For homes completed following the adoption of the Future Homes Standard (adoption planned for 2025) further uplifts in the build specification may be required. Indicative specifications have been used within this Energy Statement to provide an indication of the performance that could be achieved across these time periods.
- 7.5 Further regulatory and policy changes are anticipated into the 2030s. It is difficult to ascertain what these may be, however the Energy Statement does outline some possible directions these could take. The Summary Graph has added a potential carbon performance with the FHS specification but

- with BEIS 2040 CO₂ emission factors. Additionally, the site may look to explore a number of ambitious energy infrastructure concepts, which will be outlined within this report.
- 7.6 St James are keen to demonstrate their commitment to building in low and zero carbon principles from the outset at MK East. Recently introduced Berkeley Group science-based targets align with Milton Keynes' Sustainability Strategy, both of which commit to adopting measures which assist in limiting warming to 1.5°C (as set out in the Paris Climate Agreement, 2015).



Summary Graph: Enhancing Carbon Performance of Site

7.7 The Summary Table below demonstrates how the indicative specifications within this document will enable substantial reductions in CO₂ emissions beyond the current build standards, achieving all policy and Part L standards. For clarity, Part L 2021 calculations have utilised SAP 10.1 emission factors, with FHS calculations using BEIS 2030 projected emission factors. The BEIS 2040 factors are only illustrative for the Summary Graph. Any remaining site CO₂ emissions will be offset via the Councils offsetting fund, to be calculated at the time of each Reserved Matters application.



Summary Table: Site CO₂ Performance									
	Regula	ited	Total						
Residential									
Baseline (Part L 2013)	7,696,	400	13,777	,500					
	Part L (2021)	FHS (2025)	Part L (2021)	FHS (2025)					
Indicative Site Emissions	135,900	1,019,000	239,800	1,928,100					
	1,154,	900	2,167,900						
Reduction (%) over Baseline	85%	6	84%	.%					
	Non-Resider	ntial							
Baseline (Part L 2013)	409,4	00	1,365,	500					
	Part L (2021)	FHS (2025)	Part L (2021)	FHS (2025)					
Indicative Site Emissions	69,400	37,300	138,200	57,300					
	106,7	00	195,5	00					
Reduction (%) over Baseline	74%	6	86%	6					

APPENDICES

Appendix A

Part L 2021 & FHS Calculations

Appendix B

TER and DER Worksheets

Appendix C

SBEM BRUKL Outputs

Appendix A

Part L 2021 & FHS Calculations

Appendix B - Part L 20201 FHS Calculations

SAP & SBEM Outputs per Dwelling Type Part L 2021											
		Energy (kWh/yr)				Energy (kW	h/m²/yr)	Regulated CO:	kg/m2/yr)	Total CO₂ (kg/m2/yr)	
Description	Space Heating	Hot Water	Regulated Electrical	Unregulated Appliances & Cooking		TFEE	DFEE	TER (SAP 2012)	DER	TER (SAP 2012)	DER
			R	Residential							
1B2P MF ET	488	979	340	1,263		33.2	32.8	16.87	4.87	29.85	8.27
2B4P MF MT	581	1,108	482	1,825		33.4	32.2	15.00	4.04	27.97	7.44
3 Bed End	1,529	1,155	360	2,113		53.4	50.8	17.89	4.90	30.87	8.30
3B5P GF End	1,398	1,163	565	2,168		61.9	58.4	19.34	4.90	32.32	8.30
4 Bed Detached	2,890	1,234	487	3,500		60.1	56.4	16.70	4.48	29.68	7.88
4 Bed End Terrace	2,294	1,229	470	3,263		50.5	50.0	15.09	4.16	28.06	7.56
5 Bed Detached	4,368	1,254	595	5,175		61.0	57.8	15.36	4.08	28.34	7.48
			Nor	n-Residential							
Primary School	1.13	1.76	13.25	18.54				12.00	2.14	21.62	4.66
Retail	4.39	1.70	42.31	20.26				37.90	6.42	48.41	9.17
Pub	2.57	28.94	59.36	110.43				70.10	12.05	127.41	27.07
Office	4.86	0.68	22.45	42.19				19.00	3.71	40.90	9.45
Nursery	0.04	0.40	21.28	13.87				13.90	2.88	21.10	4.77
Large Retail	6.06	0.40	48.49	20.26				37.10	7.29	47.61	10.04
Health Centre	1.32	0.82	21.97	36.09				19.30	3.20	38.03	8.11
Gym	1.50	0.00	55.64	84.60				30.20	7.58	74.11	19.08

Site Calculations Part L 2021													
				Energy (kWh/yr)			Energy (k)	Wh/yr)	Regulated C	CO ₂ (kg/yr)	Total CO ₂ (I	kg/m2/yr)
Description	Unit Area (m2)	No. Units	Space Heating	Hot Water	Regulated Electrical	Unregulated Appliances & Cooking		TFEE	DFEE	TER	DER	TER	DER
	Residential												
1B2P MF ET	51	39	19,113	38,328	13,320	49,402		65,646	64,816	33,338	9,623	58,978	16,342
2B4P MF MT	73	59	34,076	65,026	28,267	107,120		143,155	138,013	64,267	17,322	119,862	31,890
3 Bed End	85	91	139,581	105,480	32,891	192,880		412,070	392,242	138,046	37,802	238,151	64,033
3B5P GF End	87	16	22,799	18,956	9,211	35,340		87,501	82,483	27,344	6,931	45,685	11,738
4 Bed Detached	140	36	103,669	44,256	17,473	125,543		301,807	283,226	83,883	22,494	149,040	39,568
4 Bed End Terrace	131	26	59,845	32,072	12,253	85,109		171,886	170,149	51,358	14,167	95,529	25,742
5 Bed Detached	207	33	142,450	40,875	19,389	168,750		411,818	390,420	103,703	27,569	191,284	50,519
TOTAL (Residential)			521,531	344,993	132,803	764,144		1,593,881	1,521,348	501,939	135,909	898,530	239,832
Area Weighted Average (/m2)								52.1	49.8	16.42	4.45	29.4	7.8
Improvement over Target								4.69	6	72.9	9%	73.3	3%
					Noi	n-Residential		-	·		•		
Primary School		3,000	3,390	5,280	39,750	55,620				36,000	6,420	64,867	13,985
Retail		2,000	8,780	3,400	84,620	40,520				75,800	12,836	96,830	18,346
Pub		1,000	2,570	28,940	59,360	110,430				70,100	12,049	127,413	27,068
Office		2,000	9,720	1,360	44,900	84,380				38,000	7,423	81,793	18,899
Nursery		2,000	80	800	42,560	27,740				27,800	5,760	42,197	9,533
Large Retail		1,500	9,090	600	72,735	30,390				55,650	10,930	71,422	15,063
Health Centre		2,000	2,640	1,640	43,940	72,180				38,600	6,394	76,061	16,210
Gym		1,000	1,500	0	55,640	84,600				30,200	7,577	74,107	19,082
TOTAL (Non-Residential)			37,770	42,020	443,505	505,860				372,150	69,389	634,691	138,186
Area Weighted Average (/m2)										25.67	4.79	43.8	9.5
provement over Target									81.4	1%	78.2	2%	

SAP & SBEM Outputs per Dwelling Type - BEIS 2030 (F	uture Homes Sta	ndard)									
			kWh/yr)			Energy (kW	h/m²/yr)	Regulated CO	02 (kg/m2/yr)	Total CO₂ (kg/m2/yr)	
Description	Space Heating	Hot Water	Regulated Electrical	Unregulated Appliances & Cooking		TFEE	DFEE	TER (SAP 2012)	DER	TER (SAP 2012)	DER
Residential											
1B2P MF ET	329	979	340	1,263		33.2	27.3	16.87	2.71	29.85	4.78
2B4P MF MT	417	1,108	482	1,825		33.4	27.4	15.00	2.28	27.97	4.36
3 Bed End	892	1,155	589	2,113		53.4	39.7	17.89	2.59	30.87	4.66
3B5P GF End	1,112	1,163	565	2,168		61.9	46.8	19.34	2.72	32.32	4.79
4 Bed Detached	1,648	1,234	955	3,500		60.1	45.6	16.70	2.27	29.68	4.35
4 Bed End Terrace	1,245	1,229	920	3,263		50.5	41.4	15.09	2.16	28.06	4.23
5 Bed Detached	2,517	1,254	1,170	5,175		61.0	47.6	15.36	1.98	28.34	4.06
			No	n-Residential							
Schools	0.62	1.76	11.24	18.54				12.00	1.10	21.62	1.70

Site Calculations BEIS 2030 (Future Homes Standard)													
			Energy (kWh/yr)				Energy (kWh/yr)		Regulated CO₂ (kg/yr)		Total CO₂ (kg/m2/yr)		
Description	Unit Area (m2)	No. Units	Space Heating	Hot Water	Regulated Electrical	Unregulated Appliances & Cooking		TFEE	DFEE	TER	DER	TER	DER
Residential													
1B2P MF ET	51	561	184,417	549,363	190,916	708,098				477,845	76,750	845,348	135,522
2B4P MF MT	73	841	350,790	932,035	405,159	1,535,380				921,162	140,103	1,718,024	267,539
3 Bed End	85	1309	1,167,784	1,511,886	770,782	2,764,620				1,978,665	286,388	3,413,503	515,851
3B5P GF End	87	234	259,972	271,700	132,031	506,535				391,931	55,087	654,822	97,130
4 Bed Detached	140	514	847,360	634,333	491,167	1,799,457				1,202,323	163,747	2,136,241	313,102
4 Bed End Terrace	131	374	465,606	459,700	343,813	1,219,891				736,131	105,337	1,369,254	206,588
5 Bed Detached	207	467	1,176,193	585,877	546,673	2,418,750				1,486,409	191,626	2,741,740	392,382
TOTAL (Residential)			4,452,121	4,944,894	2,880,542	10,952,731				7,194,466	1,019,037	12,878,933	1,928,114
Area Weighted Average (/m2)										235.38	33.34	421.4	63.1
Improvement over Target										85.8%		85.0%	
Non-Residential Non-Residential													
Schools	33800		20,956	59,488	379,912	626,652				405,600	37,254	730,832	57,328
TOTAL (Non-Residential)			20,956	59,488	379,912	626,652				405,600	37,254	730,832	57,328
Area Weighted Average (/m2)										12.00	1.10	21.6	1.7
Improvement over Target			·					90.8%		8%	92.2%		



Appendix B

TER and DER Worksheets

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



Property Reference	3B5P GF End				Issued on Date	16/03/2021						
Assessment Reference	2			Prop Type Ref								
Property	x, Balham, SW12 0JH	x, Balham, SW12 0JH										
SAP Rating	83 B	DER	18.71	TER	28.53							
Environmental	85 B	% DER <ter< th=""><th></th><th colspan="4">34.42</th></ter<>		34.42								
CO ₂ Emissions (t/y	1.31	DFEE	58.35	TFEE	61.90							
General Requirem	Pass	% DFEE <tfe< th=""><th>E</th><th colspan="5">5.75</th></tfe<>	E	5.75								
Assessor Details	-	r. Jonathan Peck, Jonathan Peck, Tel: 02036031622, nathan@hodkinsonconsultancy.com										
Client												





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

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DWELLING AS DESIGNED		
Ground-floor flat, total floor area 87	m²	
This report covers items included with		
It is not a complete report of regulat:		
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (The Carbon Dioxide Emission Rate)		
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) Dwelling Fabric Energy Efficiency (DFE	E)58.3 kWh/m²/yrOK	
2 Fabric U-values		
Element Average External wall 0.18 (max. 0.30)	Highest 0.18 (max. 0.70) OK	
Party wall 0.00 (max. 0.20)	0.18 (max. 0.70) OK - OK	
Floor 0.16 (max. 0.25)	0.16 (max. 0.70) OK	
Roof (no roof) Openings 1.36 (max. 2.00)	1.40 (max. 3.30) OK	
2a Thermal bridging		
	r thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
4 Heating efficiency	Wash and of the control of the contr	_
Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electri	.C
MICSUDISHI BOODAN SKW TOHE WOOVIN BO		
Secondary heating system:		
	None	
5 Cylinder insulation		
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control	OK OK
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ОК ОК ОК
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-end Minimum 8 Mechanical ventilation Continuous supply and extract system	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100%	OK OK
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-endminimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.60 1.5	OK OK
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: 7 Low energy lights Percentage of fixed lights with low-endinimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MYHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North: Windows facing North East:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.60 1.5 88% 70% Slight Average 6.48 m², No overhang 5.51 m², No overhang	OK OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: 7 Low energy lights Percentage of fixed lights with low-end minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overshading: Windows facing North: Windows facing North East: Windows facing North West:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.60 1.5 88% 70% Slight Average 6.48 m², No overhang 5.51 m², No overhang 7.42 m², No overhang	OK OK OK OK
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5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-endinimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MVHR efficiency: Minimum: 9 Summertime temperature Overshading: Windows facing North: Windows facing North: Windows facing North East: Windows facing North West: Air change rate: Blinds/curtains: 10 Key features Party wall U-value	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.60 1.5 88% 70% Slight Average 6.48 m², No overhang 5.51 m², No overhang 7.42 m², No overhang 3.00 ach Light-coloured curtain or roller blind, closed 1	OK
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AD 2012 MODICAL					9 92 Tanua								
AP 2012 WORKS					9.92, Januar NCE 09 3	ry 2014) Jan 2014 							
. Overall dwel													
round floor								Area (m2) 86.7000		ey height (m) 2.5000	(2b) =	Volume (m3) 216.7500	
otal floor are welling volume)+(1b)+(1c	e) + (1d) + (1e)(1n)	8	86.7000		(3a)+(3b)+(3c)+	+(3d)+(3e)	(3n) =	216.7500	(4) (5)
. Ventilation													
					main	se	econdary		other	tot	al m	3 per hour	
umber of chimu					heating 0 0	+ +	heating 0 0	+	0 = 0		0 * 40 = 0 * 20 =	0.0000	
umber of inter umber of passi	rmittent fan ive vents				-				-		0 * 10 = 0 * 10 =	0.0000	(7a) (7b)
umber of flue	less gas fir	es									0 * 40 = Air change	0.0000	
nfiltration du ressure test		ys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				0.0000) / (5) =	0.0000 Yes	(8)
easured/design nfiltration ra umber of sides	ate											3.0000 0.1500 2	
helter factor			11-2:	F					(20) = 1 -			0.8500	(20)
nfiltration ra	ate adjusted	to includ	e snelter	iactor					(21	1) = (18)	x (20) =	0.1275	(21)
ind speed ind 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	
ind ractor dj infilt rate		0.1594	0.1562	0.1403	0.1371	0.9500	0.9500	0.9250		0.1371	0.1434	1.1750 0.1498	
Balanced mecha			h heat rec	overy									
			ciency in	% allowing	for in-use fa	actor (from	Table 4h)	=				0.5000	
f balanced wit			ciency in	% allowing 0.2663	for in-use fa	actor (from	n Table 4h)	0.2439	0.2535	0.2631	0.2694	0.5000 74.8000 0.2758	(23c)
f balanced wit	th heat reco	very: effi							0.2535	0.2631	0.2694	74.8000	(23c)
f balanced wit	0.2886	0.2854	0.2822						0.2535	0.2631	0.2694	74.8000	(23c)
f balanced wit	0.2886	0.2854	0.2822 er	0.2663	0.2631	0.2471		0.2439	0.2535 A x I		0.2694 «-value	74.8000	(23c) (25)
f balanced with ffective ac	0.2886	0.2854	0.2822 er	0.2663	0.2631	0.2471 Net	0.2471 	0.2439 U-value W/m2K 1.0000	A x t W/F 2.2000	J F		74.8000 0.2758	(23c) (25)
f balanced with ffective ac . Heat losses lement grape 1 pening Type 2 loor 1	0.2886	0.2854	0.2822 er	0.2663	0.2631 Openings	0.2471 Net 2. 19,86.	0.2471 	0.2439 U-value W/m2K	A x T W/F 2.200 25.733 13.872 7.936	J F	(-value	74.8000 0.2758 A x K	(23c) (25)
f balanced with ffective ac	0.2886 0.2886 and heat lo (Uw = 1.40) of external	very: effi 0.2854	0.2822	0.2663 	0.2631 Openings m2	0.2471 Net 2. 19. 86. 44. 50.	0.2471	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800	A x t W/f 2.2000 25.7330 13.8720 7.9362 9.0900	J F	(-value	74.8000 0.2758 A x K	(23c) (25) (25) (26) (27) (28a) (29a) (29a) (29a) (31)
f balanced with ffective ac	0.2886 0.2886 and heat lo (Uw = 1.40) of external ss, W/K = Su	very: effi 0.2854	0.2822	0.2663 0.2663 Gross m2	0.2631 Openings m2	0.2471 Net 2. 19 86. 44 50. 202.	0.2471	U-value W/m2K 1.0000 1.3258 0.1600 0.1800	A x t W/f 2.2000 25.7330 13.8720 7.9362 9.0900	J F C O O O O O O O O O O O O O O O O O O	(-value	74.8000 0.2758 A x K	(23c) (25) (26) (27) (28a) (29a) (29a)
f balanced with ffective ac	of external ss, W/K = Su	0.2854 0.2854 ss paramet elements m (A x U) IP = Cm / T	0.2822 er 	0.2663 Gross m2 65.7000 50.5000	0.2631 	0.2471 Net 2. 19 86. 44 50. 202.	0.2471 Carea m2 2.2000 4.4100 7000 0.9000 0.9000 (.26)(:7000	0.2439 U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32)	A x t W// 2.2000 25.733(13.872(7.9362 9.0900	J F C O O O O O O O O O O O O O O O O O O	(-value	74.8000 0.2758 A x K kJ/K	(23c) (25) (25) (26) (27) (28a) (29a) (31) (33) (32) (32b) (35)
f balanced with ffective ac	of external ss, W/K = Su larameter (TMM s (Sum(L x Peat loss	. elements m (A x U) P = Cm / T esi) calcul	0.2822 eer Aum(A, m2) FA) in kJ/sated using	0.2663 Gross m2 65.7000 50.5000	0.2631 Openings m2 21.6100	0.2471 Net 2. 19 86. 44 50. 202.	0.2471 Carea m2 2.2000 4.4100 7000 0.9000 0.9000 (.26)(:7000	0.2439 U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32)	A x t W// 2.2000 25.733(13.872(7.9362 9.0900	J F F C C C C C C C C C C C C C C C C C	(-value	74.8000 0.2758 A x K kJ/K	(23c) (25) (25) (26) (27) (28a) (29a) (29a) (31) (33) (32b) (35) (35) (36)
f balanced with ffective ac . Heat losses lement pening Type 1 pening Type 2 loor 1 xternal heltered otal net area abric heat los arty arty Ceiling 1 hermal mass potential fabric heat los arty arty ceiling 1 hermal mass potential fabric heat los arty arty ceiling 1 hermal mass potential fabric heat los arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss are considered as a considered arty ceiling 1 hermal mass potential fabric heat loss are considered as a considered arty ceiling 1 hermal mass potential fabric heat loss are considered as a considered arty ceiling 1 hermal mass potential fabric heat loss are considered as a considered arty ceiling 1 hermal mass potential fabric heat loss are considered as a considered arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric heat loss arty arty ceiling 1 hermal mass potential fabric hermal mass	of external ss, W/K = Su larameter (TM seat loss at loss calc Jan	0.2854 0.2854 ss paramet elements m (A x U) IP = Cm / T si) calcul	0.2822 Aum(A, m2) FA) in kJ/mated using sthly (38)m Mar	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr	0.2631 Openings m2 21.6100	0.2471 Net 2. 19, 86. 44, 50, 202. 23. 86.	0.2471 CArea m2 2.2000 4.4100 7.000 0.9000 (26)(3.7000 7.000 Jul	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32) 0.0000	A x t W/F 2.2000 25.733 13.872 7.936 9.090 = 58.8312 0.0000	J P	<pre>%-value kJ/m2K + (36) = Nov</pre>	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996	(23c) (25) (25) (26) (27) (28a) (29a) (31) (33) (32) (32b) (35) (36) (37)
f balanced with ffective ac	of external ss, W/K = Su larameter (TM s (Sum(L x Peat loss at loss calc Jan 20.6402 coeff 95.9397	o.2854 o.2854 ss paramet elements m (A x U) IP = Cm / T rsi) calcul	0.2822 Aum(A, m2) FA) in kJ/iated using	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (0.2631 Openings m2 21.6100	0.2471 Net 2. 19, 86, 44, 50, 202. 23, 86.	0.2471 Area m2 2000 4100 7000 9000 (26)(37000 7000	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 0.0000	A x t W/Y 2.200 25.733 13.872 7.936 9.090 = 58.8312 0.0000	J F (33)	<pre>(-value kJ/m2K + (36) =</pre>	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277	(23e) (25) (25) (26) (27a) (29a) (29a) (31) (33b) (32) (33b) (37) (38) (39)
f balanced with ffective ac Heat losses Heat losses lement Bear for the feet abric heat los darty arty Ceiling hermal mass pubermal bridge otal fabric he feet loss says hermal bridge otal fabric he dentilation he says says me eat transfer contacts says say	of external ss, W/K = Su larameter (TM s (Sum(L x Peat loss at loss calc Jan 20.6402 coeff 95.9397	elements m (A x U) P = Cm / T si) calcul culated mon Feb 20.4122	0.2822 Aum(A, m2) FA) in kJ/iated using ithly (38)m Mar 20.1842	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438	0.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158	0.2471 Net 2. 19, 86, 44, 50, 202, 23, 86.	0.2471 Area m2 2000 4100 7000 9000 (26)(37000 7000 Jul 17.6762	U-value W/m2K 1.0000 0.18258 0.1600 0.1800 0.1800 0.0000 Aug 17.4482 92.7478	A x t W/Y 2.2000 25.7333 13.8720 7.9362 9.0900 = 58.8312 0.00000 Sep 18.1322 93.4318	J F ())))))))))))))))))	<pre>(-value kJ/m2K + (36) = Nov 19.2722</pre>	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868	(23e) (25) (25) (26) (27a) (29a) (29a) (31) (33b) (32) (33b) (37) (38) (39)
f balanced with ffective ac . Heat losses selement pening Type 1 pening Type 2 loor 1 xternal heltered otal net area abric heat los arty arty Ceiling 1 hermal mass penemal bridges otal fabric he entilation hee as 38) m eat transfer coverage = Sum(1)	of external six W/K = Su (IW = 1.40) of external six, W/K = Su (IW = Su (IW = IV =	elements m (A x U) P = Cm / T si) calcul	0.2822 Aum (A, m2) FA) in kJ/mated using withly (38)m Mar 20.1842 95.4837	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442	0.2631 Openings m2 21.6100) 25)m x (5) May 18.8162	0.2471 Net 2. 19, 86. 44, 50. 202. 23. 86. Jun 17.6762 92.9758	0.2471 CArea m2 2000 4100 7000 9000 (26)(37000 7000 7000 7000 7000 7000 7000 700	0.2439 U-value W/m2k 1.0000 1.3258 0.1600 0.1800 0.1800 0.1800 0.0000	A x t W/Y/ 2,2000 25.7330 13.872C 7.9362 9.0900 = 58.8312 0.00000 Sep 18.1322 93.4318	J F ())))))))))))))))))	<pre>%-value kJ/m2K + (36) = Nov 19.2722 94.5717</pre>	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277	(23e) (25) (25) (27) (28a) (29a) (32) (32) (32b) (35) (36) (37) (38) (39) (39) (39) (39)
f balanced with ffective ac . Heat losses selement pening Type 1 pening Type 2 loor 1 xternal heltered otal net area abric heat los arty arty Ceiling 3 hermal bridges otal fabric he entilation hed 38) m eat transfer coverage = Sum(3 LP LP (average)	of external ss, W/K = Su arameter (TM s (Sum(L x Peat loss at loss calc Jan 20.6402 coeff 95.9397 39) m / 12 = Jan	. elements m (A x U) IP = Cm / Trisi) calcul sulated mon Feb 20.4122 95.7117	0.2822 Aum(A, m2) FA) in kJ/s ated using thly (38)m Mar 20.1842 95.4837	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438 Apr	0.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May	0.2471 Net 2. 19. 86. 44. 50. 202. 23. 86. Jun 17.6762 92.9758	0.2471 CArea m2 2000 4100 7000 9000 (26)(3 7000 7000 Jul 17.6762 92.9758 Jul	U-value W/m2K 1.0000 0.1800 0.1800 0.1800 0.0000 Aug 17.4482 92.7478	A x t W/Y/ 2.200(25.733(13.872(7.936; 9.090(= 58.8312 0.000(Sep 18.1322 93.4318	(33) Oct 18.8162 94.1158	<pre>(-value kJ/m2K + (36) = Nov 19.2722 94.5717 Nov</pre>	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0961 1.0875	(23e) (25) (25) (27) (28a) (29a) (32) (32) (32b) (35) (36) (37) (38) (39) (39) (39) (39)
f balanced with ffective ac . Heat losses selement pening Type 1 pening Type 2 loor 1 xternal heltered otal net area abric heat los arty arty Ceiling 3 hermal bridges otal fabric he entilation hed 38) m eat transfer coverage = Sum(3 LP LP (average)	and heat lo O.2886 (Uw = 1.40) of external ss, W/K = Su arameter (TM s (Sum(L x Peat loss calc Jan 20.6402 coeff 95.9307 39)m / 12 = Jan 1.1066	elements m (A x U) P = Cm / T si) calcul ulated mon Feb 20.4122 95.7117 Feb 1.1039	0.2822 Aum(A, m2) FA) in kJ/i ated using thly (38)m Mar 20.1842 95.4837 Mar 1.1013	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438 Apr 1.0882	O.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May 1.0855	0.2471 Net 2. 19. 86. 44. 50. 202. 23. 86. Jun 17.6762 92.9758 Jun 1.0724	0.2471 Area m2 2000 4100 7000 0900 (26)(37000 7000 Jul 17.6762 92.9758 Jul 1.0724	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 0.0000 Aug 17.4482 92.7478 Aug 1.0698	A x t W/Y/ 2.200(25.733(13.872(7.936; 9.090(= 58.8312 0.000(Sep 18.1322 93.4318	(33) Oct 18.8162 94.1158 Oct 1.0855	+ (36) = Nov 19.2722 94.5717 Nov 1.0908	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0961 1.0875	(23e) (25) (25) (26) (27) (28a) (29a) (29a) (33) (32) (33) (32) (35) (36) (37) (38) (39) (39) (39) (40) (40)
f balanced with ffective ac . Heat losses lement pening Type 1 pening Type 2 loor 1 external heltered ottal net area abric heat los arty arty Ceiling 1 hermal mass paternal bridges otal fabric he entilation her as 188 m eat transfer overage = Sum (1 LP LP (average) ays in month	of external ss, W/K = Su larameter (TM seat loss at loss calc Jan 20.6402 coeff 95.9397 39)m / 12 = Jan 1.1066	elements m (A x U) P = Cm / Tsi) calcul rulated mon Feb 20.4122 95.7117 Feb 1.1039	0.2822 Aum(A, m2) FA) in kJ/i ated using ithly (38)m Mar 20.1842 95.4837 Mar 1.1013	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438 Apr 1.0882	0.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May 1.0855	0.2471 Net 2. 19. 86. 44. 50. 202. 23. 86. Jun 17.6762 92.9758 Jun 1.0724	0.2471 Area m2 2000 4100 7000 0900 5000 9000 (26)(37000 7000 Jul 17.6762 92.9758 Jul 1.0724	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32) 0.0000 Aug 17.4482 92.7478 Aug 1.0698	A x t W/Y/ 2.200(25.733(13.872(7.936; 9.090(= 58.8312 0.000(Sep 18.1322 93.4318	(33) Oct 18.8162 94.1158 Oct 1.0855	+ (36) = Nov 19.2722 94.5717 Nov 1.0908	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0961 1.0875	(23e) (25) (25) (26) (27) (28a) (29a) (29a) (33) (32) (33) (32) (35) (36) (37) (38) (39) (39) (39) (40) (40)
f balanced with ffective ac . Heat losses .	of external ss, W/K = Su (Uw = 1.40) of external ss, W/K = Su (I x Peat loss at loss calc Jan 20.6402 coeff 95.9397 39) m / 12 = Jan 1.1066 31	o.2854 o.2854 elements m (A x U) P = Cm / T si) calcul culated mon feb 20.4122 95.7117 Feb 1.1039 28	0.2822 Aum(A, m2) PFA) in kJ//ated using thly (38)m Mar 20.1842 95.4837 Mar 1.1013 31	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (. Apr 19.0442 94.3438 Apr 1.0882	O.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May 1.0855 31	0.2471 Net 2. 19, 86, 44, 50, 202. 23, 86. Jun 17.6762 92.9758 Jun 1.0724 30	0.2471 CArea m2 22000 4100 7000 9000 (26)(3 7000 7000 Jul 17.6762 92.9758 Jul 1.0724 31	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32) 0.0000 Aug 17.4482 92.7478 Aug 1.0698	A x t W/Y/ 2.200(25.733(13.872(7.936; 9.090(= 58.8312 0.000(Sep 18.1322 93.4318	(33) Oct 18.8162 94.1158 Oct 1.0855	+ (36) = Nov 19.2722 94.5717 Nov 1.0908	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0875 31	(23e) (25) (25) (26) (27) (29a) (29a) (29a) (31) (33b) (35) (36) (37) (38) (39) (39) (39) (40) (40) (41)
f balanced with ffective ac . Heat losses lement pening Type 1 pening Type 2 loor 1 xternal heltered otal net area abric heat los arty arty Ceiling 1 hermal mass posternal bridges otal fabric he entilation her as 38) m eat transfer (verage = Sum() LP LP (average) ays in month . Water heatingssumed occupants	of external ss, W/K = Su I arameter (TM s (Sum(L x P eat loss at loss calc Jan 20.6402 coeff 95.9397 39)m / 12 = Jan 1.1066 31	elements m (A x U) P = Cm / Tsi) calcul rulated mon Feb 20.4122 95.7117 Feb 1.1039 28 quirements	0.2822 Aum(A, m2) FA) in kJ/i ated using ithly (38)m Mar 20.1842 95.4837 Mar 1.1013 31	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438 Apr 1.0882 30	0.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May 1.0855	Jun 17.6762 92.9758	0.2471 Area m2 2000 4100 7000 9000 (26)(37000 7000 Jul 17.6762 92.9758 Jul 1.0724	0.2439 U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 0.01800 1.3258 0.1600 1.3258 0.1600 1.3258 0.1600 1.3258 0.1600 1.3258 0.1600 30) + (32) 0.0000	A x t W/Y/ 2.2000 25.7333 13.8720 7.9362 9.0900 = 58.8312 0.00000 Sep 18.1322 93.4318 Sep 1.0776	Oct 18.8162 94.1158 Oct 1.0855	+ (36) = Nov 19.2722 94.5717 Nov 1.0908	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0961 1.0875 31	(23e) (25) (25) (26) (27) (29a) (29a) (29a) (31) (33b) (35) (36) (37) (38) (39) (39) (39) (40) (40) (41)
f mechanical with feature ac feet ac f	of external ss, W/K = Su (Uw = 1.40) of external ss, W/K = Su (I x Peat loss at loss calc Jan 20.6402 coeff 95.9397 39) m / 12 = Jan 1.1066 and energy renergy not water us Jan yar rase user user user user user user user us	o.2854 o.2854 elements m (A x U) P = Cm / T si) calcul culated mon Feb 20.4122 95.7117 Feb 1.1039 28 quirements e (litres/ Feb 101.1482	0.2822 Aum(A, m2) PFA) in kJ//ated using thly (38)m Mar 20.1842 95.4837 Mar 1.1013 31	0.2663 Gross m2 65.7000 50.5000 m2K Appendix K = 0.33 x (Apr 19.0442 94.3438 Apr 1.0882 30 Apr 1.0882	O.2631 Openings m2 21.6100) 25)m x (5) May 18.8162 94.1158 May 1.0855 31 May 99.6975	0.2471 Net 2. 19, 86, 44, 50, 202. 23, 86. Jun 17.6762 92.9758 Jun 1.0724 30	0.2471 CArea m2 22000 4100 7000 9000 (26)(3 7000 7000 Jul 17.6762 92.9758 Jul 1.0724 31	U-value W/m2K 1.0000 1.3258 0.1600 0.1800 0.1800 30) + (32) 0.0000 Aug 17.4482 92.7478 Aug 1.0698	A x t W/Y/ 2.2000 25.7331 13.8722 7.9362 9.0900 = 58.8312 0.0000 Sep 18.1322 93.4318 Sep 1.0776	(33) Oct 18.8162 94.1158 Oct 1.0855	<pre>% (-value kJ/m2K)</pre> + (36) = Nov 19.2722 94.5717 Nov 1.0908 30 Nov 101.1482	74.8000 0.2758 A x K kJ/K 250.0000 16.4684 75.2996 Dec 19.7282 95.0277 94.2868 Dec 1.0961 1.0875 31	(23e) (25) (25) (26) (27) (29a) (29a) (29a) (31) (33) (32) (33b) (35) (36) (37) (38) (39) (39) (40) (40) (41)





	TION OF I	DWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
	23.3490	20.4212	21.0729	18.3718	17.6282	15.2118	14.0960	16.1753	16.3685	19.0759	20.8229	22.6123	(46)
Water storage Store volume	loss:											150.0000	(47)
a) If manufac Temperature	factor fro	m Table 2b	actor is kn	own (kWh/d	lay):							1.5000 0.5400 0.8100	(48) (49)
Enter (49) or Total storage	loss												
If cylinder co		icated sola			25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
Primary loss	23.2624	21.0112	25.1100 23.2624		23.2624	24.3000 22.5120	25.1100 23.2624	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	
Total heat red Solar input			ng calculat 188.8582 0.0000			148.2241	142.3456	156.2080	155.9355 0.0000	175.5453 0.0000	185.6312 0.0000	199.1210	
Output from w		179 8327	188.8582	169.2909	165.8938	148.2241	142.3456		ut (sum of:			0.0000	
Heat gains fro	om water he	ating, kWh/	month					Total p	er year (kW	h/year) = S	um (64) m =	2070.9190	(64)
	90.4550	80.2200	85.4094	78.1738	77.7738	71.1691	69.9440	74.5533	73.7332	80.9829	83.6070	88.8218	(65)
5. Internal ga	ains (see T	able 5 and	5a)										
Metabolic gain	ns (Table 5), Watts											
(66) m	128.8902				May 128.8902			Aug 128.8902	Sep 128.8902	Oct 128.8902	Nov 128.8902	Dec 128.8902	(66)
Lighting gain:	20.7609	18.4396	14.9961	11.3530	8.4865	7.1647	7.7417	10.0629	13.5065	17.1495	20.0160	21.3379	(67)
Appliances gas	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	
Pumps, fans Losses e.g. e					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating	gains (Tab	le 5)	114.7976	108.5748	104.5347	98.8460	94.0108	100.2060	102.4072	108.8480	116.1208	119.3842	
Total interna	l gains		420.6617			352.1699	337.6367	343.7367	355.4709	378.5187	405.0225	424.9881	, ,
	100.0011	1011,721	120.0017	037.0013	3,11,000	552.1055	337.0307	313.7307	300.1703	370.0107	100.0220	12113001	(,3)
6. Solar gain													
[Jan]				rea m2	Solar flux Table 6a W/m2	Specif or 5	g fic data Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
North					10.6334		0.4500	0		0.77		17.1903	(74)
Northeast Northwest			7.4	100 200	11.2829 11.2829		0.4500 0.4500	0	.8000	0.77 0.77		15.5099 20.8863	
Solar gains Total gains		106.9371 541.7092			415.4495 790.0103				229.7629 585.2337	129.6439 508.1625	67.0023 472.0248	44.0537 469.0417	
7. Mean inter			na epsenni										
Temperature du Utilisation fa	uring heati												
		ng periods	in the livi	ng area fro	om Table 9, 1							21.0000	(85)
tau alpha	actor for g Jan 62.7564	ng periods ains for li Feb 62.9059	in the livi	ng area fro nil,m (see Apr 63.8180	om Table 9, 1 Table 9a) May	Jun 64.7570	Jul 64.7570					Dec	(85)
tau	actor for g Jan 62.7564 5.1838 rea	ng periods ains for li Feb 62.9059 5.1937	in the livition of the second	ng area fro nil,m (see Apr 63.8180 5.2545	om Table 9, 1 Table 9a) May 63.9726	Jun 64.7570 5.3171	Jul 64.7570 5.3171	Aug 64.9162	64.4410 5.2961	63.9726 5.2648	63.6642 5.2443	Dec 63.3587	, , ,
tau alpha util living a: Tweekday Tweekend	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493	ng area fro nil,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759	om Table 9, Table 9a) May 63,9726 5.2648 0.8801 19.8173 20.8725	Jun 64.7570 5.3171 0.7000 19.9956 20.9729	Jul 64.7570 5.3171 0.5339 20.0204 20.9947	Aug 64,9162 5.3277 0.6116 20.0188 20.9897	64.4410 5.2961 0.8789 19.8982 20.9075	63.9726 5.2648 0.9845 19.3870 20.6609	63.6642 5.2443 0.9970 18.8043 20.4026	Dec 63.3587 5.2239 0.9988 18.3481 20.2023	, , ,
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493	ng area fro nil,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8	om Table 9, 1 Table 9a) May 63.9726 5.2648 0.8801 19.8173 20.8725	Jun 64.7570 5.3171 0.7000 19.9956 20.9729 9	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9	Aug 64.9162 5.3277 0.6116 20.0188 20.9897	64.4410 5.2961 0.8789 19.8982 20.9075 8	63.9726 5.2648 0.9845 19.3870 20.6609	63.6642 5.2443 0.9970 18.8043 20.4026 8	Dec 63.3587 5.2239 0.9988 18.3481 20.2023	, , ,
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0	in the livi. ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0	ng area fro nil,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22	m Table 9, 1 Table 9a) May 63.9726 5.2648 0.8801 19.8173 20.8725 22 0 21.0000	Jun 64.7570 5.3171 0.7000 19.9956 20.9729 9 21 0	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000	Aug 64,9162 5,3277 0.6116 20.0188 20.9897 9 22 00 21,000	64.4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000	63.9726 5.2648 0.9845 19.3870 20.6609 9 22 0 21.0000	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000	Dec 63.3587 5.2239 0.9988 18.3481 20.2023	(86)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0 21.0000 19.9976	in the livi. ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0	ng area fro nil,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105	m Table 9, 1 Table 9a) May 63,9726 5.2648 0.8801 19.8173 20.8725 9 22 0 21.0000 20.0127	Jun 64.7570 5.3171 0.7000 19.9956 20.9729 9 21.0000	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000 20.0234	Aug 64.9162 5.3277 0.6116 20.0188 20.9897 9 22 0 21.0000 20.0256	64.4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000	63.9726 5.2648 0.9845 19.3870 20.6609 9 22 0 21.0000 20.0127	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0 21.0000 20.0041	(86) (87) (88)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house 0.9980 18.3701 18.3701	ng periods ains for li Feb 62,9059 5.1937 0.9972 18.5490 20.2932 8 20 21.0000 19.9976 0.9962 18.5490 18.5490	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 00 21.0000 19.9998 0.9892 18.9022 18.9022	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105 0.9551 19.4117	m Table 9, 1 Table 9a) May 63.9726 5.2648 0.8801 19.8173 20.8725 9 22 0.21.0000 20.0127 0.8363 19.8173 19.8173	Th1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0.21.0000 20.0234 0.6120 19.9956 19.9956	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 00 21.0000 20.0234 0.4206 20.0204 20.0204	Aug 64,9162 5,3277 0.6116 20.0188 20.9897 9 22 00 21.0000 20.0256 0.4928 20.0188	64.4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 19.8982	63.9726 5.2648 0.9845 19.3870 20.6609 9 22.0000 20.0127 0.9764 19.3870 19.3870	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084 0.9958 18.8043 18.8043	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 00 21.0000 20.0041 0.9984 18.3481 18.3481	(86) (87) (88) (89)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend MIT 2 Living area f:	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 22 0.21.0000 19.9955 house 0.9980 18.3701 18.3701 19.9955 rection	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 20 0 21.0000 19.9976 0.9962 18.5490 18.5490 19.9976	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0.21.0000 19.9998 0.9892 18.9022 18.9022 19.9998	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105 0.9551 19.4117 19.4117 20.0105	m Table 9, 1 Table 9a) May 63,9726 5.2648 0.8801 19.8173 20.8725 9 22 0 21.0000 20.0127	Ph1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0 21.0000 20.0234 0.6120 19.9956 19.9956 20.0234	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000 20.0234 0.4206 20.0204 20.0204 20.0204	Aug 64,9162 5.3277 0.6116 20.0188 20.9897 9 22 0 21.0000 20.0256 0.4928 20.0188 20.0188 20.0256	64,4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 19.8982 20.0191 fLA =	63.9726 5.2648 0.9845 19.3870 20.6609 9 22 0 21.0000 20.0127 0.9764 19.3870 19.3870 19.3870 19.3870	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084 0.9984 18.8043 18.8043 20.0084	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0 21.0000 20.0041 0.9984 18.3481 18.3481 10.2031	(86) (87) (88) (89) (90) (91)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of liveekend Tweekend Tweekend Tweekend MIT 2	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house 0.9980 18.3701 18.3701 19.9955 raction 20.1995 djustment	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0 21.0000 19.9976 0.9962 18.5490 19.9976 20.2012	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0 21.0000 19.9998 0.9892 18.9022 18.9022 19.9998 20.2029	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105 0.9551 19.4117 19.4117 20.0105	m Table 9, 1 Table 9a) May 63,9726 5.2648 0.8801 19,8173 20.8725 9 22 0 21.0000 20.0127 0.8363 19.8173 19.8173 20.0127 20.2132	Th1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0.21.0000 20.0234 0.6120 19.9956 19.9956	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000 20.0234 0.4206 20.0204 20.0204 20.0204 20.0234	Aug 64,9162 5.3277 0.6116 20.0188 20.9897 9 22 0 21.0000 20.0256 0.4928 20.0188 20.0188 20.0256 20.2235	64,4410 5.2961 0.8789 19.8982 20.9075 8 22 00 21.0000 20.0191 0.8164 19.8982 19.8982 20.0191	63,9726 5.2648 0.9845 19,3870 20.6609 9 22 0 21.0000 20.0127 0.9764 19,3870 19,3870 20.0127 Living are 20.2132	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084 0.9984 18.8043 18.8043 20.0084	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0 21.0000 20.0041 0.9984 18.3481 18.3481 18.3481 0.2031 20.2063	(86) (87) (88) (89) (90) (91) (92)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of I Tweekday Tweekend MIT 2 Living area f: MIT Temperature ac adjusted MIT	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house 0.9980 18.3701 19.9955 raction 20.1995 djustment 20.1995	ng periods ains for li Feb 62,9059 5.1937 0.9972 18.5490 20.2932 8 20 21.0000 19.9976 0.9962 18.5490 19.9976 20.2012	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0 21.0000 19.9998 0.9892 18.9022 18.9022 19.9998 20.2029	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105 0.9551 19.4117 20.0105 20.2115	m Table 9, 7 Table 9a) May 63.9726 5.2648 0.8801 19.8173 20.8725 9 22 0.21.0000 20.0127 0.8363 19.8173 20.0127 20.2132	Th1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0 21.0000 20.0234 0.6120 19.9956 20.0234 20.2218 20.2218	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000 20.0234 0.4206 20.0204 20.0204 20.0204 20.0204 20.0234	Aug 64, 9162 5.3277 0.6116 20.0188 20.9897 9 22 00 21.0000 20.0256 0.4928 20.0188 20.0188 20.0256 20.2235	64,4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 19.8982 20.0191 fLA = 20.2184	63,9726 5.2648 0.9845 19,3870 20.6609 9 22 0 21.0000 20.0127 0.9764 19,3870 19,3870 20.0127 Living are 20.2132	63.6642 5.2443 0.9970 18.8043 20.4026 8 22.000 20.0084 0.9958 18.8043 18.8043 18.8043 20.0084 a / (4) = 20.2098	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0 21.0000 20.0041 0.9984 18.3481 18.3481 18.3481 0.2031 20.2063	(86) (87) (88) (89) (90) (91) (92)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend MIT 2 Living area f: MIT Temperature ac	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house 0.9980 18.3701 19.9955 rection 20.1995 djustment 20.1995	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0 21.0000 19.9976 0.9962 18.5490 19.9976 20.2012 20.2012	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 00 21.000 19.9998 0.9892 18.9022 18.9022 19.9998 20.2029	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0 21.0000 20.0105 0.9551 19.4117 19.4117 20.0105 20.2115	m Table 9, 1 Table 9a) May 63.9726 5.2648 0.8801 19.8173 20.8725 22 20.000 20.0127 0.8363 19.8173 20.8125 20.2132	Ph1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0 21.0000 20.0234 0.6120 19.9956 19.9956 20.0234 20.2218 20.2218	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0.0200 21.0000 20.0234 0.4206 20.0204 20.0204 20.0204 20.0204 20.0204	Aug 64,9162 5,3277 0,6116 20,0188 20,9897 9 22 00 21,0000 20,0256 0,4928 20,0188 20,0188 20,0256 20,2235	64,4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 19.8982 20.0191 fLA = 20.2184	63,9726 5.2648 0.9845 19,3870 20.6609 9 22 0 21.0000 20.0127 0.9764 19,3870 19,3870 20.0127 Living are 20.2132	63.6642 5.2443 0.9970 18.8043 20.4026 8 22.000 20.0084 0.9958 18.8043 18.8043 18.8043 20.0084 a / (4) = 20.2098	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0 21.0000 20.0041 0.9984 18.3481 18.3481 18.3481 0.2031 20.2063	(86) (87) (88) (89) (90) (91) (92)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of I Tweekday Tweekend MIT 2 Living area f: MIT Temperature acadjusted MIT 8. Space heat:	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 00 21.0000 19.9955 house 0.9980 18.3701 19.9955 raction 20.1995 djustment 20.1995 djustment 20.1995	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0 21.0000 19.9976 0.9962 18.5490 19.9976 20.2012 20.2012	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 0 21.0000 19.9998 0.9892 18.9022 19.9998 20.2029 20.2029	ng area fronii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 8 22 0.21.0000 20.0105 0.9551 19.4117 20.0105 20.2115 20.2115	om Table 9, 7 Table 9a) May 63,9726 5.2648 0.8801 19.8173 20.8725 9 22 0.21.0000 20.0127 0.8363 19.8173 20.0127 20.2132 20.2132	Th1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0 21.0000 20.0234 0.6120 19.9956 20.0234 20.2218 20.2218	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0 21.0000 20.0234 0.4206 20.0204 20.0204 20.0204 20.0234	Aug 64, 9162 5, 3277 0, 6116 20, 0188 20, 9897 22 00 21, 0000 20, 0256 0, 4928 20, 0188 20, 0188 20, 0256 20, 2235 20, 2235	64.4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 20.0191 6.14 20.2184	63.9726 5.2648 0.9845 19.3870 20.6609 9 22 0.21.0000 20.0127 0.9764 19.3870 20.0127 Living are 20.2132	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084 0.9958 18.8043 20.0084 a / (4) = 20.2098	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0.0000 20.0041 0.9984 18.3481 20.2063 0.0000 20.2063	(86) (87) (88) (89) (90) (91) (92) (93)
tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend MIT 2 Living area f: MIT Temperature ac adjusted MIT 2 8. Space heat:	actor for g Jan 62.7564 5.1838 rea 0.9985 18.3701 20.2148 9 22 0 21.0000 19.9955 house 0.9980 18.3701 19.9955 reation 20.1995 djustment 20.1995 djustment 20.1995 djustment 20.1995	ng periods ains for li Feb 62.9059 5.1937 0.9972 18.5490 20.2932 8 20 0 21.0000 19.9976 0.9962 18.5490 18.5490 19.9976 20.2012 20.2012	in the livi ving area, Mar 63.0561 5.2037 0.9921 18.9022 20.4493 9 22 00 21.0000 19.9998 0.9892 18.9022 19.9998 20.2029 20.2029	ng area fro nii,m (see Apr 63.8180 5.2545 0.9677 19.4117 20.6759 22 0.21.0000 20.0105 0.9551 19.4117 20.0105 20.2115 20.2115	m Table 9, 1 Table 9a) May 63,9726 5.2648 0.8801 19.8173 20.8725 0 21.0000 20.0127 0.8363 19.8173 20.0127 20.2132 20.2132	Ph1 (C) Jun 64.7570 5.3171 0.7000 19.9956 20.9729 21 0 21.0000 20.0234 0.6120 19.9956 20.0234 20.2218 20.2218 Jun 0.6310 502.0330	Jul 64.7570 5.3171 0.5339 20.0204 20.9947 9 22 0.000 20.0234 0.4206 20.0204 20.0204 20.0234 20.2218 20.2218	Aug 64,9162 5,3277 0.6116 20.0188 20.9897 9 22 0 21.0000 20.0256 0.4928 20.0188 20.0188 20.0256 20.2235	64, 4410 5.2961 0.8789 19.8982 20.9075 8 22 0 21.0000 20.0191 0.8164 19.8982 19.8982 20.0191 fLA = 20.2184 20.2184	63.9726 5.2648 0.9845 19.3870 20.6609 9 22 0 21.0000 20.0127 0.9764 19.3870 19.3870 20.0127 Living are 20.2132	63.6642 5.2443 0.9970 18.8043 20.4026 8 22 0 21.0000 20.0084 0.9984 18.8043 18.8043 20.0084 a / (4) = 20.2098 20.2098	Dec 63.3587 5.2239 0.9988 18.3481 20.2023 9 22 0.0000 20.0041 0.9984 18.3481 20.2031 20.2063 0.0000 20.2063	(86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF D	WELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
Month fracti 1.0000 Space heating kWh 770.6765 Space heating Space heating per m2	1.0000	1.0000	1.0000 280.8607	1.0000 98.7185	0.0000	0.0000	0.0000	0.0000	1.0000 303.2350 (98)	1.0000 554.1415 / (4) =		(98) (98)
8c. Space cooling require Not applicable	ement											
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:	l heating sy 	ystems, inci ntary system	luding micr	o-CHP						0.0000 1.0000 281.5163 100.0000 1398.3283	(202) (206) (208)
Jan Space heating requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	621.4318		280.8607 L)	98.7185	0.0000	0.0000	0.0000	0.0000	303.2350	554.1415	783.2094	(98)
	281.5163	281.5163	281.5163	281.5163	0.0000	0.0000	0.0000	0.0000	281.5163	281.5163	281.5163	(210)
273.7591 Water heating requirement	220.7445	186.2231	99.7671	35.0667	0.0000	0.0000	0.0000	0.0000	107.7149	196.8417	278.2111	(211)
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 requirement 204.0327 Efficiency of water heate (217)m 178.1250 Fuel for water heating, & 114.5447 Water heating fuel used Annual totals kWh/year	179.8327 er 178.1250	188.8582 178.1250 106.0256	169.2909 178.1250 95.0405	165.8938 178.1250 93.1334	148.2241 178.1250 83.2135	142.3456 178.1250 79.9133	156.2080 178.1250 87.6957	155.9355 178.1250 87.5427	175.5453 178.1250 98.5518	185.6312 178.1250 104.2140	178.1250 178.1250	(216) (217) (219)
Space heating fuel - main Space heating fuel - seco											1398.3283 0.0000	
Electricity for pumps and (BalancedWithHeatReco mechanical ventilation Total electricity for the Electricity for lighting Total delivered energy fo	d fans: overy, Datal n fans (SFP e above, kWI (calculated or all uses	= 0.7 h/year d in Append:	7500) ix L)								198.3263 198.3263 366.6436 3125.9194	(230a) (231) (232)
12a. Carbon dioxide emiss	sions - Ind	ividual heat	ting systems	including	micro-CHP							
Space heating - main syst Space heating - secondary Water heating (other fuel Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide E	cem 1 / .)						Energy kWh/year 1398.3283 0.0000 1162.6212 198.3263 366.6436		on factor g CO2/kWh 0.5190 0.5190 0.5190 0.5190 0.5190		Emissions kg CO2/year 725.7324 0.0000 603.4004 1329.1328 102.9313 190.2881 1622.3521 18.7100	(263) (264) (265) (267) (268) (272)
DER Total Floor Area Assumed number of occupar CO2 emissions from applia CO2 emissions from cookin Total CO2 emissions Residual CO2 emissions of Additional allowable elec Resulting CO2 emissions of Net CO2 emissions	ats able 12 for ances, equa- ag, equation afset from letricity generation	electricity tion (L14) n (L16) biofuel CHP neration, k	y displaced Wh/m²/year	from grid		TY GENERATIO	ON TECHNOLOG	SIES		TFA N EF	18.7100 86.7000 2.5778 0.5190 15.9165 2.0861 36.7126 0.0000 0.0000 0.0000 36.7126	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) 216.7500 (1b) - (3b) (m) x 2.5000 (2b) 86.7000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 86.7000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 216.7500 (5) main secondary total m3 per hour heating 0 0 Number of chimneys Number of open flues 0 * 40 = 0 * 20 = 3 * 10 = 0.0000 (6a) 0.0000 (6b) Number of intermittent fans Number of passive vents Number of flueless gas fires 30.0000 (7a) 0.0000 0 * 40 = Air changes per hour Infiltration due to chimneys, flues and fans = (6a) + (6b) + (7a) + (7b) + (7c) =30.0000 / (5) = 0.1384 (8) Pressure test Measured/design AP50 0.3884 (18) Infiltration rate Number of sides sheltered 2 (19) - [0.075 x (19)] (21) = (18) x (20) 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 0.4209 0.4127 0.4044 0.3632 0.3549 0.3136 0.3136 0.3054 0.3301 0.3549 0.3714 0.3879 (22b) Effective ac 3. Heat losses and heat loss parameter Openings A x U W/K 2.2000 Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 2.2000 (26) TER Opaque door TER Opening Type (Uw = 1.40) 19.4100 25.7330 11.2710 (27) (28a) Floor 1 0.1300 44.0900 50.5000 202.9000 External 21.6100 0.1800 (29a) External Sheltered Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) (26) . . . (30) + (32) = 56.2302 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) 11.6609 (36) 67.8911 (37) (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May (38)m 42.1007 41.8546 41.6134 40.4805 40.2685 Jul 39.2818 Aug 39.0991 Dec 41.1456 (38) Heat transfer coeff 109.9917 Average = Sum(39)m / 12 = 109.7457 109.5045 108.3716 108.1596 107.1729 107.1729 106.9902 107.5529 108.1596 108.5884 109.0367 (39) May 1.2475 Aug 1.2340 1.2475 1.2361 1.2405 1.2576 (40) 1.2499 (40) 1.2686 1.2630 1.2500 1.2361 1.2658 1.2525 HLP (average) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 2.5778 (42) 95.4228 (43) Feb Apr May Jun Jul Aug Sep Oct Nov Daily hot water use
104.9651
Energy conte 155.6603 101.1482 97.3313 136.1415 140.4858 Energy content (annual)
Distribution loss (46)
23.3490 Total = Sum(45)m = 1501.3730 (45) $(46)m = 0.15 \times (45)m$ 20.4212 21.0729 18.3718 17.6282 15 2118 14.0960 16.1753 16 3685 19.0759 20.8229 22.6123 (46) Store volume a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55)





CALCULAT	ION OF	TARGET E	EMISSION	IS 09.	Jan 2014								
Total storage	loss 23.3325	21 0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	ntains ded		r storage	22.5798		22.5798	23.3325	23.3325	22.5798	23.3325	22.5798		
Primary loss Total heat req		water heati			n month		23.2624	23.2624		23.2624	22.5120		
Solar input	0.0000	178.2272	187.0807 0.0000	0.0000	164.1163 0.0000	146.5039 0.0000	140.5681	0.0000	154.2153 0.0000	173.7678 0.0000 months) = Si	0.0000	197.3436 0.0000 0.0000	(63)
Output from w/		178.2272	187.0807	167.5708	164.1163	146.5039	140.5681	154.4305	154.2153	173.7678	183.9110	197.3436	(64)
Heat gains fro	m water he 89.0330	ating, kWh/ 78.9356	month 83.9874	76.7977	76.3518	69.7930	68.5220	73.1313	72.3570	h/year) = Si 79.5609	am (64)m = 82.2309	87.3998	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gain	s (Table 5		Mar				Jul		0	Oct	Nov	Dec	
(66)m Lighting gains	128.8902	128.8902	128.8902		May 128.8902 L9a), also s		128.8902	Aug 128.8902	Sep 128.8902	128.8902	128.8902	128.8902	(66)
Appliances gai	20.7594 ns (calcul	18.4383 ated in App	14.9950 endix L, eq	11.3522 uation L13	8.4859 or L13a), a	7.1642 Lso see Tab	7.7411 le 5	10.0622	13.5055	17.1483	20.0146	21.3363	(67)
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or		see Table	5	171.8007	177.8902	190.8540	207.2186	222.5989	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	
Losses e.g. ev Water heating	-103.1122	-103.1122			-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Total internal	119.6680	117.4637	112.8864	106.6635	102.6234	96.9347	92.0995	98.2947	100.4959	106.9367	114.2095	117.4729	(72)
	437.9683	435.8595	421.7494	398.9198	375.6489	353.2581	338.7248	344.8247	356.5586	379.6061	406.1097	426.0752	(73)
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	or Tab		Acce: factor Table	or	Gains W	
North Northeast Northwest			6.4 5.5 7.4	800 100 200	10.6334 11.2829 11.2829		0.6300 0.6300 0.6300	0 0 0	.7000 .7000 .7000	0.77 0.77 0.77	0.0	21.0581 18.9997 25.5857	(75)
Solar gains Total gains			231.8942 653.6436		508.9256 884.5745					158.8138 538.4199	82.0778 488.1876	53.9657 480.0410	,
7. Mean intern													
Temperature du												21.0000	(85)
Utilisation fa	ctor for g Jan	ains for li Feb	ving area, Mar	nil,m (see Apr	Table 9a) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha util living ar	54.7390 4.6493			55.5573 4.7038		56.1787 4.7452	56.1787 4.7452	56.2746 4.7516	55.9802 4.7320	55.6662 4.7111	55.4464 4.6964	55.2184 4.6812	
util living ar	0.9982	0.9966	0.9906	0.9633	0.8734	0.7009	0.5411	0.6233	0.8816	0.9835	0.9966	0.9986	(86)
MIT Th 2	19.5854 19.8655	19.7249 19.8677	20.0020 19.8699	20.4016 19.8802	20.7517 19.8822	20.9386 19.8912	20.9856 19.8912	20.9731 19.8929	20.8086 19.8877	20.3664 19.8822	19.9123 19.8783	19.5632 19.8742	
util rest of h	0.9976 17.9869	0.9954 18.1921	0.9870 18.5969	0.9487 19.1751	0.8251 19.6404	0.6041 19.8513	0.4128 19.8861	0.4895 19.8819	0.8152 19.7279	0.9746 19.1352	0.9952 18.4738		
	action 18.3116			19.4242		20.0721	20.1095	20.1036	fLA =	Living area	a / (4) =	0.2031 18.2859	(91) (92)
Temperature ad adjusted MIT		18.5034	18.8823	19.4242	19.8661	20.0721	20.1095	20.1036	19.9474	19.3853	18.7660	0.0000 18.2859	
8. Space heati	ng require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp.	501.7383	562.9746		731.3633	0.8243 729.1360 11.7000							478.6130	(95)
Heat loss rate	W 1541.1556	1492.9184	1355.9129	1140.5266	883.2406	586.4640	376.1180	396.2455	628.9094	950.2112	1266.7931	1535.8806	(97)
Space heating	kWh		1.0000		1.0000	0.0000	0.0000	0.0000	0.0000	1.0000 318.8067	1.0000		(98)
Space heating Space heating	per m2									(98)) / (4) =	4006.9682 46.2165	
8c. Space cool													
Not applicable													



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



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy red													
Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	pace heat fr pace heat fr main space secondary/s	om seconda om main sy heating sy supplementa	ry/suppleme stem(s) stem 1 (in	ntary system								0.0000 1.0000 93.5000 0.0000 4285.5275	(202) (206) (208)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	773.3265	624.9222	530.9948	294.5976	114.6538	0.0000	0.0000	0.0000	0.0000	318.8067	563.0595	786.6071	(98)
Space heating	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating	fuel (main 827.0871	heating sy 668.3660	stem) 567.9088	315.0776	122.6244	0.0000	0.0000	0.0000	0.0000	340.9697	602.2027	841.2910	(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		178.2272	187.0807	167.5708	164.1163	146.5039	140.5681	154.4305	154.2153	173.7678	183.9110	197.3436	(64)
Efficiency of			87.4452	86.3042	83.8788	79.8000	79.8000	79.8000	79.8000	86.4125	87.6078	79.8000	(216)
(217) m Fuel for wate:	r heating, k	:Wh/month										88.1300	
Water heating	229.6989 fuel used	202.7959	213.9404	194.1628	195.6590	183.5889	176.1505	193.5219	193.2523	201.0910	209.9254	223.9233 2417.7103	
Annual totals Space heating		system										4285.5275	(211)
Space heating	fuel - seco	ondary										0.0000	(215)
Electricity for central her main heating Total electricity for Total delivered	ating pump ng flue fan city for the or lighting	above, kW	d in Append	ix L)								30.0000 45.0000 75.0000 366.6167 7144.8546	(230e) (231) (232)
12a. Carbon d													
Space heating Space heating Water heating	- main syst - secondary (other fuel	em 1						Energy kWh/year 4285.5275 0.0000 2417.7103		ion factor kg CO2/kWh 0.2160 0.0000 0.2160	k	Emissions cg CO2/year 925.6739 0.0000 522.2254	(261) (263) (264)
Space and water Pumps and fans the pumps and fans the pumps and fans total CO2, kg. Emissions per Fuel factor (emissions per Emissions per Emissions per Target Carbon	s ghting /m2/year m2 for spacelectricity) m2 for ligh m2 for pump	ting s and fans		5.7001 * 1.	55) + 2.194	6 + 0.4490,	rounded to	75.0000 366.6167 2 d.p.		0.5190 0.5190		1447.8994 38.9250 190.2741 1677.0985 16.7001 1.5500 2.1946 0.4490 28.5300	(267) (268) (272) (272a) (272b) (272c)





Property Reference	3 Bed End				Issued on Date	16/03/2021
Assessment	3			Prop Type Ref		
Reference						
Property	Type 2 End, Stratford-upo	n-Avon, CV36	ò			
SAP Rating		86 B	DER	16.19	TER	26.26
Environmental		87 B	% DER <ter< th=""><th></th><th>38.36</th><th></th></ter<>		38.36	
CO ₂ Emissions (t/ye	ear)	1.17	DFEE	39.74	TFEE	53.41
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>Έ</th><th>25.60</th><th></th></tfe<>	Έ	25.60	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,	36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED	
Semi-Detached House, total floor area 85 $\ensuremath{\text{m}}^2$	
This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TER) 26.26 kgCOU/m² Dwelling Carbon Dioxide Emission Rate (DER) 16.19 kgCOU/m²OK	
lb TFEE and DFEE Target Fabric Energy Efficiency (TFEE)53.4 kWh/m²/yr Dwelling Fabric Energy Efficiency (DFEE)39.7 kWh/m²/yrOK	
2 Fabric U-values	
Element Average Highest External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK	
Party wall 0.00 (max. 0.20) - OK Floor 0.10 (max. 0.25) 0.10 (max. 0.70) OK	
Roof 0.10 (max. 0.20) 0.10 (max. 0.35) OK	
Openings 1.18 (max. 2.00) 1.20 (max. 3.30) OK	
2a Thermal bridging Thermal bridging calculated from linear thermal transmittances for each junction	
3 Air permeability	
Air permeability at 50 pascals: 3.00 (design value) Maximum 10.0 OK	
4 Heating efficiency Main heating system: Heat pump with radiators or underfloor - Electric Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	
Secondary heating system: None	
5 Cylinder insulation	
Hot water storage Measured cylinder loss: 1.50 kWh/day	
Permitted by DBSCG 1.89 OK Primary pipework insulated: Yes OK	
6 Controls	
Space heating controls: Time and temperature zone control OK	
Hot water controls: Cylinderstat OK Independent timer for DHW OK	
7 Low energy lights Percentage of fixed lights with low-energy fittings:100% Minimum 75% OK	
8 Mechanical ventilation	
Continuous supply and extract system	
Specific fan power: 0.71 Maximum 1.5 OK	
MVHR efficiency: 86%	
Minimum: 70% OK	
9 Summertime temperature Overheating risk (Midlands): Not significant OK Based on:	
Overshading: Average	
Windows facing North: 7.84 m², No overhang Windows facing East: 3.27 m², No overhang	
Windows facing South: 6.49 m², No overhang	
Windows facing West: 0.70 m², No overhang Air change rate: 4.00 ach	
Blinds/curtains: None	
10 Key features	
Party wall U-value 0.00 W/m²K	
Roof U-value 0.10 W/m²K Floor U-value 0.10 W/m²K	
Door U-value 1.00 W/m²K	
Thermal bridging y-value 0.038 W/m²K Air permeability 3.0 m³/m²h	
-	





CALCULATIO	ON OF D	WELLING	EMISSI	ONS FOR	REGULAT	IONS CO	OMPLIAN	CE 09	9 Jan 2014				
AP 2012 WORKSHE	ET FOR New	Build (As	Designed)		9.92, Janua:	ry 2014) Tan 2014							
. Overall dwell								Area	Stor	ey height		Volume	
round floor first floor lotal floor area welling volume	TFA = (1a)+(1b)+(1c)+(1d)+(1e)	(1n)	,	84.5000		(m2) 42.2500 42.2500	(1b) x	(m) 2.3900 2.6100	(2c) =	(m3) 100.9775 110.2725 211.2500	(1c) - (4)
. Ventilation r	ate												
					main heating		econdary heating		other	tot	al m	3 per hour	
umber of chimne umber of open f umber of interm umber of passiv umber of fluele	lues ittent fan e vents				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 leasured/design . nfiltration rat	AP50	ys, flues	and fans	= (6a)+(6b))+(7a)+(7b)+	(7c) =				0.0000	Air change / (5) =	0.0000 Yes 3.0000 0.1500	
helter factor nfiltration rat	e adjusted	to includ	e shelter f	actor					(20) = 1 -	[0.075 x 1) = (18)		0.9250 0.1388	(20)
ind speed ind 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	
ij infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283		0.1492	0.1561	0.1630	
Balanced mechan f mechanical ve f balanced with	ntilation:			-	for in-use fa	actor (from	n Table 4h)	=				0.5000 73.1000	
ffective ac	0.3114	0.3079	0.3045	0.2871	0.2837	0.2663	0.2663	0.2628	0.2733	0.2837	0.2906	0.2975	(25)
. Heat losses a lement		-		Gross	Openings		:Area	U-value	Ах	U K	-value	AxK	
pening Type 1 pening Type 2 (round Floor xternal Wall	Uw = 1.20)			m2 92.0000	m2 20.4200	18 42	m2 .1200 .3000 .2500	W/m2K 1.0000 1.1450 0.1000 0.1500	W/ 2.120 20.954 4.225 10.737	0 2 0	kJ/m2K	kJ/K	(26) (27) (28a) (29a)
ain Roof otal net area o				42.2500	20.4200	42.	.2500 .5000	0.1000	4.225	0			(30) (31)
abric heat loss arty Wall	, W/K = Su	m (A x U)				44	(26)(3 .5000	0.0000	= 42.261 0.000				(33)
hermal mass par hermal bridges otal fabric hea	(Sum(L x P)					(33)	+ (36) =	250.0000 6.6805 48.9417	(36)
entilation heat	loss calc Jan 21.7089	ulated mon Feb 21.4671	thly (38)m Mar 21.2253	= 0.33 x (2 Apr 20.0162	25)m x (5) May 19.7744	Jun 18.5653	Jul 18.5653	Aug 18.3235	Sep 19.0489	Oct 19.7744	Nov 20.2580	Dec 20.7416	(30)
eat transfer co	eff 70.6506	70.4088	70.1670	68.9579	68.7161	67.5070	67.5070	67.2652		68.7161	69.1997	69.6834 68.8975	(39)
LP LP (average)	Jan 0.8361	Feb 0.8332	Mar 0.8304	Apr 0.8161	May 0.8132	Jun 0.7989	Jul 0.7989	Aug 0.7960	Sep 0.8046	Oct 0.8132	Nov 0.8189	Dec 0.8247 0.8154	(40)
ays in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heating	energy re	quirements	(kWh/year)										
ssumed occupanc verage daily ho	У											2.5427 94.5897	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
aily hot water 1 nergy conte 1	04.0486	100.2650 134.9527	96.4815 139.2591	92.6979 121.4095	88.9143 116.4953	85.1307 100.5266	85.1307 93.1527	88.9143 106.8940		96.4815 126.0625		104.0486 149.4324	





CALCULAT	ION OF E	OWELLIN	G EMISSI	ONS FO	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	l e			
Water storage	23.1452	20.2429	20.8889	18.2114	17.4743	15.0790	13.9729	16.0341	16.2256	18.9094	20.6411	22.4149	(46)
Store volume a) If manufac		ared loss fa	actor is kno	own (kWh/	dav):							150.0000 (
Temperature Enter (49) or	factor from (54) in (55	n Table 2b										0.5400 (0.8100 ((49)
Total storage If cylinder co	25.1100	22.6800		24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 ((56)
Primary loss	25.1100	22.6800	25.1100			24.3000 22.5120	25.1100 23.2624	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120		
Total heat red	202.6735	178.6439	187.6315	168.2215	164.8677				154.9827			197.8048 (
Solar input Output from w	0.0000 /h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 ut (sum of	0.0000 months) = Si		0.0000 (
	202.6735			168.2215	164.8677	147.3386	141.5251					197.8048 (2057.8097 (
Heat gains fro		nting, kWh/r 79.8247		77.8183	77.4326	70.8747	69.6712	74.2402	73.4164	80.6137	83.2040	88.3842	(65)
5. Internal ga	ains (see Ta	able 5 and 5	5a)										
Metabolic gair		, Watts	Mar	Apr		Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	s (calculate	ed in Append	dix L, equat	tion L9 or		see Table 5			127.1361				
Appliances gas	ins (calcula	ated in Appe	endix L, equ	uation L13	8.3383 or L13a), al 196.1941	lso see Tab	le 5		13.2705	16.8500	19.6664	20.9651 (
Cooking gains	(calculated	d in Append:	ix L, equat:	ion L15 or		see Table	5		35.7136		35.7136	35.7136	
Pumps, fans Losses e.g. ev				le 5)			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating	gains (Tabl				-101.7089 104.0761	98.4371	93.6441		101.9672	108.3518		118.7959	
Total internal	l gains				369.7493								
6. Solar gains	 3												
[Jan]					Solar flux					Acce:		Gains	
[Udii]			PL.	Lea									
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data le 6c	factor Table	or 6d	W	
North East				 400 700	10.6334			0		factor Table	or 6d		
North East South West			7.84 3.2 6.49 0.70	400 700 900	10.6334 19.6403 46.7521 19.6403		0.4500 0.4500 0.4500 0.4500	0 0 0 0	.7000	factor Table	or 6d 00 00	W 18.1983 ((76) (78)
North East South			7.84 3.2 6.49 0.70	400 700 900	10.6334 19.6403 46.7521 19.6403		0.4500 0.4500 0.4500 0.4500	0 0 0 0	.7000 .7000 .7000 .7000	factor Table (0.77) (0.77) (0.77)	or 6d 00 00 00 00	18.1983 (14.0197 (66.2353 (3.0012 ((76) (78) (80)
North East South West	101.4545	176.5507	7.84 3.2' 6.4! 0.70	400 700 900 000	10.6334 19.6403 46.7521 19.6403	393.8368	0.4500 0.4500 0.4500 0.4500 376.3467	0 0 0 0	.7000 .7000 .7000 .7000 .7000	factor Table (0.77) 0.77) 0.77(0.77) 197.9095	00 00 00 00 00 00 122.1844	18.1983 (14.0197 (66.2353 (3.0012 ((76) (78) (80)
North East South West 	101.4545 532.5535	176.5507 605.5560	7.8 3.2 6.4 0.7 252.1103 667.2174	400 700 900 900 331.0694 723.7033	10.6334 19.6403 46.7521 19.6403	393.8368 741.5511	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490	332.0529 671.5049	.7000 .7000 .7000 .7000 .7000	factor Table (0.77) 0.77) 0.77(0.77) 197.9095	00 00 00 00 00 00 122.1844	18.1983 (14.0197 (66.2353 (3.0012 ((76) (78) (80)
North East South West Solar gains Total gains	101.4545 532.5535 nal temperat	176.5507 605.5560 ture (heati	7.8 3.2' 6.4' 0.7' 252.1103 667.2174	331.0694 723.7033	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717	393.8368 741.5511	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490	332.0529 671.5049	.7000 .7000 .7000 .7000 .7000	factor Table (0.77) 0.77) 0.77(0.77) 197.9095	00 00 00 00 00 00 122.1844	18.1983 (14.0197 (66.2353 (3.0012 ((76) (78) (80) (83) (84)
North East South West Solar gains Total gains 7. Mean inter Temperature di Utilisation fa	101.4545 532.5535 nal temperations the sector for general sector for g	176.5507 605.5560 ture (heating)	7.8 3.2' 6.4' 0.7' 252.1103 667.2174	331.0694 723.7033	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717	393.8368 741.5511 Ph1 (C) Jun	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490	332.0529 671.5049	.7000 .7000 .7000 .7000 .7000 279.1724 630.1673	fact. Table 0.771 0.771 0.771 0.771 197.9095 571.5936	Dr 6d 00 00 00 00 00 122.1844 521.9576	86.4015 (505.8057 ((76) (78) (80) (83) (84)
North East South West	101.4545 532.5535 mal temperaturing heating heating datur for garder for 30.0574 6.5372	176.5507 605.5560 ture (heating periods:	7.8 3.2' 6.4' 0.7(252.1103 667.2174	331.0694 723.7033	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 om Table 9, 1 Table 9a) May 85.3956	393.8368 741.5511	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490	332.0529 671.5049	.7000 .7000 .7000 .7000 .7000 279.1724 630.1673	factor Table v 0.771 0.771 0.771 0.771 0.771 0.771 0.771 0.771 0.771 0.771 197.9095 571.5936	22.1844 521.9576	18.1983 (14.0197 (66.2353 (3.0012 (55.8057 (55.8	(76) (78) (80) (83) (84)
North East South West	101.4545 532.5535 nal temperaturing heating deator for gas Jan 83.0574 6.5372	176.5507 605.5560 ture (heating periods: sins for liver Feb 83.3426 6.5562 0.9923	7.8 3.2' 6.4' 0.7' 252.1103 667.2174 ang season) in the livir ving area, 1 Mar 83.6298 6.5753	331.0694 723.7033 331.0694 723.7033 area area fil,m (see Apr 85.0962 6.6731 0.9228	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 50m Table 9, 17 Table 9a) May 85.3956 6.6930 0.7851	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490 Jul 86.9251 6.7950 0.4178	332.0529 671.5049 Aug 87.2376 6.8158 0.4595	.7000 .7000 .7000 .7000 .7000 279.1724 630.1673 Sep 86.3068 6.7538 0.7156	fact. Table 0.771 0.771 0.771 0.771 197.9095 571.5936 Oct 85.3956 6.6930 0.9453	Nov 84.7988 6.6533 0.9921	18.1983 (14.0197 (66.2353 (3.0012 (5.0000 (6.2553 (3.0012 (5.0000 (6.2553 (6.2	(76) (78) (80) (83) (84)
North East South West Solar gains Total gains 7. Mean interr Temperature du Utilisation fa tau alpha util living an	101.4545 532.5535 anal temperation temperation for for gradient for gr	176.5507 605.5560 ture (heating periods; 1766 1766 1766 1766 1766 1766 1766 1766	7.8 3.2' 6.4' 0.7(252.1103 667.2174 mg season) in the livir ving area, 1 Mar 83.6298 6.5753 0.9776	331.0694 723.7033 331.0694 723.7033 0.0106 6.6731 0.9228 20.0106 20.8780	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 m Table 9, Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486	393.8368 741.5511 Ph1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714	Jul 86.9251 6.7950 0.4178	332.0529 671.5049 Aug 87.2376 6.8158 0.4595 20.1979 20.9737	.7000 .7000	factor Table volume 1	Nov 84.7988 6.6533 0.9921 19.6668 20.7189	18.1983 (14.0197 (66.2353 (3.0012 (6.2353 (5.2353 (6.2	(76) (78) (80) (83) (84)
North East South West Total gains Total gains 7. Mean interr Temperature du Utilisation fa tau alpha util living au Tweekday Tweekday Tweekend 24 / 16 24 / 9	101.4545 532.5535 all temperatairing heating actor for garage 3.0574 6.5372	176.5507 605.5560 	7.8 3.2 6.4 0.7 252.1103 667.2174 252.1103 667.2174 3.6298 6.5753 0.9776	331.0694 723.7033 ng area fro nil,m (see Apr 85.0962 6.6731 0.9228	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 Dom Table 9, 17 Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 9	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929	Jul 86.9251 6.7950 0.4178 20.1954	332.0529 671.5049 Aug 87.2376 6.8158 0.4595 20.1979	.7000 .7000 .7000 .7000 .7000 279.1724 630.1673 Sep 86.3068 6.7538 0.7156 20.1783	Factor Table 10 . 771 0 . 771 0 . 771 0 . 771 0 . 771 0 . 771 197 . 9095 571 . 5936 0 . 9453 20 . 0081	Nov 84.7988 6.6533 0.9921 19.6668	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (56.4015 (66.2353 (66.4015 (66.2353 (66.2	(76) (78) (80) (83) (84)
North East South West Total gains Total gains Total gains Total gains Total gains Total gains Themperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2	101.4545 532.5535 all temperataring heating actor for gradies and actor for gradies and actor for 30.574 area and 20.6022 area area area area area area area ar	176.5507 605.5560 Lure (heating periods: ains for lives 183.3426 6.5562 0.9923 19.5425 20.6685 8	7.8 3.2' 6.4' 0.7(252.1103 667.2174 ang season) in the livir ying area, 1 Mar 83.6298 6.5753 0.9776 19.7574 20.7643 9	331.0694 723.7033 ang area from street from the street from th	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 DOM Table 9, Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 22 0 21.0000	393.8368 741.5511 Ph1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714 9 21	Jul 86,9251 6.7950 0.4178 20.1954 20.2738	332.0529 671.5049 Aug 87.2376 6.8158 0.4595 20.1979 20.9737 9	.7000 .7000	factor Table () 0.77()	Nov 84.7988 6.6533 0.9921 19.6668 20.7189 8	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (66.235	(76) (78) (88) (83) (84) (85)
North East South West Total gains Total gains 7. Mean interr Temperature di Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of h	101.4545 532.5535 all temperataring heatinactor for graph of the state of the stat	176.5507 605.5560 Ture (heating periods: ains for liv Feb 83.3426 6.5562 0.9923 19.5425 20.6685 8 20 000 21.000 20.2246	7.8 3.2' 6.4' 0.7(252.1103 667.2174 ang season) In the livir ying area, 1' Mar 83.6298 6.5753 0.9776 19.7574 20.7643 9 22 0 21.0000 20.2271 0.9707	331.0694 723.7033 331.0694 723.7033 ang area fro nil,m (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 8 22 00 21.0000 20.2394	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 m Table 9, 'Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 9 22 0 01.0000 20.2419 0.7374	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714 9 21 00 21.0000 20.2543 0.5120	Jul 86.9251 6.7950 0.4578 20.1954 20.2032 0.3474	Aug 87.2376 6.8158 0.4595 20.1979 20.9737 9 22 00 21.0000 20.2568 0.3860	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8000 .8000 .7000 .8000	0.771 0.771 0.771 0.771 0.771 197.9095 571.5936 Oct 85.3956 6.6930 0.9453 20.0081 20.8736 9 22 0 21.0000 20.2419 0.9247	Nov 84.798 6.6533 0.9921 19.6668 20.7189 8 22 0 21.0000 20.2370 0.9892	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (56.2353 (66.2	(76) (78) (88) (83) (84) (85) (86)
North East South West Total gains Total gains Total gains Total gains Total gains Total gains Themperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2	101.4545 532.5535 	176.5507 605.5560 ture (heating periods: a sins for live Feb 83.3426 6.5562 0.9923 19.5425 20.6685 8 20 0 21.0000 20.2246	7.8 3.2' 6.4' 0.7' 252.1103 667.2174 252.1103 667.2174 252.1103 3.6298 6.5753 0.9776 19.7574 20.7643 9 22 0 21.0000 20.2271	331.0694 723.7033 331.0694 723.7033 area fr nil,m (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 8 22 0.21.0000 20.2394	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 Dom Table 9, Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 220 21.0000 20.22419 0.7374 20.1462 20.1462	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714 9 21 0 21.0000 20.2543	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490 Jul 86.9251 6.7950 0.4178 20.1954 20.9738 9 22 0 21.0000 20.2543	Aug 87.2376 6.8158 0.4595 20.1979 20.9737 9 22 0.1.0000 20.2568	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8000 .7000	Oct 85.3956 6.6930 0.9453 20.0081 20.2419 0.9247 20.0081 20.0081	Nov 84.7988 6.6533 0.9921 19.6668 20.7189 22 0.21.0000 20.2370	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (66.235	(76) (78) (88) (83) (84) (85) (86) (87) (88) (89)
North East South West Total gains Total gains Total gains Total gains Total gains Temperature of Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1 Tweekday Tweekend MIT 2 Living area fi	101.4545 532.5535 all temperataring heating to for graph of the state	176.5507 605.5560 Lure (heating periods: sins for liver for 100, 100, 100, 100, 100, 100, 100, 100	7.8 3.2° 6.4' 0.70 252.1103 667.2174 252.1103 667.2174 252.1103 3.6298 6.5753 0.9776 19.7574 20.7643 22 0.21.0000 20.2271 0.9707 19.7574 19.7574	331.0694 723.7033 331.0694 723.7033 ang area from film (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 8 22 00 21.0000 20.2394 0.9008 20.0106 20.0106 20.0106	10.6334 19.6403 19.6403 388.6224 758.3717 Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.2419 0.7374 20.1462 20.1462 20.2419	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 21.0000 20.2543 0.5120 20.1929 20.1929	0.4500 0.4500 0.4500 0.4550 376.3467 709.7490 Jul 86.9251 6.7950 0.4178 20.1954 20.1954 20.2543 0.3474 20.1954 20.1954	Aug 87.2376 6.8158 0.4595 20.1979 22 20 21.0000 20.2568 0.3860 20.1979 20.1979	.7000 .7000	Oct 85.3956 6.6930 0.9453 20.0081 20.0081 20.0081 20.2419 Living area	Nov 84.7988 6.6533 0.9921 19.6668 20.2370 0.9892 19.6668 19.6668 19.6668 20.2370 a / (4) =	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (66.235	(76) (78) (88) (83) (84) (85) (85) (86) (87) (88) (89)
North East South West	101.4545 532.5535 all temperations and temperations and temperations are series and temperations and temperations and temperations and temperations are series and temperations and temperations are series and temperations and temperations are series are series and temperations are series are	176.5507 605.5560 Lure (heating periods: 176	7.8 3.2' 6.4' 0.7(252.1103 667.2174 ang season) in the livir ving area, 1 Mar 83.6298 6.5753 0.9776 19.7574 20.7643 9 22.0000 20.2271 0.9707 19.7574 19.7574 20.7574	331.0694 723.7033 331.0694 723.7033 331.0694 723.7033 331.0694 723.7033 0.928 8.22 20.0106 20.8780 21.0000 20.2394 0.9008 20.0106 20.2394	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 Table 9, 7 Table 9, 6.6930 0.7851 20.1462 20.9486 0.21.0000 20.2419 0.7374 20.1462 20.1462 20.1462 20.2419 20.4420	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714 9 21 00 21.0000 20.2543 0.5120 20.1929 20.1929 20.1929 20.2543	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490 376.3467 709.7490 0.4178 20.1954 20.9738 9 22 20 21.0000 20.2543 0.3474 20.1954 20.1954 20.1954	Aug 87.2376 6.8158 0.4595 20.1979 20.2768 0.3860 20.1979 20.1979 20.2568 20.4529	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8000 .7000 .8000 .7000	Oct 85.3956 6.6930 0.9453 20.0081 20.0081 20.0081 20.2419 Living area	Nov 84.7988 6.6533 0.9921 19.6668 20.2370 0.9892 19.6668 19.6668 19.6668 20.2370 a / (4) =	18.1983 (14.0197 (66.2353 (3.0012 (6.2353 (3.0012 (6.2353 (6.2	(76) (78) (88) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92)
North East South West Total gains Total gains Total gains Total gains 7. Mean interr Temperature dutilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of h Tweekday Tweekend MIT 2 Living area fi MIT Temperature ac adjusted MIT	101.4545 532.5535 all temperataring heating to for graph of the state	176.5507 605.5560 Ture (heating periods: ains for liv Feb 83.3426 6.5562 0.9923 19.5425 20.6685 8 20 0.00 20.2246 0.9899 19.5425 19.5425 20.2246 20.4292 20.4292	7.84 3.2° 6.4' 0.70 252.1103 667.2174 252.1103 667.2174 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1032 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103	331.0694 723.7033 ang area fro nil,m (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 22 0 21.0000 20.2394 0.9008 20.0106 20.0106 20.0106 20.0394 20.4401	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 m Table 9, 'Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9466 9 21.0000 20.2419 0.7374 20.1462 20.1462 20.1462 20.1462 20.2419 20.4420	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 21.0000 20.2543 0.5120 20.1929 20.1929 20.1929 20.2543 20.4511 20.4511	Jul 86.9251 6.7950 0.4178 20.1954 20.1954 20.1954 20.2543 20.4511 20.4511	Aug 87.2376 6.8158 0.4595 20.1979 22.200 20.2568 0.3860 20.1979 20.1979 20.1979 20.2568 20.4529	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7012 .802 .7015 .802 .7156 .7156 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .71	Oct 85.3956 6.6930 0.9453 20.0081 20.8736 21.0000 20.2419 0.9247 20.0081 20.0081 20.2419 Living are 20.4420	Nov 84.7988 6.6533 0.9921 19.6668 20.2370 0.9892 19.6668 19.6668 20.2370 21.0000 20.2370	18.1983 (14.0197 (66.2353 (3.0012 (6.2353 (3.0012 (6.2353 (6.2	(76) (78) (88) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92)
North East South West	101.4545 532.5535 all temperataneous for go Jan 83.0574 6.5372 rea 0.9970 19.3914 20.6022 9 22 21.0000 20.2222 nouse 0.9960 19.3914 20.2222 nouse 0.94274 20.2222 nouse 19.3914 20.4274 nouse 19.3914 nouse 19.3914 20.4274 nouse 19.3914 nouse 19.3914 nouse 19.3914 nouse 19.3914 nouse 19.	176.5507 605.5560 Ture (heating periods: sins for livered for liv	7.8 3.2 6.4 0.7 252.1103 667.2174 252.1103 667.2174 252.1103 667.2174 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 26	331.0694 723.7033 331.0694 723.7033 ang area froil,m (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 8 22 0.0106 20.2394 0.9008 20.0106 20.2394 20.4401 20.4401	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 Dom Table 9, 7 Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 9 22 0 21.0000 20.2419 0.7374 20.1462 20.2419 20.4420 20.4420	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 20.9714 9 21 00 21.0000 20.2543 0.5120 20.1929 20.1929 20.2543 20.4511 20.4511	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490 Jul 86.9251 6.7950 0.4178 20.1954 20.2543 0.3474 20.1954 20.1954 20.1954 20.1954 20.1954 20.1954 20.4511	Aug 87.2376 6.8158 0.4595 20.1979 20.2568 20.4529 20.4529	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7012 .802 .7015 .802 .7156 .7156 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .802 .7158 .71	Oct 85.3956 6.6930 0.9453 20.0081 20.8736 21.0000 20.2419 0.9247 20.0081 20.0081 20.2419 Living are 20.4420	Nov 84.7988 6.6533 0.9921 19.6668 20.2370 0.9892 19.6668 19.6668 20.2370 21.0000 20.2370	18.1983 (14.0197 (66.2353 (3.0012 (6.2353 (3.0012 (6.2353 (6.2	(76) (78) (88) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92)
North East South West Total gains Total gains 7. Mean interr Temperature dt Utilisation fa tau alpha util living an Tweekend 24 / 16 24 / 9 16 / 9 MIT The 2 util rest of l Tweekday Tweekend MIT 2 Living area fr MIT Temperature ac adjusted MIT 8. Space heat:	101.4545 532.5535 all temperatements for graph of the state of the st	176.5507 605.5560 Ture (heating periods: sins for liv Feb 83.3426 6.5562 0.9923 19.5425 20.6685 8 20 0.000 20.2246 0.9899 19.5425 20.2246 20.4292 20.4292	7.8 3.2 6.4 0.7 252.1103 667.2174 252.1103 667.2174 10.7 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.1103 252.103 252.1103	331.0694 723.7033 331.0694 723.7033 ang area fro nil,m (see Apr 85.0962 6.6731 0.9228 20.0106 20.8780 22 0 21.0000 20.2394 0.9008 20.0106 20.0106 20.0106 20.0394 20.4401	10.6334 19.6403 46.7521 19.6403 388.6224 758.3717 m Table 9, 'Table 9a) May 85.3956 6.6930 0.7851 20.1462 20.9486 9 21.0000 20.2419 0.7374 20.1462 20.1462 20.1462 20.1462 20.1462 20.2419 20.4420	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 21.0000 20.2543 0.5120 20.1929 20.1929 20.1929 20.2543 20.4511 20.4511	Jul 86.9251 6.7950 0.4178 20.1954 20.1954 20.1954 20.2543 20.4511	Aug 87.2376 6.8158 0.4595 20.1979 22.9737 0 21.0000 20.2568 0.3860 20.1979 20.1979 20.2568 20.4529 20.4529	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .860 .7000	Cct 85.3956 6.6930 0.9453 20.0081 20.2419 0.9247 20.0081 20.2419 Living area 20.4420 Oct	Nov 84.7988 6.6533 0.9921 19.6668 20.7189 22 21.0000 20.2370 0.9892 19.6668 20.2370 0.9892 19.6668 20.2370 a / (4) = 20.4383	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (3.0012 (66.2353 (66.23	(76) (78) (78) (80) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92) (93)
North East South West	101.4545 532.5535 all temperataring heating actor for graph and temperataring heating actor for graph and the second sec	176.5507 605.5560 Lure (heating periods: ains for liver feb 83.3426 6.5562 0.9923 19.5425 20.6685 20 0 21.0000 20.2246 0.9899 19.5425 19.5425 20.2246 20.4292 20.4292	7.8 3.2' 6.4' 0.7(252.1103 667.2174 252.1103 667.2174 252.1103 0.9776 19.7574 20.7643 9 22 21.0000 20.2271 0.9707 19.7574 19.7574 20.2271 20.4311 20.4311	331.0694 723.7033 331.0694 723.7033 331.0694 723.7033 331.0694 723.7033 0.0106 20.8780 20.0106 20.2394 20.0106 20.2394 20.0106 20.2394 20.0106 20.2394 20.4401 20.4401	10.6334 19.6403 19.6403 388.6224 758.3717 male pai	393.8368 741.5511 Th1 (C) Jun 86.9251 6.7950 0.5763 20.1929 21.0000 20.2543 0.5120 20.1929 20.1929 20.2543 20.4511 20.4511	0.4500 0.4500 0.4500 0.4500 376.3467 709.7490 Jul 86.9251 6.7950 0.4178 20.1954 20.2543 0.3474 20.1954 20.1954 20.2543 20.4511 20.4511	Aug 87.2376 6.8158 0.4555 20.1979 20.2568 20.4529 20.4529 Aug 0.4055 272.2721	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7017 .802 .7017 .802 .7017 .802 .7017 .802 .7017 .802 .7017 .802 .7017	Oct 85.3956 6.6930 0.9453 20.0081 20.2419 0.9247 20.0081 20.2419 Living area 20.4420 20.4420 0ct 0.9308	Nov 84.7988 6.6533 0.9921 19.6668 20.2370 0.21.0000 20.2370 19.6668 20.2370 20.4383 20.4383	18.1983 (14.0197 (66.2353 (3.0012 (66.2353 (3.0012 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.0000 (67.00000 (67.0000 (67.0000 (67.000000 (67.00000 (67.00000 (67.00000 (67.00000 (67.00000 (67.00000)	(76) (78) (88) (88) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF I	DWELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	,			
1139.4133 Month fracti 1.0000 Space heating kWh	1093.3958	977.5007 1.0000	795.7846 1.0000	600.7140 1.0000	394.9894 0.0000	259.9753 0.0000	272.6200 0.0000	431.5663 0.0000	676.3017 1.0000	923.0088	1131.2881	
	331.6441	244.3941	100.3093	23.4274	0.0000	0.0000	0.0000	0.0000	107.3274	292.4841	466.3751 2018.9322 23.8927	(98)
8c. Space cooling requir	ement											
Not applicable												
9a. Energy requirements	- Individua	l heating s	stems, inc	luding micr	o-CHP							
Fraction of space heat f Fraction of space heat f Efficiency of main space Efficiency of secondary/ Space heating requiremen	rom seconda rom main sy: heating sy: supplementa	ry/supplemen stem(s) stem 1 (in s	ntary syste								0.0000 1.0000 226.2549 100.0000 892.3265	(202) (206) (208)
Jan Space heating requiremen	Feb t	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency	(main heat		L)	23.4274	0.0000	0.0000	0.0000	0.0000	107.3274	292.4841	466.3751	
Space heating fuel (main		stem)	226.2549	226.2549	0.0000	0.0000	0.0000	0.0000	226.2549	226.2549	226.2549	
Water heating requiremen			44.3347	10.3544	0.0000	0.0000	0.0000	0.0000	47.4365	129.2719	206.1282	
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 requiremen 202.6735 Efficiency of water heat	178.6439	187.6315	168.2215	164.8677	147.3386	141.5251	155.2664	154.9827	174.4349	184.4191	197.8048 178.1250	
(217)m 178.1250 Fuel for water heating,		178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	(217)
Water heating fuel used Annual totals kWh/year		105.3370	94.4401	92.5573	82.7164	79.4527	87.1671	87.0078	97.9284	103.5335	111.0483 1155.2616	(219)
Space heating fuel - mai Space heating fuel - sec											892.3265 0.0000	
Electricity for pumps an (BalancedWithHeatRec mechanical ventilatio Total electricity for th Electricity for lighting Total delivered energy f	overy, Datal n fans (SFP e above, kW (calculate	= 0.8 h/year	3875)	1.2500, SFP	= 0.8875)						228.7309 228.7309 360.2389 2636.5579	(231) (232)
12a. Carbon dioxide emis												
Space heating - main sys Space heating - secondar Water heating (other fue	tem 1 Y						Energy kWh/year 892.3265 0.0000 1155.2616		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	ĵ	Emissions kg CO2/year 463.1174 0.0000 599.5807	(263) (264)
Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide	Emission Ra	te (DER)					228.7309 360.2389		0.5190 0.5190		1062.6982 118.7114 186.9640 1368.3736 16.1900	(267) (268) (272)
16 CO2 EMISSIONS ASSOCIA DER Total Floor Area Assumed number of occupa CO2 emission factor in T CO2 emissions from appli CO2 emissions from cooki Total CO2 emissions Residual CO2 emissions o Additional allowable ele Resulting CO2 emissions Net CO2 emissions	nts able 12 for ances, equa ng, equation ffset from l ctricity gen	electricity tion (L14) n (L16) biofuel CHP neration, k	y displaced Wh/m²/year	from grid		TY GENERATION	ON TECHNOLO	GIES		TFA N EF	16.1900 84.5000 2.5427 0.5190 16.0304 2.1305 34.3508 0.0000 0.0000 0.0000 34.3508	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) 100.9775 (1b) - (3b) (m2) 42.2500 (1b) (m) 2.3900 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 42.2500 (1c) 2.6100 (2c) 110.2725 (1c) - (3c) 84.5000 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 0.0000 (6b) 30.0000 (7a) Air changes 30.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 1420 (8) Pressure test Measured/design AP50 0.3920 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] = (21) = (18) x (20) = 0.9250 (20) 0.3626 (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 TER Opaque door TER Opening Type (Uw = 1.40) 18.3000 1.3258 24.2614 (27)42.2500 71.5800 42.2500 Ground Floor 0.1300 5.4925 (28a) 20 4200 Total net area of external elements Aum(A, m2) 176.5000 (31)50.2508 Fabric heat loss, $W/K = Sum (A \times U)$ (26)...(30) + (32) =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) 10.5805 (36) 60.8313 (37) (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 Jan Feb Mar Apr May May 40.1526 Nov 40.6568 Feb 42.0174 Aug 38.7777 42.3067 39.4394 (38) m 41.7338 40.4018 41.1838 (38) 38.9925 38.9925 40.1526 Heat transfer coeff 103.1380 Average = Sum(39)m / 12 102.8487 102 5651 101 2331 100 9839 99 8238 99 8238 99 6090 100 2706 100 9839 101.4880 102.0151 (39) 101.2319 (39) Feb Mar 1.2138 Apr 1.1980 May 1.1951 Jun 1.1813 Aug 1.1788 Sep 1.1866 1.2206 1.2171 1.2073 (40) 1.1980 (40) 1.1813 1.1951 1.2010 HLP (average) Days in month 31 (41) 4. Water heating energy requirements (kWh/year) 2.5427 (42) 94.5897 (43) Assumed occupancy Average daily hot water use (litres/day) Feb Мау Jan Mar Apr Jun Jul Aug Sep Nov Daily hot water use 104.0486 92.6979 88.9143 85.1307 85.1307 92.6979 100.2650 121.4095 116.4953 100.5266 93.1527 106.8940 108.1707 126.0625 137.6071 Total = Sum(45)m = 149.4324 (45) 1488.2637 (45) Water storage loss: 150.0000 (47) 1.3938 (48) 0.5400 (49) Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b





CALCULAT	ION OF 1	TARGET E	MISSION	IS 09.	Jan 2014								
Enter (49) or	(54) in (5	5)										0.7527	(55)
Total storage			23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	
If cylinder co	ntains ded		r storage				23.3325	23.3325		23.3325	22.5798		
Primary loss Total heat red	23.2624	21.0112	23.2624	22.5120	23.2624		23.2624	23.2624		23.2624		23.2624	
Solar input					163.0902	145.6184	139.7476 0.0000	0.0000	153.2625 0.0000 ut (sum of	172.6574 0.0000 months) = S	0.0000	196.0273 0.0000 0.0000	(63)
Output from w/		177.0384	185.8540	166.5013	163.0902	145.6184	139.7476	153.4889	153.2625 er year (kW	172.6574	182.6989		
Heat gains fro		ating, kWh/ 78.5404		76.4421	76.0106	69.4986	68.2492	72.8182	72.0402	79.1917	81.8278	86.9622	
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	127.1361	127.1361	127.1361	127.1361	127.1361	127.1361			127.1361	127.1361	127.1361	127.1361	(66)
Appliances gai	20.3982	18.1175	14.7342	11.1547	8.3383	7.0395	7.6064 le 5	9.8872	13.2705	16.8500	19.6664	20.9651	(67)
Cooking gains	228.5881	230.9601	224.9827	212.2575	196.1941	181.0968	171.0109	168.6389	174.6163	187.3416	203.4049	218.5022	(68)
Pumps, fans					35.7136		35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	
Losses e.g. ev	aporation	(negative v	alues) (Tab		-101.7089				-101.7089				
Water heating	gains (Tab					96.5258	91.7328	97.8739	100.0559	106.4405	113.6498	116.8847	
Total internal	gains	430.0940				348.8030	334.4910	340.5408	352.0835	374.7728	400.8619	420.4929	
6. Solar gains													
[Jan]				rea	Solar flux		g		FF	Acce	ss	Gains	
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data	fact Table	or	W	
North East				400 700	10.6334 19.6403		0.6300 0.6300		.7000	0.77 0.77		25.4777 19.6276	
South West			6.4	900	46 7521		0.6300	0	.7000	0.77	00	92.7294	(78)
									.,,,,,	0.,,		1.2010	(00)
Solar gains Total gains					544.0714 914.9094					277.0733 651.8461			
7. Mean intern													
Temperature du Utilisation fa	ring heati	ng periods	in the livi	ng area fro	om Table 9, 3							21.0000	(85)
tau	Jan 56.8952	Feb	Mar 57.2130	Apr	May	Jun 58.7841	Jul 58.7841	Aug 58.9109	Sep 58.5222	Oct 58.1088	Nov 57.8202	Dec 57.5214	
alpha util living ar					4.8739	4.9189	4.9189	4.9274	4.9015	4.8739	4.8547	4.8348	
	0.9965	0.9919	0.9794	0.9397		0.6658	0.5006	0.5531	0.7997	0.9605	0.9925	0.9974	(86)
MIT Th 2 util rest of h		19.9195 19.9063	20.1937 19.9090	20.5379 19.9216		20.9563 19.9350	20.9912 19.9350	20.9859 19.9370		20.5324 19.9239			
MIT 2		0.9892 18.5016	0.9722 18.8992	0.9183 19.3914		0.5725 19.9071	0.3843 19.9319	0.4332 19.9315	0.7185 19.8485	0.9421 19.3952	0.9895 18.7336		
Living area fr	action 18.6321	18.8758	19.2408	19.6939	20.0274	20.1840	20.2114	20.2098		Living are 19.6953			
Temperature ac adjusted MIT		18.8758	19.2408	19.6939	20.0274	20.1840	20.2114	20.2098	20.1239	19.6953	19.0867	0.0000 18.5988	
8. Space heati	ng require	ment											
Utilisation Useful gains Ext temp.	570.4301			782.4899	725.5079		Jul 0.4151 357.6002 16.6000		545.9573	0ct 0.9370 610.7939 10.6000		538.7032	(95)
Heat loss rate Month fracti	1478.1886				840.9324 1.0000	557.4141 0.0000	360.5057 0.0000	379.4872 0.0000	604.0177 0.0000	918.4798 1.0000	1216.5113		
Space heating	kWh	517.3690				0.0000	0.0000	0.0000					
Space heating Space heating												3311.9357 39.1945	(98)
8c. Space cool	ing requir	ement											





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

9a. Energy rec													
Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	pace heat fr pace heat fr main space secondary/s	com seconda com main sy heating sy supplementa	ry/supplemen stem(s) stem 1 (in s	ntary system								0.0000 1.0000 93.5000 0.0000 3542.1772	(202) (206) (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	675.3723	517.3690	419.2181	223.3545	85.8758	0.0000	0.0000	0.0000	0.0000	228.9183	469.7659	692.0618	(98)
Space heating	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating	fuel (main 722.3233	heating sy 553.3358	stem) 448.3616	238.8818	91.8458	0.0000	0.0000	0.0000	0.0000	244.8324	502.4234	740.1731	(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 200.8960	177.0384	185.8540	166.5013	163.0902	145.6184	139.7476	153.4889	153.2625	172.6574	182.6989	196.0273	(64)
Efficiency of			86.9201	85.5982			79.8000			85.5671	87.2251	79.8000	(216)
(217) m Fuel for water	heating, k	:Wh/month			83.1927	79.8000		79.8000	79.8000			87.8985	
Water heating		202.3099	213.8216	194.5151	196.0390	182.4792	175.1222	192.3420	192.0583	201.7802	209.4569	223.0155 2411.7484	
Annual totals Space heating Space heating	fuel - main											3542.1772 0.0000	
Electricity for central heat main heating Total electricity for Total delivered	ating pump ng flue fan city for the or lighting	above, kW		ix L)								30.0000 45.0000 75.0000 360.2389 6389.1646	(230e) (231) (232)
12a. Carbon di													
Space heating								Energy kWh/year 3542.1772		ion factor kg CO2/kWh 0.2160	k	Emissions g CO2/year 765.1103	(261)
Space heating Water heating Space and water	- secondary (other fuel	,						0.0000		0.0000 0.2160		0.0000 520.9377 1286.0479	(263) (264)
Pumps and fans Energy for lic Total CO2, kg/ Emissions per Fuel factor (e Emissions per Emissions per	yhting /m2/year m2 for spac electricity) m2 for ligh m2 for pump	ting s and fans	-	- 2105 + 1	EE) 2 010	6 1 0 4607	manundad t-	75.0000 360.2389		0.5190 0.5190		38.9250 186.9640 1511.9369 15.2195 1.5500 2.2126 0.4607 26.2600	(267) (268) (272) (272a) (272b) (272c)
Target Carbon	DIOVING FILL		(TEV) - (T	1.	JJ, T 2.212	0.4007,	rounded to	2 u.p.				20.2000	(4/3)





Property Reference	3 Bed End				Issued on Date	16/03/2021
Assessment	2			Prop Type Ref		
Reference						
Property	Type 2 End, Stratford-upo	on-Avon, CV36	5			
SAP Rating		84 B	DER	18.70	TER	26.26
Environmental		85 B	% DER <ter< th=""><th></th><th>28.80</th><th></th></ter<>		28.80	
CO ₂ Emissions (t/ye	ear)	1.37	DFEE	50.84	TFEE	53.41
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>4.81</th><th></th></tfe<>	E	4.81	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	*)36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve	d Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Semi-Detached House, total floor area 8	5 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:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 26.26 kgCO□/m²	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)5 Dwelling Fabric Energy Efficiency (DFEE)50.8 kWh/m2/yrOK	
Party wall 0.00 (max. 0.20) Floor 0.16 (max. 0.25) Roof 0.11 (max. 0.20) Openings 1.39 (max. 2.00) 2a Thermal bridging	thermal transmittances for each junction	
3 Air permeability Air permeability at 50 pascals:	5.00 (design value)	OK
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day	OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100%	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing East: Windows facing East: Windows facing South:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK





CALCULATION	ON OF E	OWELLIN	G EMISSI	ONS FOR	REGULAT	TIONS C	OMPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKSH CALCULATION OF	DWELLING P	EMISSIONS F	OR REGULATI	ONS COMPLIA		Jan 2014							
1. Overall dwel													
Ground floor First floor Total floor are Dwelling volume		la)+(1b)+(1	c)+(1d)+(1e)(ln)		84.5000		Area (m2) 42.2500 42.2500	(1b) x	ey height (m) 2.3900 2.6100	(2c) =		(1b) - (3b (1c) - (3c (4) (5)
2. Ventilation	rate												
					main		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		0 * 40 = 0 * 20 = 3 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 30.0000 0.0000	(6b) (7a) (7b)
Infiltration du Pressure test Measured/design	AP50	neys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				30.0000	Air change / (5) =	0.1420 Yes 5.0000	(8)
Infiltration ra Number of sides		d										0.3920	(18) (19)
Shelter factor Infiltration ra	te adjust	ed to inclu	de shelter	factor					(20) = 1 - (21)		(19)] = x (20) =	0.9250 0.3626	
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	0.4623 0.6069	0.4533 0.6027	0.4442 0.5987	0.3989 0.5795	0.3898 0.5760	0.3445 0.5593	0.3445 0.5593	0.3354 0.5563	0.3626 0.5657	0.3898 0.5760	0.4079 0.5832	0.4261 0.5908	
3. Heat losses	and heat	loss parame	ter										
Element Opening Type 1 Opening Type 2 Ground Floor External Wall Main Roof Total net area Fabric heat los	(Uw = 1.40	0) al elements	Aum(A, m2)	Gross m2 92.0000 42.2500	Openings m2	Ne 2 18 42 71 42	m2 .1200 .3000 .2500 .5800 .2500	U-value W/m2K 1.3000 1.3258 0.1600 0.1800 0.1100 30) + (32)	A x t W/F 2.7560 24.2614 6.7600 12.8844 4.6475	()	-value kJ/m2K	A x K kJ/K	
Party Wall Thermal mass pa Thermal bridges Total fabric he	(Sum(L x)	44	1.5000	0.0000	0.0000		+ (36) =	250.0000 11.1386 62.4479	(36)
Ventilation hea			nthly (38)m	= 0.33 x (25)m x (5)								•
(38)m Heat transfer c	Jan 42.3067	Feb 42.0174	Mar 41.7338	Apr 40.4018	May 40.1526	Jun 38.9925	Jul 38.9925	Aug 38.7777	Sep 39.4394	Oct 40.1526	Nov 40.6568	Dec 41.1838	(38)
	104.7546	104.4653	104.1817	102.8497	102.6005	101.4404	101.4404	101.2256	101.8873	102.6005	103.1047	103.6317 102.8485	
HLP HLP (average)	Jan 1.2397	Feb 1.2363	Mar 1.2329	Apr 1.2172	May 1.2142	Jun 1.2005	Jul 1.2005	Aug 1.1979	Sep 1.2058	Oct 1.2142	Nov 1.2202	Dec 1.2264 1.2171	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heati	ng energy n	equirements	(kWh/year))									
Assumed occupa Average daily		ıse (litres/	'day)									2.5427 94.5897	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot wate	er use												
	104.0486	100.2650	96.4815	92.6979	88.9143	85.1307	85.1307	88.9143	92.6979	96.4815	100.2650	104.0486	(44)
Energy conte	154.3011	134.9527	139.2591	121.4095	116.4953	100.5266	93.1527	106.8940	108.1707	126.0625	137.6071	149.4324	(45)
Energy content	(annual)									Total = S	um (45) m =	1488.2637	(45)
Distribution 1	oss (46)m	$= 0.15 \times (4$	15)m										
	23.1452	20.2429	20.8889	18.2114	17.4743	15.0790	13.9729	16.0341	16.2256	18.9094	20.6411	22.4149	(46)
Water storage	loss:												
Store volume												150.0000	(47)
a) If manufac	turer decla	red loss fa	ctor is kno	own (kWh/da	av):							1.5000	





CALCULA	ION OF E	OWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
Temperature												0.5400	
Enter (49) or Total storage			25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	0.8100 25.1100	
If cylinder c		icated sola		24.3000		24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
Primary loss Total heat re	quired for v			ed for each	n month	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	
Solar input	0.0000	0.0000	187.6315 0.0000	0.0000	0.0000	147.3386 0.0000	141.5251 0.0000	0.0000	154.9827 0.0000	174.4349 0.0000 months) = Si	0.0000	197.8048 0.0000 0.0000	(63)
Output from w		178.6439	187.6315	168.2215	164.8677	147.3386	141.5251	_		174.4349			
Heat gains fr	om water hea	ating, kWh/	month 85.0016	77 0100	77 4226	70.8747	69.6712	Total p		h/year) = Si			
	90.0030	79.8247	85.0016	//.8183	77.4326	70.8747	69.6712	74.2402	73.4164	80.6137	83.2040	88.3842	(63)
5. Internal g													
Metabolic gai	ns (Table 5)), Watts											
(66) m		127.1361			May 127.1361			Aug 127.1361	Sep 127.1361	Oct 127.1361	Nov 127.1361	Dec 127.1361	(66)
Lighting gain: Appliances ga	20.3982	18.1175	14.7342	11.1547	8.3383	7.0395	7.6064	9.8872	13.2705	16.8500	19.6664	20.9651	(67)
Cooking gains	228.5881	230.9601	224.9827	212.2575	196.1941	181.0968	171.0109	168.6389	174.6163	187.3416	203.4049	218.5022	(68)
Pumps, fans					35.7136	35.7136	35.7136 0.0000	35.7136 0.0000	35.7136 0.0000	35.7136 0.0000	35.7136 0.0000	35.7136 0.0000	
Losses e.g. e	vaporation	(negative v	alues) (Tab	le 5)	-101.7089				-101.7089		-101.7089	-101.7089	
Water heating	gains (Tab			108.0809		98.4371	93.6441	99.7852	101.9672	108.3518	115.5610	118.7959	(72)
Total interna		429.0053	415.1071	392.6339	369.7493	347.7142	333.4022	339.4521	350.9948	373.6841	399.7732	419.4041	(73)
6. Solar gain	s												
[Jan]					Solar flux	Coool	g	Connifin	FF	Acce:		Gains	
				m2						facto Table		W	
North East			3.2	400 700	10.6334 19.6403		0.4500	0	.7000 .7000	0.77	0.0	18.1983 14.0197	(76)
South West			0.7	900 000	46.7521 19.6403		0.4500 0.4500	0	.7000 .7000	0.77		66.2353 3.0012	
Solar gains Total gains	101.4545 532.5535	176.5507 605.5560	252.1103 667.2174		388.6224 758.3717	393.8368	376.3467	332.0529	279.1724 630.1673		122.1844 521.9576	86.4015 505.8057	
Total gains	532.5535	605.5560	667.2174	723.7033		393.8368 741.5511	376.3467 709.7490	332.0529 671.5049					
Total gains 7. Mean inter	532.5535	605.5560 ture (heati	667.2174	723.7033	758.3717	393.8368 741.5511	376.3467 709.7490	332.0529 671.5049				505.8057	(84)
Total gains 7. Mean inter	532.5535 nal temperaturing heating actor for gr	605.5560 ture (heati	ng season) in the livi	723.7033	758.3717	393.8368 741.5511	376.3467 709.7490	332.0529 671.5049					(84)
7. Mean inter-Temperature d Utilisation f.	uring heating actor for grant 56.0172	ture (heati	ng season) in the livi ving area,	723.7033 ng area fro nil,m (see Apr	758.3717 m Table 9, 17 Table 9a) May 57.1932	393.8368 741.5511 Th1 (C)	376.3467 709.7490	332.0529 671.5049	630.1673	571.5936	521.9576	21.0000	(84)
7. Mean inter	uring heating actor for grant 56.0172	ture (heati	ng season) in the livi ving area, Mar 56.3252	723.7033 ng area fro nil,m (see Apr 57.0546	758.3717 om Table 9, 17 Table 9a) May 57.1932 4.8129	393.8368 741.5511 Th1 (C) Jun 57.8473	376.3467 709.7490 	332.0529 671.5049	630.1673 Sep 57.5936	571.5936 Oct 57.1932	Nov 56.9136	21.0000 Dec 56.6241	(84)
7. Mean inter- Temperature d Utilisation f tau alpha util living a	532.5535 nal temperal uring heatin actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230	605.5560 ture (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452	ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091	723.7033 ng area fr nil,m (see Apr 57.0546 4.8036 0.9677 19.1968	758.3717 mm Table 9, 5 Table 9a) May 57.1932 4.8129 0.9078 19.6131	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597	376.3467 709.7490 Jul 57.8473 4.8565 0.6026 19.9119	332.0529 671.5049 	Sep 57.5936 4.8396 0.8707	Oct 57.1932 4.8129 0.9764 19.2587	Nov 56.9136 4.7942 0.9950 18.6150	21.0000 Dec 56.6241 4.7749 0.9981 18.0969	(84)
7. Mean inter- Temperature d'Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16	532.5535 mal temperal uring heatin actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230 20.1388	605.5560 ture (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365	667.2174 ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9	723.7033 ng area fro nil,m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 82	758.3717 mm Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9	332.0529 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8	Oct 57.1932 4.8129 0.9764 19.2587 20.6385 9	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 92	(84)
7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9	532.5535 nal temperal uring heatin actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230 20.1388 9 22 0	605.5560 ture (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0	667.2174 ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9 22 0	723.7033 ng area from in, m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22	758.3717 om Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 0	376.3467 709.7490 Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0	332.0529 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8	Oct 571.5936 Oct 571.1932 4.8129 0.9764 19.2587 20.6385 9	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 9 22	(84)
7. Mean inter- Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9	532.5535 nal temperal uring heatin actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230 20.1388 9 22 0 21.0000 19.8884	605.5560 ture (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0	ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9 22	723.7033 ng area fr nil,m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0.21.0000	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0 21.0000	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9	376.3467 709.7490 Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0	332.0529 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8	Oct 57.1932 4.8129 0.9764 19.2587 20.6385 9 22 21.0000	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 22 0	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 9 22	(84)
7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2	532.5535 nal temperal uring heatin actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230 20.1388 9 22 0 21.0000 19.8884	005.5560 ture (heati 	ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9 22 0 21.0000	723.7033	758.3717 mm Table 9, 5 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.21.0000 19.9087 0.8683	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 0 21.0000	376.3467 709.7490 Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0 21.0000	332.0529 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8 22 021.0000	Oct 57.1932 4.8129 0.9764 19.2587 20.6385 9 22 00 21.0000 19.9087	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 0 21.0000 19.9039	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 22 0 21.0000 19.8989	(84) (85) (86) (87) (88) (89)
Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of :	532.5535 mal temperal actor for gr Jan 56.0172 4.7345 rea 0.9975 18.1230 20.1388 9 22 0 21.0000 19.8884 house 0.9966 18.1230	005.5560 ture (heati- ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452		723.7033 ng area fr ni1,m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0 21.0000 19.9063 0.9546 19.1968 19.1968	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.000 19.9087 0.8683 19.6131 19.6131	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 00 21.0000 19.9196 0.6776	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0.01.0000 19.9196 0.4677 19.9119	332.0529 671.5049 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 22 0.21.0000 19.9154 0.8023 19.7753	Oct 57.1932 4.8129 0.9764 19.2587 20.6385 9 22 00 21.0000 19.9087	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0.21.0000 19.9039 0.9929 18.6150 18.6150	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.9974 18.0969 18.0969	(84) (85) (86) (87) (88) (89)
7. Mean inter- Temperature di Utilisation fotau alpha util living a Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1	532.5535	605.5560 ture (heati- ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452		ng area from in, m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0 0.21.0000 19.9063 0.9546 19.1968 19.1968 19.9063	758.3717 Table 9, 1 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.21.0000 19.9087 0.8683 19.6131 19.6131 19.6131	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 00 21.000 19.9196 0.6776 19.8597 19.8597	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0.01.0000 19.9196 0.4677 19.9119	Aug 57.9701 4.8647 0.6529 19.9089 20.9806 0 21.0000 19.9217 0.5191 19.9089 19.9089 19.9089	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8 22 00 21.0000 19.9154 0.8023 19.7753 19.7753	Oct 57.1932 4.8129 0.9764 19.2587 20.6385 9 22.0000 19.9087 0.9643 19.2587 19.2587 19.2587	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 0.21.0000 19.9039 0.9929 18.6150 18.6150 18.6150 19.9039	21,0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 9 22 00 21.0000 19.8989 0.9974 18.0969 18.0969 18.0969 19.8989 0.2639 0.21895	(84) (85) (86) (87) (88) (89)
Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of Tweekday Tweekend MIT 2 Living area f	532.5535 mal temperal uring heatin actor for gr Jan 56.0172 4.7345 18.1230 20.1388 9 22 0 21.0000 19.8884 house 0.9966 18.1230 18.1230 19.8884 raction 20.1817 justment	005.5560 Lure (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452 18.3452 19.8911 20.1837	of 667.2174 ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9 22 0 21.0000 19.8938 0.9841 18.7091 18.7091 19.8938 20.1857	723.7033 ng area from fil, m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0.21.0000 19.9063 0.9546 19.1968 19.1968 19.9063 20.1949	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.10000 19.9087 0.8683 19.6131 19.6131 19.9087 20.1967	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 00 21.0000 19.9196 0.6776 19.8597 19.8597 19.8597	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0 21.0000 19.9196 0.4677 19.9119 19.9119	Aug 57,9701 4.8647 0.6529 19,9089 20,9806 9 22,000 21,0000 19,9217 0.5191 19,9089 19,9089 19,9089 19,9089	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.7753	Oct 571.5936 057.1932 4.8129 0.9764 19.2587 20.6385 9 22.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 21.0000 19.9039 0.9929 18.6150 18.6150 19.9039 a / (4) = 20.1932	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.9974 18.0969 18.0969 18.0969 19.8989 0.2639 20.1895 0.0000	(84) (85) (86) (87) (88) (89) (90) (91) (92)
Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 MIT Th 2 util rest of Tweekday Tweekend MIT 2 Living area f MIT Temperature a	532.5535 mal temperal uring heatin actor for gr Jan 56.0172 4.7345 18.1230 20.1388 9 22 0 21.0000 19.8884 house 0.9966 18.1230 18.1230 19.8884 raction 20.1817 justment	005.5560 Lure (heati ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452 18.3452 19.8911 20.1837	of 667.2174 ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 9 22 0 21.0000 19.8938 0.9841 18.7091 18.7091 19.8938 20.1857	723.7033 ng area from fil, m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0.21.0000 19.9063 0.9546 19.1968 19.1968 19.9063 20.1949	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.10000 19.9087 0.8683 19.6131 19.6131 19.9087 20.1967	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 0 21.0000 19.9196 0.6776 19.8597 19.8597 19.8597 19.9196 20.2047	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22.0000 19.9196 0.4677 19.9119 19.9119 19.9119	Aug 57,9701 4.8647 0.6529 19,9089 20,9806 9 22,000 21,0000 19,9217 0.5191 19,9089 19,9089 19,9089 19,9089	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8 22 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.9154 fLA = 20.2016	Oct 571.5936 057.1932 4.8129 0.9764 19.2587 20.6385 9 22.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 21.0000 19.9039 0.9929 18.6150 18.6150 19.9039 19.9039 19.9039	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.9974 18.0969 18.0969 19.8989 0.2639 20.1895 0.0000	(84) (85) (86) (87) (88) (89) (90) (91) (92)
Total gains 7. Mean inter: Temperature d' Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1 Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT 8. Space heat	532.5535 nal temperate tring heating actor for grant fo	005.5560 ture (heati- ng periods ains for li Feb 56.1723 4.7448 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452 19.3452 19.3452 19.3452 19.3452	ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 22 0 21.0000 19.8938 0.9841 18.7091 18.7091 19.8938 20.1857 20.1857	723.7033	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0.21.0000 19.9087 0.8683 19.6131 19.6131 19.6131 20.1967 20.1967	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 00 21.000 19.9196 0.6776 19.8597 19.8597 19.9196 20.2047 20.2047	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0.0000 19.9196 0.4677 19.9119 19.9196 20.2047	332.0529 671.5049 671.5049 	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 8 22 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.9154 fLA = 20.2016	Oct 571.5936 057.1932 4.8129 0.9764 19.2587 20.6385 9 22.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 21.0000 19.9039 0.9929 18.6150 18.6150 19.9039 19.9039 19.9039	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.9974 18.0969 18.0969 19.8989 0.2639 20.1895 0.0000	(84) (85) (86) (87) (88) (89) (90) (91) (92)
Total gains 7. Mean inter 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1 Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT	532.5535 mal temperal uring heatin actor for gr Jan 56.0172 4.7345 18.1230 20.1388 9 22 0 21.0000 19.8884 house 0.9966 18.1230 19.8884 raction 20.1817 djustment 20.1817	605.5560 ture (heati	667.2174	ng area from in, m (see Apr 57.0546 4.8036 0.9677 19.1968 20.6137 8 22 0.000 19.9063 0.9546 19.1968 19.1968 19.1968 20.1949 20.1949	758.3717 Table 9, 1 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0 21.0000 19.9087 0.8683 19.6131 19.6131 19.9087 20.1967	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 0 21.0000 19.9196 0.6776 19.8597 19.8597 19.9196 20.2047 20.2047	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0 21.0000 19.9196 0.4677 19.9119 19.9119 20.2047	Aug 57, 9701 4, 8647 0, 6529 19, 9089 20, 9806 9 22, 0 21, 0000 19, 9217 0, 5191 19, 9089 19, 9089 19, 9217 20, 2062 20, 2062	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 20 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.7753 19.7753 20.2016	Oct 57.1932 4.8129 0.9764 19.2587 22.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587 19.2587 20.1967	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 0.21.0000 19.9039 0.9929 18.6150 18.6150 18.6150 20.1932 20.1932	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.2974 18.0969 18.0969 19.8989 0.2639 0.20895 0.0000 20.1895	(84) (85) (86) (87) (88) (89) (90) (91) (92)
Total gains	532.5535 mal temperal actor for grant for gra	005.5560 ture (heati ng periods ains for li Feb 0.9950 18.3452 20.2365 8 20 0 21.0000 19.8911 0.9932 18.3452 19.8911 20.1837 20.1837	067.2174 ng season) in the livi ving area, Mar 56.3252 4.7550 0.9884 18.7091 20.3976 22 0 21.0000 19.8938 0.9841 18.7091 19.8938 20.1857 20.1857	723.7033	Om Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 0 21.0000 19.9087 0.8663 19.6131 19.6131 19.6131	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 9 21 00 21.0000 19.9196 0.6776 19.8597 19.9196 20.2047 20.2047	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 0 21.0000 19.9196 0.4677 19.9119 19.9196 20.2047 20.2047	332.0529 671.5049 671.5049 Aug 57.9701 4.8647 0.6529 19.9089 20.9806 9 21.000 19.9217 0.5191 19.9089 19.9217 20.2062 20.2062	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 22 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.7753 20.2016 20.2016	Oct 571.5936 0ct 57.1932 4.8129 0.9764 19.2587 22 0 21.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587 20.1967	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 222 0.21.0000 19.9039 0.9929 18.6150 19.9039 a/ (4) = 20.1932	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.9974 18.0969 18.0969 19.8989 0.2639 20.1895 0.0000 20.1895	(84) (85) (86) (87) (88) (89) (90) (91) (92) (93)
Total gains 7. Mean inter 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT 8. Space heat Utilisation Useful gains Ext temp. Heat loss rat-	532.5535 nal temperate uring heating actor for gray Jan 0.9975 18.1230 20.1388 9 22 0.21.0000 19.8884 house 0.9966 18.1230 19.8884 raction 20.1817 distribution 20.1817 distribution Jan 0.9969 530.9043 4.3000 e 1663.6849	005.5560 ture (heati- ng periods ains for li Feb 0.9950 18.3452 20.2365 8 20 021.0000 19.8911 0.9932 18.3452 19.8911 20.1837 20.1837	667.2174	723.7033	758.3717 Table 9, 17 Table 9a) May 57.1932 4.8129 0.9078 19.6131 20.8113 9 22 21.0000 19.9087 0.8663 19.6131 19.6131 19.6131 19.6131 19.6137 20.1967 May 0.8862 675.5047 11.7000 871.7622	393.8368 741.5511 Th1 (C) Jun 57.8473 4.8565 0.7699 19.8597 20.9442 21.0000 19.9196 0.6776 19.8597 19.8597 19.9196 20.2047 20.2047	Jul 57.8473 4.8565 0.6026 19.9119 20.9867 9 22 21.0000 19.9196 0.4677 19.9119 19.9196 20.2047 20.2047	332.0529 671.5049 Aug 57.9701 4.8647 0.6529 19.9089 20.9806 9 22 0.0000 19.9217 0.5191 19.9089 19.9089 19.9082 20.2062 Aug 0.5567 373.8384 16.4000	Sep 57.5936 4.8396 0.8707 19.7753 20.8902 22 0 21.0000 19.9154 0.8023 19.7753 19.7753 19.7753 20.2016 20.2016	Oct 57.15936 0.9764 19.2587 22.06385 9.22.0000 19.9087 0.9643 19.2587 19.2587 19.2587 19.2587 20.1967 20.1967	Nov 56.9136 4.7942 0.9950 18.6150 20.3517 8 22 0 0.21.0000 19.9039 0.9929 18.6150 18.6150 18.6150 20.1932 20.1932	21.0000 Dec 56.6241 4.7749 0.9981 18.0969 20.1240 0.21.0000 19.8989 0.2639 0.2639 0.2639 0.0000 20.1895 0.0000 20.1895	(84) (85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF D	WELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ.			
Space heating Space heating per m2									(98) / (4) =	4348.7739 51.4648	
8c. Space cooling requirem	ment											
Not applicable												
9a. Energy requirements -												
Fraction of space heat fro Fraction of space heat fro Efficiency of main space h Efficiency of secondary/su Space heating requirement	om seconda: om main sys neating sys	ry/supplemen stem(s) stem 1 (in ^s	ntary system								0.0000 1.0000 284.4674 100.0000 1528.7422	(202) (206) (208)
Jan Space heating requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
842.7888 Space heating efficiency (668.5435			151.9675	0.0000	0.0000	0.0000	0.0000	320.8911	598.5980	857.4097	(98)
284.4674	284.4674	284.4674	284.4674	284.4674	0.0000	0.0000	0.0000	0.0000	284.4674	284.4674	284.4674	(210)
Space heating fuel (main h	235.0158		118.4529	53.4218	0.0000	0.0000	0.0000	0.0000	112.8042	210.4276	301.4087	(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 Water heating requirement 202.6735	178.6439	187.6315	168.2215	164.8677	147.3386	141.5251	155.2664	154.9827	174.4349	184.4191	197.8048	
Efficiency of water heater (217)m 178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	
Fuel for water heating, kW 113.7816 Water heating fuel used		105.3370	94.4401	92.5573	82.7164	79.4527	87.1671	87.0078	97.9284	103.5335	111.0483 1155.2616	
Annual totals kWh/year Space heating fuel - main Space heating fuel - secon	system ndary										1528.7422 0.0000	
Electricity for pumps and Total electricity for the Electricity for lighting (Total delivered energy for	above, kWl		ix L)								0.0000 360.2389 3044.2427	(232)
12a. Carbon dioxide emissi												
Space heating - main syste Space heating - secondary Water heating (other fuel)							Energy kWh/year 1528.7422 0.0000 1155.2616		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	k	Emissions cg CO2/year 793.4172 0.0000 599.5807	(261) (263) (264)
Space and water heating Pumps and fans							0.0000		0.0000		1392.9980	(267)
Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide Em	nission Rat	te (DER)					360.2389		0.5190		186.9640 1579.9620 18.7000	(272)
16 CO2 EMISSIONS ASSOCIATE	יסי ווחדוו סי	DITANCES AND	O COOPING 3	ND CIME WIF	E FIECMDICT	my commonant	ON TECHNOTO	CIPC				
DER Total Floor Area Assumed number of occupant CO2 emission factor in Tak CO2 emissions from appliar CO2 emissions from cooking Total CO2 emissions Residual CO2 emissions off Additional allowable elect	cs ole 12 for nces, equat g, equation	electricity tion (L14) n (L16) biofuel CHP	y displaced		B BEBURIUT	II GENERAII	ON TECHNOLOG	GIES		TFA N EF	18.7000 84.5000 2.5427 0.5190 16.0304 2.1305 36.8608 0.0000	ZC2 ZC3 ZC4 ZC5
Resulting CO2 emissions of Net CO2 emissions	Efset from	additional	allowable	electricity	generation						0.0000 36.8608	





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) 100.9775 (1b) - (3b) (m2) 42.2500 (1b) (m) 2.3900 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 42.2500 (1c) 2.6100 (2c) 110.2725 (1c) - (3c) 84.5000 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 0.0000 (6b) 30.0000 (7a) Air changes 30.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 1420 (8) Pressure test Measured/design AP50 0.3920 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] = (21) = (18) x (20) = 0.9250 (20) 0.3626 (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 TER Opaque door TER Opening Type (Uw = 1.40) 18.3000 1.3258 24.2614 (27)42.2500 71.5800 42.2500 Ground Floor 0.1300 5.4925 (28a) 20 4200 Total net area of external elements Aum(A, m2) 176.5000 (31)50.2508 Fabric heat loss, $W/K = Sum (A \times U)$ (26)...(30) + (32) =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) 10.5805 (36) 60.8313 (37) (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 Jan Feb Mar Apr May May 40.1526 Nov 40.6568 Feb 42.0174 Aug 38.7777 42.3067 39.4394 (38) m 41.7338 40.4018 41.1838 (38) 38.9925 38.9925 40.1526 Heat transfer coeff 103.1380 Average = Sum(39)m / 12 102.8487 102 5651 101 2331 100 9839 99 8238 99 8238 99 6090 100 2706 100 9839 101.4880 102.0151 (39) 101.2319 (39) Feb Mar 1.2138 Apr 1.1980 May 1.1951 Jun 1.1813 Aug 1.1788 Sep 1.1866 1.2206 1.2171 1.2073 (40) 1.1980 (40) 1.1813 1.1951 1.2010 HLP (average) Days in month 31 (41) 4. Water heating energy requirements (kWh/year) 2.5427 (42) 94.5897 (43) Assumed occupancy Average daily hot water use (litres/day) Feb Мау Jan Mar Apr Jun Jul Aug Sep Nov Daily hot water use 104.0486 92.6979 88.9143 85.1307 85.1307 92.6979 100.2650 121.4095 116.4953 100.5266 93.1527 106.8940 108.1707 126.0625 137.6071 Total = Sum(45)m = 149.4324 (45) 1488.2637 (45) Water storage loss: 150.0000 (47) 1.3938 (48) 0.5400 (49) Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b





CALCULAT	ION OF 1	TARGET E	MISSION	IS 09.	Jan 2014								
Enter (49) or	(54) in (5	5)										0.7527	(55)
Total storage			23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	
If cylinder co	ntains ded		r storage				23.3325	23.3325		23.3325	22.5798		
Primary loss Total heat red	23.2624	21.0112	23.2624	22.5120	23.2624		23.2624	23.2624		23.2624		23.2624	
Solar input					163.0902	145.6184	139.7476 0.0000	0.0000	153.2625 0.0000 ut (sum of	172.6574 0.0000 months) = S	0.0000	196.0273 0.0000 0.0000	(63)
Output from w/		177.0384	185.8540	166.5013	163.0902	145.6184	139.7476	153.4889	153.2625 er year (kW	172.6574	182.6989		
Heat gains fro		ating, kWh/ 78.5404		76.4421	76.0106	69.4986	68.2492	72.8182	72.0402	79.1917	81.8278	86.9622	
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	127.1361	127.1361	127.1361	127.1361	127.1361	127.1361			127.1361	127.1361	127.1361	127.1361	(66)
Appliances gai	20.3982	18.1175	14.7342	11.1547	8.3383	7.0395	7.6064 le 5	9.8872	13.2705	16.8500	19.6664	20.9651	(67)
Cooking gains	228.5881	230.9601	224.9827	212.2575	196.1941	181.0968	171.0109	168.6389	174.6163	187.3416	203.4049	218.5022	(68)
Pumps, fans					35.7136		35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	35.7136 3.0000	
Losses e.g. ev	aporation	(negative v	alues) (Tab		-101.7089				-101.7089				
Water heating	gains (Tab					96.5258	91.7328	97.8739	100.0559	106.4405	113.6498	116.8847	
Total internal	gains	430.0940				348.8030	334.4910	340.5408	352.0835	374.7728	400.8619	420.4929	
6. Solar gains													
[Jan]				rea	Solar flux		g		FF	Acce	ss	Gains	
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data	fact Table	or	W	
North East				400 700	10.6334 19.6403		0.6300 0.6300		.7000	0.77 0.77		25.4777 19.6276	
South West			6.4	900	46 7521		0.6300	0	.7000	0.77	00	92.7294 4.2016	(78)
									.,,,,,	0.,,		1.2010	(00)
Solar gains Total gains					544.0714 914.9094					277.0733 651.8461			
7. Mean intern													
Temperature du Utilisation fa	ring heati	ng periods	in the livi	ng area fro	om Table 9, 3							21.0000	(85)
tau	Jan 56.8952	Feb	Mar 57.2130	Apr	May	Jun 58.7841	Jul 58.7841	Aug 58.9109	Sep 58.5222	Oct 58.1088	Nov 57.8202	Dec 57.5214	
alpha util living ar					4.8739	4.9189	4.9189	4.9274	4.9015	4.8739	4.8547	4.8348	
	0.9965	0.9919	0.9794	0.9397		0.6658	0.5006	0.5531	0.7997	0.9605	0.9925	0.9974	(86)
MIT Th 2 util rest of h		19.9195 19.9063	20.1937 19.9090	20.5379 19.9216		20.9563 19.9350	20.9912 19.9350	20.9859 19.9370		20.5324 19.9239			
MIT 2		0.9892 18.5016	0.9722 18.8992	0.9183 19.3914		0.5725 19.9071	0.3843 19.9319	0.4332 19.9315	0.7185 19.8485	0.9421 19.3952	0.9895 18.7336		
Living area fr	action 18.6321	18.8758	19.2408	19.6939	20.0274	20.1840	20.2114	20.2098		Living are 19.6953			
Temperature ac adjusted MIT		18.8758	19.2408	19.6939	20.0274	20.1840	20.2114	20.2098	20.1239	19.6953	19.0867	0.0000 18.5988	
8. Space heati	ng require	ment											
Utilisation Useful gains Ext temp.	570.4301			782.4899	725.5079		Jul 0.4151 357.6002 16.6000		545.9573	0.9370 610.7939 10.6000		538.7032	(95)
Heat loss rate Month fracti	1478.1886				840.9324 1.0000	557.4141 0.0000	360.5057 0.0000	379.4872 0.0000	604.0177 0.0000	918.4798 1.0000	1216.5113		
Space heating	kWh	517.3690				0.0000	0.0000	0.0000					
Space heating Space heating												3311.9357 39.1945	(98)
8c. Space cool	ing requir	ement											





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

9a. Energy rec													
Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	pace heat fr pace heat fr main space secondary/s	com seconda com main sy heating sy supplementa	ry/supplemen stem(s) stem 1 (in s	ntary system								0.0000 1.0000 93.5000 0.0000 3542.1772	(202) (206) (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	675.3723	517.3690	419.2181	223.3545	85.8758	0.0000	0.0000	0.0000	0.0000	228.9183	469.7659	692.0618	(98)
Space heating	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating	fuel (main 722.3233	heating sy 553.3358	stem) 448.3616	238.8818	91.8458	0.0000	0.0000	0.0000	0.0000	244.8324	502.4234	740.1731	(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 200.8960	177.0384	185.8540	166.5013	163.0902	145.6184	139.7476	153.4889	153.2625	172.6574	182.6989	196.0273	(64)
Efficiency of			86.9201	85.5982			79.8000			85.5671	87.2251	79.8000	(216)
(217) m Fuel for water	heating, k	:Wh/month			83.1927	79.8000		79.8000	79.8000			87.8985	
Water heating		202.3099	213.8216	194.5151	196.0390	182.4792	175.1222	192.3420	192.0583	201.7802	209.4569	223.0155 2411.7484	
Annual totals Space heating Space heating	fuel - main											3542.1772 0.0000	
Electricity for central heat main heating Total electricity for Total delivered	ating pump ng flue fan city for the or lighting	above, kW		ix L)								30.0000 45.0000 75.0000 360.2389 6389.1646	(230e) (231) (232)
12a. Carbon di													
Space heating								Energy kWh/year 3542.1772		ion factor kg CO2/kWh 0.2160	k	Emissions g CO2/year 765.1103	(261)
Space heating Water heating Space and water	- secondary (other fuel	,						0.0000		0.0000 0.2160		0.0000 520.9377 1286.0479	(263) (264)
Pumps and fans Energy for lic Total CO2, kg/ Emissions per Fuel factor (e Emissions per Emissions per	yhting /m2/year m2 for spac electricity) m2 for ligh m2 for pump	ting s and fans	-	- 2105 + 1	EE) 2 010	6 1 0 4607	manundad t-	75.0000 360.2389		0.5190 0.5190		38.9250 186.9640 1511.9369 15.2195 1.5500 2.2126 0.4607 26.2600	(267) (268) (272) (272a) (272b) (272c)
Target Carbon	DIOVING FILL		(TEV) - (T	1.	JJ, T 2.212	0.4007,	rounded to	2 u.p.				20.2000	(4/3)





Property Reference	2B4P MF MT				Issued on Date	16/03/2021			
Assessment Reference	3			Prop Type Ref					
Property	2B4P, x, Stratford Upon A	von, CV36							
SAP Rating		89 B	DER	14.26	14.26 TER 21.6				
Environmental		90 B	% DER <ter< th=""><th></th><th>34.02</th><th></th></ter<>		34.02				
CO ₂ Emissions (t/ye	ear)	0.88	DFEE	27.35	TFEE	33.41			
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>18.15</th><th></th></tfe<>	E	18.15				
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID	T296-0001			
Client									





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

REGULATIONS COMPLIANCE REPORT -	Approved Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Mid-floor flat, total floor are	a 73 m²	
This report covers items includ It is not a complete report of	regulations compliance.	
la TER and DER Fuel for main heating:Electrici Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Dwelling Carbon Dioxide Emissio	ty Rate (TER) 21.61 kgCO□/m² n Rate (DER) 14.26 kgCO□/m²OK	
lb TFEE and DFEE Target Fabric Energy Efficiency Dwelling Fabric Energy Efficien	(TFEE)33.4 kWh/m²/yr cy (DFEE)27.3 kWh/m²/yrOK	
2 Fabric U-values Element Average External wall 0.15 (max. 0.30 Party wall 0.00 (max. 0.20 Floor (no floor) Roof (no roof) Openings 1.17 (max. 2.00	Highest) 0.15 (max. 0.70) OK) - OK	
2a Thermal bridging Thermal bridging calculated from	m linear thermal transmittances for each junction	
3 Air permeability Air permeability at 50 pascals: Maximum	10.0	OK
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50V	Heat pump with radiators or underfloor -	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	OK
6 Controls Space heating controls:	Time and temperature zone control	ок
Hot water controls:	Cylinderstat Independent timer for DHW	OK OK
7 Low energy lights Percentage of fixed lights with Minimum	low-energy fittings:100% 75%	OK
8 Mechanical ventilation Continuous supply and extract s Specific fan power:	0.53	
Maximum MVHR efficiency: Minimum:	1.5 89% 70%	OK OK
9 Summertime temperature	70%	
Overshading:	Not significant	OK
	Average	
Windows facing West: Air change rate:	Average 10.43 m ² , No overhang 6.00 ach	
Windows facing West: Air change rate: Blinds/curtains:	10.43 m², No overhang 6.00 ach Light-coloured curtain or roller blind, c	losed 100% of daylight hour:
Air change rate: Blinds/curtains:	10.43 m², No overhang 6.00 ach Light-coloured curtain or roller blind, c	losed 100% of daylight hour:





CALCULATI	ON OF D	WELLIN	G EMISSI	ONS FOR	REGULAT	IONS CO	OMPLIAN	ICE 09	9 Jan 2014				
					0.02 Tanua								
SAP 2012 WORKSF													
1. Overall dwel													
								Area		rey height		Volume	
Ground floor	/1				_			(m2) 73.0000		(m) 2.5000	(2b) =	(m3) 182.5000	(1b) - (3b
Total floor are Dwelling volume		a) + (1b) + (1	c)+(1a)+(1e)(1n)	,	73.0000		(3a) + (3b) + (3c)	+ (3d) + (3e)	(3n) =	182.5000	(4) (5)
2. Ventilation					main		econdary		other	tot	al m	3 per hour	
Number of chimr	nevs				heating 0	+	heating 0	+		=	0 * 40 =	0.0000	(6a)
Number of open Number of inter Number of passi Number of fluel	flues rmittent fa: ive vents				0	+	0	+		=	0 * 20 = 0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000 0.0000	(6b) (7a) (7b)
	-		, -			(T.)					Air change:	s per hour	
Infiltration du Pressure test Measured/design		eys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				0.0000	/ (5) =	0.0000 Yes 3.0000	(8)
Infiltration ra Number of sides	ate											0.1500	(18) (19)
Shelter factor Infiltration ra	ate adjuste	d to inclu	de shelter	factor					(20) = 1	- [0.075 x 21) = (18)		0.7750 0.1163	
Wind speed Wind factor Adj infilt rate	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 mecha	0.1482	0.1453 ilation wi	0.1424 th heat rec	0.1279 overv	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)
If mechanical v If balanced wit	ventilation	:			for in-use fa	actor (fro	m Table 4h)	=				0.5000 75.6500	
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583	(25)
3. Heat losses													
Element				Gross m2	Openings m2		m2	U-value W/m2K 1.0000	W	/K	-value kJ/m2K	A x K kJ/K	(26)
Opening Type 1 Opening Type 2 External Wall)		24.3000	12.3200	10	.8900 .4300 .9800	1.1450	11.94: 11.79	27			(26) (27) (29a)
Corridor Wall Total net area	of externa	l elements	Aum(A, m2)	24.3000		24	.3000 .6000	0.1500	3.64				(29a) (31)
Fabric heat los Party Wall Party Floor 1 Party Ceiling 1		um (A x U)				73	(26)(.0000 .0000 .0000	30) + (32) 0.0000	= 19.27 0.00				(33) (32) (32d) (32b)
Thermal mass pa Thermal bridges Total fabric he	s (Sum(L x)					(33)	+ (36) =	250.0000 5.6116 24.8863	(36)
Ventilation hea						7	T. 3		0	0			
(38)m Heat transfer o	Jan 16.2589	Feb 16.0838	Mar 15.9088	Apr 15.0337	May 14.8586	Jun 13.9835	Jul 13.9835	Aug 13.8085	Sep 14.3336	Oct 14.8586	Nov 15.2087	Dec 15.5588	(38)
Average = Sum (3	41.1452	40.9702	40.7952	39.9200	39.7450	38.8698	38.8698	38.6948	39.2199	39.7450	40.0950	40.4451 39.8763	
HLP HLP (average) Days in month	Jan 0.5636	Feb 0.5612	Mar 0.5588	Apr 0.5468	May 0.5445	Jun 0.5325	Jul 0.5325	Aug 0.5301	Sep 0.5373	Oct 0.5445	Nov 0.5492	Dec 0.5540 0.5463	
10 month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4 Water heatin													
4. Water heatin	ncy											2.3167	
Average daily h	not water u Jan	se (litres Feb	/day) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	89.2216 Dec	(43)
Daily hot water Energy conte Energy content	r use 98.1438 145.5444	94.5749 127.2941	91.0061	87.4372 114.5194	83.8683 109.8841	80.2995 94.8216	80.2995 87.8662	83.8683 100.8277	87.4372	91.0061 118.9084	94.5749	98.1438 140.9520	(45)
Distribution lo		= 0.15 x (45)m							iorai = S	uni(43)m =	1403.803/	(40)





CALCULAT	ION OF	DWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
	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)
Water storage Store volume												150.0000	(47)
a) If manufac Temperature Enter (49) or	factor fro (54) in (5	m Table 2b	actor is kn	own (kWh/c	day):							1.5000 0.5400 0.8100	(49)
Total storage	25.1100	22.6800		24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder co	25.1100	22.6800	25.1100	24.3000		24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
Primary loss Total heat red				ed for each	n month	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 189.3244	
Solar input	0.0000	170.9853	0.0000	0.0000		141.6336	136.2386	0.0000	0.0000	167.2808 0.0000 months) = Su	0.0000	0.0000	(63)
Output from w,		170.9853	179.7285	161.3314	158.2565	141.6336	136.2386			167.2808 h/year) = Su			
Heat gains fro	om water he 87.0914			75.5273	75.2344	68.9778	67.9134	72.2231	71.3752	78.2350	80.6074	85.5645	(65)
5. Internal ga	ains (see T	able 5 and	5a)										
Metabolic gair	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	s (calculat	ed in Appen	dix L, equa	tion L9 or		see Table 5			115.8350	115.8350	115.8350	115.8350	
Appliances gas		ated in App	endix L, eq	uation L13		lso see Tab		9.1691	12.3068	15.6263	18.2382	19.4427	
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or		see Table	5		155.9828	167.3501	181.6993	195.1856	
Pumps, fans	34.5835 0.0000	34.5835 0.0000	0.0000	0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	34.5835 0.0000	
Losses e.g. ev	-92.6680	-92.6680			-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating	117.0584	114.9974	110.7175	104.8990	101.1215	95.8025	91.2815	97.0741	99.1322	105.1545	111.9547	115.0060	(72)
Total internal		395.8638	383.1067	362.6014	341.8627	321.8530	308.8482	314.6370	325.1723	345.8814	369.6427	387.3847	(73)
6. Solar gains	5												
[Jan]					Solar flux		g		FF	Acces	ss	Gains	
				m2	Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data le 6c	facto Table 6		W	
West			10.4	300	W/m2 19.6403		0.4500	0			5d	W 51.1055	(80)
West	51.1055	99.9731	10.4	300 	W/m2 19.6403 294.2759	301.2437	0.4500	246.3538		Table 6	63.7225		(83)
West 	51.1055 449.0264	99.9731 495.8369	10.4 164.6415 547.7482	240.1198 602.7212	W/m2 19.6403 294.2759 636.1386	301.2437 623.0968	0.4500 286.7963 595.6445	246.3538 560.9907	.8000 191.4849	Table 6	63.7225	51.1055 42.0266	(83)
Solar gains Total gains 7. Mean inter	51.1055 449.0264 mal tempera	99.9731 495.8369 ture (heati	10.4 164.6415 547.7482 ng season)	240.1198 602.7212	294.2759 636.1386	301.2437 623.0968	0.4500 286.7963 595.6445	246.3538 560.9907	.8000 191.4849	Table 6	63.7225	51.1055 42.0266	(83) (84)
Solar gains Total gains	51.1055 449.0264 anal tempera uring heati actor for g	99.9731 495.8369 ture (heati 	10.4 164.6415 547.7482 ng season) in the livi ving area,	240.1198 602.7212 ng area fr nil,m (see Apr	W/m2 19.6403 294.2759 636.1386 om Table 9, 17 Table 9a) May	301.2437 623.0968 Th1 (C)	0.4500 286.7963 595.6445	246.3538 560.9907	.8000 191.4849 516.6572	Table 6 0.770 118.6265 464.5080	6d 00 63.7225 433.3652	51.1055 42.0266 429.4114 21.0000 Dec	(83) (84)
Solar gains Total gains 7. Mean inter Temperature di Utilisation fa	51.1055 449.0264 nal tempera uring heati actor for g Jan 123.2086 9.2139	99.9731 495.8369 ture (heati ng periods ains for li Feb 123.7350	10.4 164.6415 547.7482 ng season) in the livi ving area,	240.1198 602.7212 ng area fr nil,m (see Apr	W/m2 19.6403 294.2759 636.1386 om Table 9, 1 Table 9a) May 127.5493	301.2437 623.0968 Th1 (C)	0.4500 286.7963 595.6445	246.3538 560.9907	.8000 191.4849 516.6572	Table 6 0.770 118.6265 464.5080 Oct 127.5493	63.7225 433.3652 Nov 126.4357	51.1055 42.0266 429.4114 21.0000 Dec	(83) (84)
Solar gains Total gains 7. Mean interr Temperature di Utilisation fa	51.1055 449.0264 nal tempera uring heati actor for g Jan 123.2086 9.2139	99.9731 495.8369 tture (heati 	10.4 164.6415 547.7482 ng season) in the livi ving area; Mar 124.2658 9.2844	240.1198 602.7212 ng area fro nil,m (see Apr 126.9900 9.4660	W/m2 19.6403 294.2759 636.1386 om Table 9, Table 9a) May 127.5493 9.5033	301.2437 623.0968 Fh1 (C) Jun 130.4210 9.6947	Jul 130.4210 9.6947	246.3538 560.9907	.8000 191.4849 516.6572 Sep 129.2570 9.6171	Table 6 0.770 118.6265 464.5080 Oct 127.5493 9.5033	63.7225 433.3652 Nov 126.4357 9.4290	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561	(83) (84)
Solar gains Total gains 7. Mean inter Temperature di Utilisation fa tau alpha util living an	51.1055 449.0264 anal tempera uring heati actor for g Jan 123.2086 9.2139 rea 0.9930	99.9731 495.8369 ture (heati- ng periods tains for li Feb 123.7350 9.2490 0.9813	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337	240.1198 602.7212 ng area fro nil,m (see Apr 126.9900 9.4660 0.7797	W/m2 19.6403 294.2759 636.1386 om Table 9, Table 9a) May 127.5493 9.5033 0.5796	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992	Jul 130.4210 9.6947 0.2871	246.3538 560.9907 Aug 131.0110 9.7341 0.3173	Sep 129.2570 9.6171 0.5233	Oct 127.5493 9.5033 0.8441	000 63.7225 433.3652 Nov 126.4357 9.4290 0.9776	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823	(83) (84)
Solar gains Total gains 7. Mean interr Temperature du Utilisation fatuutil living an Tweekday Tweekday Tweekend 24 / 16	51.1055 449.0264 mal tempera uring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9	99,9731 495.8369 	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9	240.1198 602.7212 ng area fro nil,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878	W/m2 19.6403 294.2759 636.1386 om Table 9, Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992	301.2437 623.0968 Fh1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 9	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 9	Aug 131.0110 9.7341 0.3173 20.4933 21.0000	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9	Nov 126, 4357 9,4290 0,9776 20,2316 20,8752 8	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9	(83) (84)
Solar gains Total gains 7. Mean inter Temperature di Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9	51.1055 449.0264 anal tempera aring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 22 0	99.9731 495.8369 Lture (heati- ng periods ains for li Feb 123.7350 9.2490 0.9813 20.1410 20.8388 8 20 0	10.4 164.6415 547.7482 ng season) in the liviving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0	240.1198 602.7212 	W/m2 19.6403 294.2759 636.1386 Dom Table 9, 17 Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 9 22 0	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 9	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 9	246.3538 560.9907 Aug 131.0110 9.7341 0.3173 20.4933 21.0000 9	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 20	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 0	Nov 126, 4357 9, 4290 0, 9776 20, 2316 20, 8752 8	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22	(83) (84) (85)
West Solar gains Total gains 7. Mean interr Temperature du Utilisation fatualpha util living au Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of h	51.1055 449.0264	99.9731 495.8369 tture (heati 	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 21.0000	240.1198 602.7212 ang area from film (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878 8 22 0.21.0000	W/m2 19.6403 294.2759 636.1386 om Table 9, Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 0 21.0000	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 9	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 9 22 0 21.0000 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 20	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 0 21.0000	Nov 126. 4357 9.4290 0.9776 20.2316 20.8752 22 0.21.0000 20.4759	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0 21.0000 20.4715	(83) (84) (85) (86)
Solar gains Total gains 7. Mean interr Temperature di Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 MIT Th 2 util rest of N	51.1055 449.0264 anal tempera arring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 22 0 21.0000 0.21.0000 0.9911 19.9988 nouse 0.9911	99.9731 495.8369 Lture (heati- 	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 0 21.0000 20.4672 0.9196	240.1198 602.7212 	W/m2 19.6403 294.2759 636.1386 Dom Table 9, 'Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 9 22 0 01.0000 20.4803 0.5478	301.2437 623.0968 Ph1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 21.0000 20.4912	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 9 22 00 21.0000 20.4912 0.2539	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 9 22 00 21.0000 20.4933 0.2823	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 0 21.0000 20.4868 0.4846	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 0 21.0000 20.4803	Nov 126.4357 9.4290 0.9776 20.2316 20.8752 8 22 0 0 21.0000 20.4759	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22	(83) (84) (85) (86)
Solar gains Total gains 7. Mean interr Temperature du Utilisation fa tau alpha util living au Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l	51.1055 449.0264 anal tempera arring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 22 0 21.0000 0.21.0000 0.9911 19.9988 nouse 0.9911	99.9731 495.8369 tture (heati 	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 1.0000 20.4672 0.9196 20.3276	240.1198 602.7212 ng area from 11,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.4584 20.4584 20.4584 20.4584	W/m2 19.6403 294.2759 636.1386 om Table 9, Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 22 021.0000 20.4803 0.54788 20.4791 20.4791	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 9 21 00 21.0000 20.4912 0.3675	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 0.2539 20.4912 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 22.4000 20.4933 0.2823 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 0 21.0000 20.4868 0.4846 20.4868	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 22 0 21.0000 20.4803 0.8134 20.4488 20.4488	Nov 126, 4357 9, 4290 0,9776 20,2316 20,4759 0,9711 20,2316 20,2316 20,2316	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 021.0000 20.4715 0.9935 19.9823 19.9823	(83) (84) (85) (86) (87) (88) (89)
Solar gains Total gains Total gains Total gains 7. Mean interr Temperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of h Tweekday Tweekend MIT 2 Living area fi	51.1055 449.0264	99,9731 495.8369 Lture (heating periods lains for life periods lains l	10.4 164.6415 547.7482 ng season) in the liviving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 21.0000 20.4672	240.1198 602.7212 area fromil, (see Apr 126.9900 0.7797 20.4584 20.4584 0.21.0000 20.4781 0.7514 20.4584 20.4584 20.4584 20.4584	W/m2 19.6403 294.2759 636.1386 294.2759 636.1386 Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 20 0.21.0000 20.4803 0.5478 20.4791 20.4791 20.4791 20.4791	301.2437 623.0968 Fh1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 21.0000 20.4912 0.3675 20.4911 20.4911	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 0.2539 20.4912 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 22.0000 20.4933 0.2823 20.4933 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.4868 0.4846 20.4865 20.4865 20.4868	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 0.21.0000 20.4803 0.8134 20.4488 20.4808 Living area	Nov 126.4357 9.4290 0.9776 20.2316 20.4759 0.9711 20.2316 20.2316 20.4759	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0 21.0000 20.4715 0.9935 19.9823 19.9823 19.9823 20.4715 0.3616	(83) (84) (85) (86) (87) (88) (89)
West	51.1055 449.0264 anal tempera aring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 22 0 21.0000 20.4628 nouse 0.9911 19.9988 20.4628 raction 20.6571 1justment	99,9731 495.8369 Lture (heati 	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.3276 20.3276 20.3276 20.3276 20.3276 20.3276 20.4672 20.6599	240.1198 602.7212 area free inl,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878 8 22 0 21.0000 20.4781 0.7514 20.4584 20.4584 20.4584 20.4584 20.4781	W/m2 19.6403 294.2759 636.1386 Description of the control of th	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 0.21.0000 20.4912 0.3675 20.4911 20.4912 20.4912 20.6752	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 0.2539 20.4912 20.4912 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 0.21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 22 0 21.0000 20.4868 0.4846 20.4865 20.4865 20.4865 20.4865	Oct 118.6265 464.5080 Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 20 21.0000 20.4803 0.8134 20.4488 20.4488 20.4488 20.4488	Nov 126.4357 9.4290 0.9776 20.2316 20.2316 20.2000 0.9771 20.2316 20.2316 20.2316 20.2316 20.2316 20.4759	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0.0000 20.4715 0.9935 19.9823 19.9823 19.9823 20.4715 0.3616 20.6627 0.0000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
Solar gains Total gains Total gains 7. Mean interr Temperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of h Tweekday Tweekend MIT 2 Living area fi MIT Temperature ac adjusted MIT	51.1055 449.0264 anal tempera actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 21.0000 20.4628 nouse 0.9911 19.9988 20.4628 raction 20.6571 ijustment 20.6571	99.9731 495.8369 Liture (heati	10.4 164.6415 547.7482 ng season) in the livity ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 21.0000 20.4672 0.9196 20.3276 20.3276 20.3276 20.4672 20.6599 20.6599	240.1198 602.7212 ng area frr nil,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878 8 222 0 21.0000 20.4781 0.7514 20.4584 20.4584 20.4584 20.4588	W/m2 19.6403 294.2759 636.1386 m Table 9, 1 Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 9 22 0 21.0000 21.0003 0.5478 20.4791 20.4803 20.6682 20.6682	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 20.4912 0.3675 20.4911 20.4911 20.4912 20.6752 20.6752	0.4500 286.7963 595.6445 Jul 130.4210 9.6947 0.2871 20.4912 21.0000 20.4912 0.2539 20.4912 20.4912 20.4912 20.6752	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 0 21.0000 20.4868 0.4846 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865	Oct 118.6265 464.5080 Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 20 21.0000 20.4803 0.8134 20.4488 20.4488 20.4488 20.4488	Nov 126.4357 9.4290 0.9776 20.2316 20.4759 0.9711 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316	21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0 21.0000 20.4715 0.9935 19.9823 19.9823 19.9823 20.4715 0.3616 20.6627 0.0000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
Solar gains Total gains Total gains 7. Mean internation Temperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1 Tweekday Tweekend MIT 2 Living area for	51.1055 449.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.02667 Ad9.026671	99.9731 495.8369 Liture (heati Teb 123.7350 9.2490 0.9813 20.1410 20.8388 8 20 0 0 21.0000 20.4650 0.9765 20.1410 20.1410 20.4650 20.6585	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 21.0000 20.4672 0.9196 20.3276 20.3276 20.3276 20.4672 20.6599 20.6599	240.1198 602.7212 ng area from 11,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878 22 0.21.0000 20.4781 0.7514 420.4584 20.4584 20.4781 20.6668	W/m2 19.6403 294.2759 636.1386 294.2759 636.1386 294.2759 20.00 20.4803 0.5796 20.4791 20.4803 0.5478 20.4791 20.4791 20.4803 20.6682 20.6682	301.2437 623.0968 Fh1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 21.0000 20.4912 0.3675 20.4911 20.4912 20.6752 20.6752	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 0.2539 20.4912 20.4912 20.4912 20.4912 20.4912 20.4912 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 8 22 0 21.0000 20.4868 0.4846 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865	Oct 118.6265 464.5080 Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 20 21.0000 20.4803 0.8134 20.4488 20.4488 20.4488 20.4488	Nov 126.4357 9.4290 0.9776 20.2316 20.4759 0.9711 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316	21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0 21.0000 20.4715 0.9935 19.9823 19.9823 19.9823 20.4715 0.3616 20.6627 0.0000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
West	51.1055 449.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.0264 Ad9.02667 Ad9.026671	99.9731 495.8369 Liture (heati Teb 123.7350 9.2490 0.9813 20.1410 20.8388 8 20 0 0 21.0000 20.4650 0.9765 20.1410 20.1410 20.4650 20.6585	10.4 164.6415 547.7482 ng season) in the livi ying area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 021.0000 20.4672 0.9196 20.3276 20.3276 20.3276 20.3276 20.4672 20.6599 20.6599	240.1198 602.7212 ng area frenil,m (see Apr 126.9900) 9.4660 0.7797 20.4584 20.9878 8 22 0 21.0000 20.4781 0.7514 20.4584 20.4781 20.6668 20.6668	W/m2 19.6403 294.2759 636.1386 m Table 9, 7 Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 20 21.0000 20.4803 0.5478 20.4791 20.4803 20.6682 20.6682	301.2437 623.0968 Th1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 20.4912 0.3675 20.4911 20.4911 20.4912 20.6752 20.6752	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 0.2539 20.4912 20.4912 20.4912 20.4912 20.4912 20.4912 20.4912	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 20.21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 22 0 21.0000 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865 20.4865	Oct 118.6265 464.5080 Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 20 21.0000 20.4803 0.8134 20.4488 20.4488 20.4488 20.4488	Nov 126.4357 9.4290 0.9776 20.2316 20.4759 0.9711 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316 20.2316	21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0 21.0000 20.4715 0.9935 19.9823 19.9823 19.9823 20.4715 0.3616 20.6627 0.0000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
West Solar gains Total gains Total gains Total gains Total gains Total gains Total gains T. Mean intern Temperature du Utilisation fa tau alpha util living an Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of N Tweekend MIT 2 Living area fn MIT 2 Living area fn MIT Temperature ac adjusted MIT 8. Space heat: Utilisation Useful gains Ext temp.	51.1055 449.0264 mal tempera arring heati actor for g Jan 123.2086 9.2139 rea 0.9930 19.9988 20.7754 9 21.0000 20.4628 nouse 0.9911 19.9988 19.9988 19.9988 20.4628 caction 20.6571 djustment 20.6571 djustment 20.6571 djustment 20.6571	99.9731 495.8369 Liture (heati Ing periods ains for li Feb 123.7350 9.2490 0.9813 20.1410 20.8388 8 20 0 0 21.0000 20.4650 0.9765 20.1410 20.1410 20.4650 20.6585 20.6585	10.4 164.6415 547.7482 In the livitying area, was a season) 20.3276 20.9253 9 22 00 21.0000 20.4672 0.9196 20.3276 20.3276 20.3276 20.4672 20.6599 20.6599	240.1198 602.7212	W/m2 19.6403 294.2759 636.1386 Dm Table 9, 5 Table 9a, 5 Table	301.2437 623.0968 Ph1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 21.0000 20.4912 0.3675 20.4911 20.4912 20.6752 20.6752	Jul 130.4210 9.6947 0.2871 20.4912 21.0000 21.0000 20.4912 20.4912 20.4912 20.4912 20.4912 20.6752 20.6752	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4933 20.4936 20.	Sep 129.2570 9.6171 0.5233 20.4865 20.9988 22 0 21.0000 20.4868 0.4866 20.4865 20.4865 20.4865 20.4865 20.4865 20.6724 20.6724	Oct 127.5493 9.5033 0.8441 20.4488 20.9801 99 22 0.4803 0.8134 20.4488 20.4808 Living area 20.6682 20.6682	Nov 126.4357 9.4290 0.9776 20.2316 20.8752 22 0 21.0000 20.4759 0.9711 20.2316 20.4759 3 / (4) = 20.6654 20.6654	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 9 22 0.0000 20.4715 0.9935 19.9823 19.9823 20.4715 0.3616 20.6627	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)
West	51.1055 449.0264 Add.0264 Add.0264	99.9731 495.8369 Liture (heati	10.4 164.6415 547.7482 ng season) in the livi ving area, Mar 124.2658 9.2844 0.9337 20.3276 20.9253 9 22 0 021.0000 20.4672 0.9196 20.3276 20.3276 20.3276 20.3276 20.3276 20.4672 20.6599 20.6599	240.1198 602.7212 ng area frc ni1,m (see Apr 126.9900 9.4660 0.7797 20.4584 20.9878 8 222 0 21.0000 20.4781 0.7514 20.4584 20.4584 20.4584 20.4588 20.6668	W/m2 19.6403 294.2759 636.1386 Dom Table 9, Table 9a) May 127.5493 9.5033 0.5796 20.4791 20.9992 9 22 00 21.0000 20.4803 0.5478 20.4791 20.4791 20.4803 20.6682 May 0.5593 355.8027	301.2437 623.0968 Fh1 (C) Jun 130.4210 9.6947 0.3992 20.4911 21.0000 20.4912 0.3675 20.4911 20.4912 20.6752 20.6752	0.4500 286.7963 595.6445 Jul 130.4210 9.6947 0.2871 20.4912 21.0000 20.4912 20.4912 20.4912 20.4912 20.4912 20.6752 Jul 0.2659 158.4013 16.6000 158.4016	Aug 131.0110 9.7341 0.3173 20.4933 21.0000 20.21.0000 20.4933 20.4933 20.4933 20.4933 20.4933 20.4936 20.6766 20.6766	Sep 129.2570 9.6171 0.5233 20.4865 20.9998 22 0.21.0000 20.4868 0.4846 20.4865 20.4865 20.4865 20.4865 20.4864 20.6724 20.6724	Table 6 0.770 118.6265 464.5080 Oct 127.5493 9.5033 0.8441 20.4488 20.9801 9 22 0 21.0000 20.4803 0.8134 20.4488 20.4488 20.46682 20.6682 Oct 0.8249 383.1751 10.6000 400.1610	Nov 126.4357 9.4290 0.9776 20.2316 20.2316 20.230 20.4759 0.9711 20.2316 20.2316 20.4759 a / (4) = 20.6654 Nov 0.9737 421.9592 7.1000 543.9066	51.1055 42.0266 429.4114 21.0000 Dec 125.3414 9.3561 0.9949 19.9823 20.7647 0.01000 20.4715 0.9935 19.9823 19.9823 20.4715 0.3616 20.6627 0.0000 20.6627	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF D	WELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014			
169.3630 Space heating Space heating per m2	107.8694	52.8315	7.6073	0.4753	0.0000	0.0000	0.0000	0.0000	12.6376	87.8022	177.7912 (98) 616.3776 (98) 8.4435 (99)
8c. Space cooling require	ment										
Not applicable											
9a. Energy requirements - Fraction of space heat fr Fraction of space heat fr Efficiency of main space Efficiency of secondary/S	om seconda: om main sys	ry/supplementstem(s)	ntary system								0.0000 (201) 1.0000 (202) 147.8266 (206) 100.0000 (208)
Space heating requirement											416.9598 (211)
Jan Space heating requirement		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
169.3630 Space heating efficiency	(main heat:			0.4753	0.0000	0.0000	0.0000	0.0000	12.6376	87.8022	177.7912 (98)
Space heating fuel (main	heating sys			147.8266	0.0000	0.0000	0.0000	0.0000	147.8266	147.8266	147.8266 (210)
114.5687 Water heating requirement	72.9702	35.7388	5.1461	0.3216	0.0000	0.0000	0.0000	0.0000	8.5489	59.3954	120.2701 (211)
0.0000 Water heating Water heating requirement		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
193.9168 Efficiency of water heate	170.9853	179.7285	161.3314	158.2565	141.6336	136.2386	149.2001	148.8439	167.2808	176.6098	189.3244 (64) 178.1250 (216)
(217)m 178.1250 Fuel for water heating, k	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 (217)
108.8656 Water heating fuel used	95.9917	100.9002	90.5720	88.8458	79.5136	76.4848	83.7615	83.5615	93.9120	99.1494	106.2874 (219) 1107.8454 (219)
Annual totals kWh/year Space heating fuel - main Space heating fuel - seco											416.9598 (211) 0.0000 (215)
Electricity for pumps and (BalancedWithHeatReco mechanical ventilation Total electricity for the Electricity for lighting Total delivered energy fo	very, Datal fans (SFP above, kWl (calculated	= 0.0	5625)	1.2500, SFP	= 0.6625)						147.5056 (230a) 147.5056 (231) 334.0784 (232) 2006.3892 (238)
12a. Carbon dioxide emiss											
Space heating - main syst Space heating - secondary Water heating (other fuel Space and water heating	•						Energy kWh/year 416.9598 0.0000 1107.8454		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	k	Emissions g CO2/year 216.4021 (261) 0.0000 (263) 574.9718 (264) 791.3739 (265)
Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide E	mission Ra	te (DER)					147.5056 334.0784		0.5190 0.5190		76.5554 (267) 173.3867 (268) 1041.3160 (272) 14.2600 (273)
DER Total Floor Area Assumed number of occupan CO2 emission factor in Ta 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	ble 12 for nces, equation g, equation fset from 1	electricity tion (L14) n (L16) piofuel CHP meration, ki	y displaced Wh/m²/year	from grid		TY GENERATI	ON TECHNOLO	GIES		TFA N EF	14.2600 ZC1 73.0000 2.3167 0.5190 16.5756 ZC2 2.3918 ZC3 33.2274 ZC4 0.0000 ZC5 0.0000 ZC5 0.0000 ZC7 33.2274 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) 182.5000 (1b) - (3b) (m) 2.5000 (2b) 73.0000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 73.0000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 182.5000 (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) = 0.1644 (8) Pressure test Measured/design AP50 0.4144 (18) Infiltration rate Number of sides sheltered 3 (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 0.4095 0.4014 0.3533 0.3452 0.3051 0.3051 0.2971 0.3211 0.3452 0.3613 0.3773 (22b) 0.3934 Effective ac 3. Heat losses and heat loss parameter Openings A x U W/K 1.8900 Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 m2 1.8900 10.4300 11.9800 (26) TER Opaque door TER Opening Type (Uw = 1.40) External Wall 13.8277 (27) (29a) 24.3000 12.3200 0.1800 EXTERNAL WALL Corridor Wall Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 24.3000 0.1800 4.3740 (29a) 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) 4.1968 (36) (33) + (36) = Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan
(38)m 35.1612
Heat transfer coeff Feb 34.9651 Apr 33.8704 May 33.7015 Aug 32.7698 34.7729 34.0431 34.4003 (38) 61.4100 61.2178 60.3152 60.1463 59.3602 59.3602 59.2146 59.6630 60.1463 61.6060 Average = Sum(39)m / 12 60.4880 60.8451 (39) 60.3144 (39) Aug 0.8112 Jan 0.8439 Feb 0.8412 May 0.8239 Jun 0.8132 Apr 0.8262 0.8386 0.8239 0.8132 0.8286 HLP (average) 0.8262 (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) 83.8683 80.2995 87.4372 94.5749 98.1438 (44) 118.9084 129.7978 Total = Sum (45) m = 140.9520 (45) 1403.8037 (45) Distribution loss (46)m = 0.15 x (45)m 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) Water storage loss: Store volume
a) If manufacturer declared loss factor is known (kWh/day): 150.0000 (47) 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss 0.5400 (49) 0.7527 (55)





CALCULAT	ION OF 1	TARGET E	MISSION	IS 09.	Jan 2014								
TE aulindan as	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	23.3325 23.2624	21.0745 21.0112	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat rec	192.1393	169.3798	ng calculate 177.9510 0.0000	159.6113	156.4790	139.9135	134.4611		147.1238	165.5033	174.8896		
Solar input Output from w/	0.0000 h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 Solar inp	0.0000 ut (sum of	0.0000 months) = Si	0.0000 am(63)m =	0.0000	
	192.1393	169.3798		159.6113	156.4790	139.9135	134.4611			165.5033 h/year) = Su			
Heat gains fro	m water he 85.6694	ating, kWh/: 75.9939	month 80.9518	74.1512	73.8124	67.6017	66.4914	70.8011	69.9991	76.8130	79.2312	84.1425	(65)
5. Internal ga													
Metabolic gair	Jan	Feb	Mar	Apr	May 115.8350	Jun	Jul	Aug	Sep 115.8350	Oct 115.8350	Nov 115.8350	Dec 115.8350	(66)
Lighting gains				tion L9 or	L9a), also			9.4246	12.6496	16.0616	18.7463	19.9842	
Appliances gai	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains	34.5835 3.0000	34.5835	34.5835	ion L15 or 34.5835 3.0000	34.5835	34.5835	5 34.5835 3.0000	34.5835 3.0000	34.5835	34.5835 3.0000	34.5835 3.0000	34.5835	
Pumps, fans Losses e.g. ev	aporation	3.0000 (negative v -92.6680		le 5)	-92.6680	3.0000 -92.6680	-92.6680	-92.6680	3.0000 -92.6680	-92.6680	-92.6680	3.0000 -92.6680	
Water heating	gains (Tab			102.9877	99.2102	93.8912	89.3702	95.1628	97.2210	103.2432	110.0434	113.0947	
Total internal	gains	397.4205		363.9782	343.1668	323.1236	310.1334	315.9811	326.6039	347.4054	371.2395	389.0150	
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	or	Gains W	
West			10.43	300	19.6403		0.6300	0	.7000	0.770	00	62.6042	(80)
Solar gains Total gains		122.4671 519.8876	201.6859 586.2619	294.1468 658.1250	360.4879 703.6548	369.0235 692.1472	351.3255 661.4588	301.7834 617.7645	234.5690 561.1729	145.3175 492.7229	78.0601 449.2995	51.4826 440.4976	
7. Mean intern													
Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9, '							21.0000	(85)
Utilisation fa	Jan 82.2882	Feb 82.5509	ving area, mar Mar 82.8100	Apr 84.0492	May	Jun 85.4014	Jul 85.4014	Aug 85.6113	Sep 84.9679	Oct 84.2852	Nov 83.8091	Dec 83.3172	
alpha util living ar	6.4859	6.5034	6.5207	6.6033		6.6934	6.6934	6.7074	6.6645	6.6190	6.5873	6.5545	
,,	0.9969	0.9927	0.9762	0.9088	0.7517	0.5444	0.3944	0.4399	0.7063	0.9478	0.9924	0.9977	(86)
MIT Th 2	20.2260 20.2154	20.3557 20.2177	20.5699 20.2200	20.8200 20.2307	20.9584 20.2326	20.9957 20.2419	20.9996 20.2419	20.9991 20.2437	20.9790 20.2384	20.7832 20.2326	20.4604 20.2286	20.2045	
util rest of h	0.9960 19.1773	0.9904 19.3677	0.9690 19.6770	0.8843 20.0275		0.4819 20.2392	0.3267 20.2418	0.3681 20.2433	0.6389 20.2229	0.9278 19.9878	0.9897 19.5292	0.9970 19.1530	
Living area fr	action	19.7250	19.9999	20.3141		20.5128	20.5158		fLA =	Living area	a / (4) =	0.3616	(91)
Temperature adadjusted MIT		19.7250	19.9999	20.3141	20.4709	20.5128	20.5158	20.5167	20.4964	20.2754	19.8659	0.0000 19.5332	(93)
8. Space heati													
									_			_	
Utilisation Useful gains Ext temp.	4.3000	513.9663	566.6188		May 0.7183 505.4645 11.7000		232.3071			0.9291 457.7857 10.6000	Nov 0.9880 443.9066 7.1000	438.7926	(95)
	939.8959 1.0000	910.4036 1.0000	826.4344 1.0000	688.4433 1.0000			232.4446		381.6258 0.0000		772.1857 1.0000		
Space heating		266.4058	193.3027	75.2828	16.4242	0.0000	0.0000	0.0000	0.0000	92.3728	236.3609	367.6549 1605.0119	
Space heating	per m2									(98)	/ (4) =	21.9865	
8c. Space cool													
Not applicable													





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individu	al heating s	ystems, inc	luding micr	o-CHP							
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	ystem(s) ystem 1 (in	8)	m (Table 11)						0.0000 1.0000 93.5000 0.0000 1716.5903	(202) (206) (208)
Jan Feb Space heating requirement	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
357.2077 266.4058 Space heating efficiency (main hea	193.3027	75.2828	16.4242	0.0000	0.0000	0.0000	0.0000	92.3728	236.3609	367.6549	(98)
93.5000 93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating s 382.0403 284.9260	ystem) 206.7409	80.5164	17.5660	0.0000	0.0000	0.0000	0.0000	98.7944	252.7924	393.2138	(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 192.1393 169.3798	177.9510	159.6113	156.4790	139.9135	134.4611	147.4226	147.1238	165.5033	174.8896	187.5469	
Efficiency of water heater (217)m 86.4459 86.0171	85.0348	82.9430	80.7064	79.8000	79.8000	79.8000	79.8000	83.3291	85.6179	79.8000 86.5785	
Fuel for water heating, kWh/month 222.2654 196.9140	209.2684	192.4350	193.8867	175.3302	168.4976	184.7401	184.3656	198.6140	204.2675	216.6206	
Water heating fuel used Annual totals kWh/year										2347.2051	
Space heating fuel - main system Space heating fuel - secondary										1716.5903 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, k Electricity for lighting (calculat- Total delivered energy for all use	ed in Append	ix L)								30.0000 45.0000 75.0000 343.3842 4482.1795	(230e) (231) (232)
12a. Carbon dioxide emissions - Inc	dividual hea	ting system	s 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 Fuel factor (electricity) Emissions per m2 for lighting Emissions per m2 for pumps and fan.	er heating					Energy kWh/year 1716.5903 0.0000 2347.2051 75.0000 343.3842		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190 0.5190	1	Emissions Gg CO2/year 370.7835 0.0000 506.9963 877.7798 38.9250 178.2164 1094.9212 12.0244 1.5500 2.4413 0.5332	(261) (263) (264) (265) (267) (268) (272) (272a) (272b)
Target Carbon Dioxide Emission Rate		2.0244 * 1.	55) + 2.441	3 + 0.5332,	rounded to	2 d.p.				21.6100	





Property Reference	2B4P MF MT				Issued on Date	16/03/2021						
Assessment Reference	2		Prop Type Ref									
Property	2B4P, x, Stratford Upon A	2B4P, x, Stratford Upon Avon, CV36										
SAP Rating		88 B	DER	15.43	TER	21.61						
Environmental		89 B	% DER <ter< th=""><th></th><th colspan="5">28.61</th></ter<>		28.61							
CO ₂ Emissions (t/ye	ear)	0.94	DFEE	32.21	TFEE	33.41						
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>Ε</th><th>3.60</th><th></th></tfe<>	Ε	3.60							
Assessor Details		r. Jonathan Peck, Jonathan Peck, Tel: 02036031622, nathan@hodkinsonconsultancy.com										
Client												





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

PEGULATIONS COMPLIANCE PEPOPT - Approve		
ABOURTIONS CONTUINED REFORM APPLOVE	ed Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Mid-floor flat, total floor area 73 $\ensuremath{\text{m}}^2$		
This report covers items included within It is not a complete report of regulati	ons compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 21.61 kgCO□/m² DER) 15.43 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)3 Dwelling Fabric Energy Efficiency (DFEE	33.4 kWh/m²/yr 33.2 kWh/m²/yrOK	
2 Fabric U-values		
Element Average	Highest	
External wall 0.18 (max. 0.30)	0.18 (max. 0.70) OK	
Party wall 0.00 (max. 0.20)	- OK	
Floor (no floor) Roof (no roof)		
	1.40 (max. 3.30) OK	
	thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electr	ric
	None	
5 Cylinder insulation		
Hot water storage	Measured cylinder loss: 1 50 kWh/day	
Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day OK	
Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day OK Yes	OK
Permitted by DBSCG 1.89 Primary pipework insulated:	OK	
Permitted by DBSCG 1.89 Primary pipework insulated:	OK Yes	
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Yes Time and temperature zone control	
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	OK Yes	OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Yes Time and temperature zone control Cylinderstat	ok Ok
Permitted by DBSCG 1.89 Primary pipework insulated:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok Ok
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100%	ok Ok
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum Continuous supply and extract system Specific fan power: Maximum MVHR efficiency:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89%	OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands):	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 Overshading risk (Midlands): Based on: Overshading:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing West:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing West: Air change rate:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang 6.00 ach	OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 Overshading: Windows facing West: Air change rate: Blinds/curtains:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang	OK OK OK OK OK OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 Overshading risk (Midlands): Based on: Overshading: Windows facing West: Air change rate: Blinds/curtains: 10 Key features	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang 6.00 ach Light-coloured curtain or roller blind, closed	OK OK OK OK OK OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang 6.00 ach Light-coloured curtain or roller blind, closed	OK OK OK OK OK OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing West: Air change rate: Blinds/curtains: 10 Key features Party wall U-value Door U-value Door U-value	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW Property of the property of	OK OK OK OK OK OK OK OK
Permitted by DBSCG 1.89 Primary pipework insulated:	OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 10.43 m², No overhang 6.00 ach Light-coloured curtain or roller blind, closed	OK OK OK OK OK OK OK OK





	ON OF D	WELLING	g EMISSI	ONS FOR	REGULAT	IONS CC	DMPLIAN	CE 09	Jan 2014				
SAP 2012 WORKSH					9.92, Januar NCE 09 3								
. Overall dwel													
								Area (m2)		y height (m)	(0)	Volume (m3)	(42.)
round floor otal floor are welling volume		ı)+(1b)+(1c	c) + (1d) + (1e)(ln)	7	3.0000		73.0000	(1b) x 3a)+(3b)+(3c)+	2.5000 (3d)+(3e)		182.5000 182.5000	(4)
. Ventilation													
					main		econdary		other	tot	al mi	3 per hour	
umber of chimn					heating 0 0	++	heating 0 0	+	0 =		0 * 40 = 0 * 20 =	0.0000	
mber of inter mber of passi	mittent far ve vents										0 * 10 = 0 * 10 =	0.0000	(7a) (7b)
umber of fluel											0 * 40 = Air changes		
nfiltration du ressure test easured/design		eys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000	/ (5) =	0.0000 Yes 3.0000	(8)
afiltration rate umber of sides sheltered												0.1500	(18) (19)
nelter factor nfiltration ra	ite adjusted	l to includ	de shelter	factor					(20) = 1 - (21		(19)] = x (20) =	0.7750 0.1163	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
nd speed .nd factor Hj infilt rate	5.1000 1.2750	5.0000 1.2500	4.9000 1.2250	4.4000 1.1000	4.3000 1.0750	3.8000 0.9500	3.8000 0.9500	3.7000 0.9250		4.3000 1.0750	4.5000 1.1250	4.7000 1.1750	
alanced mecha	0.1482 nical venti		0.1424 th heat rec	0.1279 overy	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	
f mechanical v f balanced wit			iciency in	% allowing	for in-use fa	ctor (from	n Table 4h)	=				0.5000 75.6500	
ffective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583	(25)
. Heat losses lement				Gross	Openings		 :Area	U-value	Α×U	K	-value	AxK	
pening Type 1				m2	m2	1.	m2 .8900	W/m2K 1.0000	W/K 1.8900		kJ/m2K	kJ/K	(26)
pening Type 2 kternal Wall orridor Wall	(UW = 1.40)			24.3000 24.3000	12.3200	11.	.4300 .9800 .3000	1.3258 0.1800 0.1800	13.8277 2.1564 4.3740				(27) (29a) (29a)
otal net area abric heat los arty Wall			Aum(A, m2)				.6000 (26)(3 .0000	30) + (32) 0.0000	= 22.2481 0.0000				(31) (33) (32)
	<u>.</u>					73.	.0000	0.0000	0.0000				(32d) (32b)
arty Floor 1		1P = Cm / 1)							250.0000 8.6602	
arty Floor 1 arty Ceiling 1 nermal mass pa										(33)	+ (36) =	30.9083	
arty Floor 1 arty Ceiling 1 nermal mass panermal bridges otal fabric he	S (Sum(L x I eat loss	si) calcul		- 0 22 /	25) m v (5)								
arty Floor 1 arty Ceiling 1 hermal mass pa hermal bridges otal fabric he entilation hea 38)m	s (Sum(L x Peat loss at loss calc Jan 16.2589	si) calcul		= 0.33 x (Apr 15.0337	25)m x (5) May 14.8586	Jun 13.9835	Jul 13.9835	Aug 13.8085	Sep 14.3336	Oct 14.8586	Nov 15.2087	Dec 15.5588	(38)
arty Floor 1 arty Ceiling 1 nermal mass pa nermal bridges that fabric he entilation hea 38)m eat transfer c	s (Sum(L x Peat loss at loss calc Jan 16.2589 coeff 47.1671	eulated mor	nthly (38)m Mar	Apr	May							15.5588 46.4670	(39)
arty Floor 1 arty Ceiling 1 nermal mass pa nermal bridges btal fabric he entilation hea 38)m eat transfer c yerage = Sum(3	s (Sum(L x ! eat loss at loss calc Jan 16.2589 coeff 47.1671 39)m / 12 = Jan	culated mor Feb 16.0838 46.9921	nthly (38)m Mar 15.9088 46.8171	Apr 15.0337 45.9419 Apr	May 14.8586 45.7669 May	13.9835 44.8917 Jun	13.9835 44.8917 Jul	13.8085 44.7167 Aug	14.3336 45.2418 Sep	14.8586 45.7669 Oct	15.2087 46.1169 Nov	15.5588 46.4670 45.8982 Dec	(39) (39)
arty Floor 1 arty Ceiling 1 hermal mass pa hermal bridges stal fabric he entilation hea 38)m eat transfer c verage = Sum(3 LP LP (average)	s (Sum(L x I eat loss calc Jan 16.2589 coeff 47.1671 39)m / 12 = Jan 0.6461	Psi) calcul culated mor Feb 16.0838 46.9921 Feb 0.6437	Mar 15.9088 46.8171 Mar 0.6413	Apr 15.0337 45.9419 Apr 0.6293	May 14.8586 45.7669 May 0.6269	13.9835 44.8917 Jun 0.6150	13.9835 44.8917 Jul 0.6150	13.8085 44.7167 Aug 0.6126	14.3336 45.2418 Sep 0.6198	14.8586 45.7669 Oct 0.6269	15.2087 46.1169 Nov 0.6317	15.5588 46.4670 45.8982 Dec 0.6365 0.6287	(39) (39) (40) (40)
arty Floor 1 arty Ceiling 1 hermal mass pa hermal bridges stal fabric he entilation hea 38)m eat transfer c verage = Sum(3 LP LP (average)	s (Sum(L x ! eat loss at loss calc Jan 16.2589 coeff 47.1671 39)m / 12 = Jan	culated mor Feb 16.0838 46.9921	nthly (38)m Mar 15.9088 46.8171	Apr 15.0337 45.9419 Apr	May 14.8586 45.7669 May	13.9835 44.8917 Jun	13.9835 44.8917 Jul	13.8085 44.7167 Aug	14.3336 45.2418 Sep 0.6198	14.8586 45.7669 Oct	15.2087 46.1169 Nov	15.5588 46.4670 45.8982 Dec 0.6365 0.6287	(39) (39)
arty Floor 1 arty Ceiling 1 arty Ceiling 1 arty Mary Ceiling 1 arty Ceiling 1 art	s (Sum(L x ! eat loss calc Jan 16.2589 coeff 47.1671 e Jan 0.6461	Psi) calcululated more Feb 16.0838 46.9921 Feb 0.6437	nthly (38)m Mar 15.9088 46.8171 Mar 0.6413	Apr 15.0337 45.9419 Apr 0.6293	May 14.8586 45.7669 May 0.6269	13.9835 44.8917 Jun 0.6150	13.9835 44.8917 Jul 0.6150	13.8085 44.7167 Aug 0.6126	14.3336 45.2418 Sep 0.6198	14.8586 45.7669 Oct 0.6269	15.2087 46.1169 Nov 0.6317	15.5588 46.4670 45.8982 Dec 0.6365 0.6287	(39) (39) (40) (40)
arty Floor 1 arty Ceiling 1 arty Cei	s (Sum(L x 1 eat loss calc Jan 16.2589 coeff 47.1671 sp)m / 12 = Jan 0.6461 31	Psi) calculated more reb 16.0838 46.9921 Feb 0.6437 28	Mar 15.9088 46.8171 Mar 0.6413	Apr 15.0337 45.9419 Apr 0.6293	May 14.8586 45.7669 May 0.6269	13.9835 44.8917 Jun 0.6150	13.9835 44.8917 Jul 0.6150	13.8085 44.7167 Aug 0.6126	14.3336 45.2418 Sep 0.6198	14.8586 45.7669 Oct 0.6269	15.2087 46.1169 Nov 0.6317	15.5588 46.4670 45.8982 Dec 0.6365 0.6287 31	(39) (39) (40) (40) (41)
arty Floor 1 arty Ceiling 1 arty Ceiling 1 nermal mass pa nermal bridges stal fabric he entilation hea 38)m eat transfer c verage = Sum(3 LP LP (average) and the stall fabric arty floor in the stall fabric arty floor in the stall floor arty	s (Sum(L x 1 eat loss calc loss calc Jan 16.2589 coeff 47.1671 e)m / 12 = Jan 0.6461 31	Psi) calculated more Feb 16.0838 46.9921 Feb 0.6437 28	Mar 15.9088 46.8171 Mar 0.6413	Apr 15.0337 45.9419 Apr 0.6293	May 14.8586 45.7669 May 0.6269	13.9835 44.8917 Jun 0.6150	13.9835 44.8917 Jul 0.6150	13.8085 44.7167 Aug 0.6126	14.3336 45.2418 Sep 0.6198	14.8586 45.7669 Oct 0.6269	15.2087 46.1169 Nov 0.6317	15.5588 46.4670 45.8982 Dec 0.6365 0.6287	(39) (39) (40) (40) (41)
arty Floor 1 arty Ceiling 1 mermal mass pa hermal bridges stal fabric he entilation hea 38)m eat transfer c verage = Sum(3 LP LP (average) ays in month . Water heatin	s (Sum(L x 1 eat loss at loss at loss calc Jan 16.2589 coeff 47.1671 eag) m / 12 = Jan 0.6461 eag energy record water us Jan	Psi) calculated more Feb 16.0838 46.9921 Feb 0.6437 28	Mar 15.9088 46.8171 Mar 0.6413	Apr 15.0337 45.9419 Apr 0.6293	May 14.8586 45.7669 May 0.6269	13.9835 44.8917 Jun 0.6150	13.9835 44.8917 Jul 0.6150	13.8085 44.7167 Aug 0.6126	14.3336 45.2418 Sep 0.6198 30	14.8586 45.7669 Oct 0.6269	15.2087 46.1169 Nov 0.6317	15.5588 46.4670 45.8982 Dec 0.6365 0.6287 31	(39) (39) (40) (40) (41) (41)





CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014	
21.8317 19.0941 19.7034 17.1779 16.4826 14.2232 13.1799 15.1242 15.3048 17.8363 19.46 Water storage loss:	21.1428 (46)
Store volume a) If manufacturer declared loss factor is known (kWh/day): Temperature factor from Table 2b Enter (49) or (54) in (55)	150.0000 (47) 1.5000 (48) 0.5400 (49) 0.8100 (55)
Total storage loss 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.300	0 25.1100 (56)
If cylinder contains dedicated solar storage 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 24.300 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.1100 25.	
Primary loss 23.2624 21.0112 23.2624 22.5120 2	
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.	0.0000 (63)
Output from w/h 193.9168 170.9853 179.7285 161.3314 158.2565 141.6336 136.2386 149.2001 148.8439 167.2808 176.60 Total per year (kWh/year) = Sum(64)m	
Heat gains from water heating, kWh/month 87.0914 77.2782 82.3738 75.5273 75.2344 68.9778 67.9134 72.2231 71.3752 78.2350 80.60	4 85.5645 (65)
5. Internal gains (see Table 5 and 5a) Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov (66)m 115.8350	Dec 0 115.8350 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 18.9169 16.8018 13.6642 10.3446 7.7327 6.5283 7.0541 9.1691 12.3068 15.6263 18.23	19.4427 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 204.1952 206.3141 200.9745 189.6072 175.2580 161.7717 152.7621 150.6432 155.9828 167.3501 181.69 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	3 195.1856 (68)
34.5835 34.583	
Losses e.g. evaporation (negative values) (Table 5) -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680 -92.6680	0 -92.6680 (71)
Water heating gains (Table 5) 117.0584 114.9974 110.7175 104.8990 101.1215 95.8025 91.2815 97.0741 99.1322 105.1545 111.95	7 115.0060 (72)
Total internal gains 397.9210 395.8638 383.1067 362.6014 341.8627 321.8530 308.8482 314.6370 325.1723 345.8814 369.64	387.3847 (73)
6. Solar gains	
6. SOLAT GALIES	
[Jan] Area Solar flux g FF Access m2 Table 6a Specific data Specific data factor W/m2 or Table 6b or Table 6c Table 6d	Gains W
West 10.4300 19.6403 0.4500 0.8000 0.7700	51.1055 (80)
Solar gains 51.1055 99.9731 164.6415 240.1198 294.2759 301.2437 286.7963 246.3538 191.4849 118.6265 63.72 Total gains 449.0264 495.8369 547.7482 602.7212 636.1386 623.0968 595.6445 560.9907 516.6572 464.5080 433.36	
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, ni1,m (see Table 9a)	21.0000 (85)
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92	Dec 8 109.0977
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area	Dec 8 109.0977 4 8.2732
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area 0.9956 0.9890 0.9616 0.8536 0.6613 0.4608 0.3316 0.3666 0.6008 0.9040 0.988	Dec 88 109.0977 14 8.2732
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area 0.9956 0.9890 0.9616 0.8536 0.6613 0.4608 0.3316 0.3666 0.6008 0.9040 0.98 Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9485 20.80 24 / 16 9 8 9 9 8 9 9 9 9 9 9 8 9	Dec 18 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area Util living area 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9948 20.80 24 / 16 9 8 8 9 8 9 9 9 9 9 9 9 8 8 9 9 8 9 9 9 9 9 9 8 8 9 9 8 9 9 9 9 9 9 9 8 8 9	Dec 18 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area Util living area Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9485 20.80 24 / 16 9 8 8 9 8 9 9 9 9 9 9 9 8 8 9 9 9 9 9	Dec 18 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765 8 9 12 22 00 01 21.0000 (87)
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area Util living area 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9985 20.80 24 / 16 9 8 8 9 8 8 9 9 9 9 9 8 8 9 9 24 / 9 22 20 22 22 22 22 22 22 22 22 22 22 22	Dec 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765 8 9 12 22 0 0 21.0000 (87) 15 20.3972 (88) 11 0.9958 (89)
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 199.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area 0.9956 0.9890 0.9616 0.8836 0.6613 0.4608 0.3316 0.3666 0.6008 0.9040 0.98 Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8865 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9985 20.80 24 / 16 9 9 8 9 8 9 9 9 9 9 9 9 8 8 9 24 / 9 22 20 22 22 22 22 22 22 22 22 22 22 22	Dec 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765 18 9 12 22 00 0 21.0000 (87) 15 20.3972 (88) 11 0.9958 (89) 16 19.7216 16 19.7216
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area 0.9956 0.9890 0.9616 0.8536 0.6613 0.4608 0.3316 0.3666 0.6008 0.9040 0.98 Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9988 20.80 24 / 16 9 9 8 9 9 9 9 9 9 9 9 8 8 9 9 8 9 9 9 9 9 9 9 8 8 9 9 8 4 9 9 9 9	Dec 109.0977 14 8.2732 12 0.9968 (86) 16 19.7216 12 20.6765 18 9 12 22 00 00 (87) 15 20.3972 (88) 11 0.9958 (89) 16 19.7216 19.7216 15 20.3972 (90) 10.3616 (91) 10 20.6152 (92)
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) The periods of the living area fraction The periods of the periods of the living area fraction The periods of the periods o	Dec 109.0977 144 8.2732 152 0.9968 (86) 166 19.7216 162 20.6765 188 199 19.7216 19.721
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for galms for living area, mil,m (see Table 9a) Utilisation factor for galms for living area, mil,m (see Table 9a) Utilisation factor for galms for living area, mil,m (see Table 9a) Table 9a In Feb Mar Apr May Jun Jul Aug Sep Oct Nov 112.9260 112.9260 113.3680 112.0522 110.7666 109.922 110.7660 109.922 110.7660 109.922 110.7660 110.922 110.7660 109.922 110.7660 109.922 110.7660 110.7660 110.922 110.7660 110.922 110.7660 110.922 110.7660 110.7660 110.7660 110.7660 1	Dec 109.0977 144 8.2732 152 0.9968 (86) 166 19.7216 162 20.6765 188 199 19.7216 19.721
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil, m (see Table 9a) Utilisation factor for gains for living area, nil, m (see Table 9a) Lau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 Lapha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 Util living area Util living area Ungekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9485 20.80 24 / 16 9 8 9 9 9 9 9 9 9 8 9 9 9 9 8 9 9 9 9	Dec 109.0977 144 8.2732 152 0.9968 (86) 166 19.7216 162 20.6765 188 199 19.7216 19.721
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil, m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov tau 107.4784 107.8787 108.2820 110.3446 110.7666 112.9260 112.9260 113.3680 112.0522 110.7666 109.92 alpha 8.1652 8.1919 8.2188 8.3563 8.3844 8.5284 8.5284 8.5284 8.5579 8.4701 8.3844 8.32 util living area 0.9956 0.9890 0.9616 0.8536 0.6613 0.4608 0.3316 0.3666 0.6008 0.9040 0.98 Tweekday 19.7406 19.8945 20.1247 20.3398 20.3996 20.4164 20.4166 20.4187 20.4105 20.3200 20.01 Tweekend 20.6881 20.7561 20.8605 20.9620 20.9954 20.9998 21.0000 21.0000 20.9984 20.9485 20.80 24 / 16 9 8 9 8 9 9 9 9 9 9 8 9 9 9 9 8 9 9 9 9 9 8 9 9 9 9 8 9 9 9 9 9 8 9 9 9 9 9 8 9 9 9 9 9 8 9 9 9 9 9 9 8 9 9 9 9 9 9 9 8 9	Dec 19. 19. 19. 19. 19. 19. 19. 19. 19. 19.





CALCULATION OF D	WELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
239.9984 Space heating Space heating per m2	167.2405	102.1835	24.7079	2.6830	0.0000	0.0000	0.0000	0.0000	34.4442	141.5935	249.2258 962.0767 13.1791	(98)
8c. Space cooling requirem												
Not applicable												
9a. Energy requirements -												
Fraction of space heat fro Fraction of space heat fro Efficiency of main space h Efficiency of secondary/su Space heating requirement	om main sys neating sys	stem(s) stem 1 (in 9	s)	n (Table 11)						0.0000 1.0000 165.7192 100.0000 580.5462	(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 239.9984 Space heating efficiency (24.7079	2.6830	0.0000	0.0000	0.0000	0.0000	34.4442	141.5935	249.2258	(98)
	165.7192	165.7192	165.7192	165.7192	0.0000	0.0000	0.0000	0.0000	165.7192	165.7192	165.7192	(210)
144.8223 Water heating requirement		61.6606	14.9095	1.6190	0.0000	0.0000	0.0000	0.0000	20.7847	85.4418	150.3904	(211)
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 193.9168		179.7285	161.3314	158.2565	141.6336	136.2386	149.2001	148.8439	167.2808	176.6098	189.3244	
Efficiency of water heater (217)m 178.1250 Fuel for water heating, kW	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	
108.8656 Water heating fuel used	95.9917	100.9002	90.5720	88.8458	79.5136	76.4848	83.7615	83.5615	93.9120	99.1494	106.2874 1107.8454	
Annual totals kWh/year Space heating fuel - main Space heating fuel - secon											580.5462 0.0000	
Electricity for pumps and (BalancedWithHeatRecov mechanical ventilation Total electricity for the Electricity for lighting (Total delivered energy for	rery, Datak fans (SFP above, kWh (calculated	= 0.6	5625)	1.2500, SFP	= 0.6625)						147.5056 147.5056 334.0784 2169.9756	(231) (232)
12a. Carbon dioxide emissi												
Space heating - main syste Space heating - secondary Water heating (other fuel) Space and water heating							Energy kWh/year 580.5462 0.0000 1107.8454		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	1	Emissions ag CO2/year 301.3035 0.0000 574.9718 876.2753	(263) (264)
Pumps and fans Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide Em	nission Rat	te (DER)					147.5056 334.0784		0.5190 0.5190		76.5554 173.3867 1126.2173 15.4300	(268) (272)
16 CO2 EMISSIONS ASSOCIATE DER Total Floor Area	ED WITH API	PLIANCES ANI	COOKING AN	ND SITE-WID	E ELECTRICI	TY GENERATI	ON TECHNOLOG	GIES		TFA	15.4300 73.0000	ZC1
Assumed number of occupant CO2 emission factor in Tak CO2 emissions from appliar CO2 emissions from cooking Total CO2 emissions Residual CO2 emissions off	ole 12 for nces, equat g, equation	tion (L14) n (L16)	/ displaced	from grid						N EF	2.3167 0.5190 16.5756 2.3918 34.3974 0.0000	ZC3 ZC4
Additional allowable elect Resulting CO2 emissions of Net CO2 emissions	ricity ger	neration, kV		electricity	generation						0.0000 0.0000 34.3974	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) 182.5000 (1b) - (3b) (m) 2.5000 (2b) 73.0000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 73.0000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 182.5000 (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) = 0.1644 (8) Pressure test Measured/design AP50 0.4144 (18) Infiltration rate Number of sides sheltered 3 (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 0.4095 0.4014 0.3533 0.3452 0.3051 0.3051 0.2971 0.3211 0.3452 0.3613 0.3773 (22b) 0.3934 Effective ac 3. Heat losses and heat loss parameter Openings A x U W/K 1.8900 Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 m2 1.8900 10.4300 11.9800 (26) TER Opaque door TER Opening Type (Uw = 1.40) External Wall 13.8277 (27) (29a) 24.3000 12.3200 0.1800 EXTERNAL WALL Corridor Wall Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 24.3000 0.1800 4.3740 (29a) 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) 4.1968 (36) (33) + (36) = Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan
(38)m 35.1612
Heat transfer coeff Feb 34.9651 Apr 33.8704 May 33.7015 Aug 32.7698 34.7729 34.0431 34.4003 (38) 61.4100 61.2178 60.3152 60.1463 59.3602 59.3602 59.2146 59.6630 60.1463 61.6060 Average = Sum(39)m / 12 60.4880 60.8451 (39) 60.3144 (39) Aug 0.8112 Jan 0.8439 Feb 0.8412 May 0.8239 Jun 0.8132 Apr 0.8262 0.8386 0.8239 0.8132 0.8286 HLP (average) 0.8262 (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) 83.8683 80.2995 87.4372 94.5749 98.1438 (44) 118.9084 129.7978 Total = Sum (45) m = 140.9520 (45) 1403.8037 (45) Distribution loss (46)m = 0.15 x (45)m 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) Water storage loss: Store volume
a) If manufacturer declared loss factor is known (kWh/day): 150.0000 (47) 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss 0.5400 (49) 0.7527 (55)





CALCULAT	ION OF 1	TARGET E	MISSION	IS 09.	Jan 2014								
TE aulindan as	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	23.3325 23.2624	21.0745 21.0112	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat rec	192.1393	169.3798	ng calculate 177.9510 0.0000	159.6113	156.4790	139.9135	134.4611		147.1238	165.5033	174.8896		
Solar input Output from w/	0.0000 h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 Solar inp	0.0000 ut (sum of	0.0000 months) = Si	0.0000 am(63)m =	0.0000	
	192.1393	169.3798		159.6113	156.4790	139.9135	134.4611			165.5033 h/year) = Su			
Heat gains fro	m water he 85.6694	ating, kWh/ 75.9939	month 80.9518	74.1512	73.8124	67.6017	66.4914	70.8011	69.9991	76.8130	79.2312	84.1425	(65)
5. Internal ga													
Metabolic gair	Jan	Feb	Mar	Apr	May 115.8350	Jun	Jul	Aug	Sep 115.8350	Oct 115.8350	Nov 115.8350	Dec 115.8350	(66)
Lighting gains				tion L9 or	L9a), also			9.4246	12.6496	16.0616	18.7463	19.9842	
Appliances gai	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains	34.5835 3.0000	34.5835	34.5835	ion L15 or 34.5835 3.0000	34.5835	34.5835	5 34.5835 3.0000	34.5835 3.0000	34.5835	34.5835 3.0000	34.5835 3.0000	34.5835	
Pumps, fans Losses e.g. ev	aporation	3.0000 (negative v -92.6680		le 5)	-92.6680	3.0000 -92.6680	-92.6680	-92.6680	3.0000 -92.6680	-92.6680	-92.6680	3.0000 -92.6680	
Water heating	gains (Tab			102.9877	99.2102	93.8912	89.3702	95.1628	97.2210	103.2432	110.0434	113.0947	
Total internal	gains	397.4205		363.9782	343.1668	323.1236	310.1334	315.9811	326.6039	347.4054	371.2395	389.0150	
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	or	Gains W	
West			10.43	300	19.6403		0.6300	0	.7000	0.770	00	62.6042	(80)
Solar gains Total gains		122.4671 519.8876	201.6859 586.2619	294.1468 658.1250	360.4879 703.6548	369.0235 692.1472	351.3255 661.4588	301.7834 617.7645	234.5690 561.1729	145.3175 492.7229	78.0601 449.2995	51.4826 440.4976	
7. Mean intern													
Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9, '							21.0000	(85)
Utilisation fa	Jan 82.2882	Feb 82.5509	ving area, mar Mar 82.8100	Apr 84.0492	May	Jun 85.4014	Jul 85.4014	Aug 85.6113	Sep 84.9679	Oct 84.2852	Nov 83.8091	Dec 83.3172	
alpha util living ar	6.4859	6.5034	6.5207	6.6033		6.6934	6.6934	6.7074	6.6645	6.6190	6.5873	6.5545	
,,	0.9969	0.9927	0.9762	0.9088	0.7517	0.5444	0.3944	0.4399	0.7063	0.9478	0.9924	0.9977	(86)
MIT Th 2	20.2260 20.2154	20.3557 20.2177	20.5699 20.2200	20.8200 20.2307	20.9584 20.2326	20.9957 20.2419	20.9996 20.2419	20.9991 20.2437	20.9790 20.2384	20.7832 20.2326	20.4604 20.2286	20.2045	
util rest of h	0.9960 19.1773	0.9904 19.3677	0.9690 19.6770	0.8843 20.0275		0.4819 20.2392	0.3267 20.2418	0.3681 20.2433	0.6389 20.2229	0.9278 19.9878	0.9897 19.5292	0.9970 19.1530	
Living area fr	action 19.5566	19.7250	19.9999	20.3141		20.5128	20.5158		fLA =	Living area 20.2754	a / (4) =	0.3616 19.5332	(91)
Temperature adadjusted MIT		19.7250	19.9999	20.3141	20.4709	20.5128	20.5158	20.5167	20.4964	20.2754	19.8659	0.0000 19.5332	(93)
8. Space heati													
										0-1	37	n	
Utilisation Useful gains Ext temp.	4.3000	513.9663	566.6188		May 0.7183 505.4645 11.7000		232.3071			0.9291 457.7857 10.6000	Nov 0.9880 443.9066 7.1000	438.7926	(95)
	939.8959 1.0000	910.4036 1.0000	826.4344 1.0000	688.4433 1.0000			232.4446		381.6258 0.0000		772.1857 1.0000		
Space heating	357.2077	266.4058	193.3027	75.2828	16.4242	0.0000	0.0000	0.0000	0.0000		236.3609	1605.0119	(98)
Space heating	per m2									(98)	/ (4) =	21.9865	(99)
8c. Space cool													
Not applicable													





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individu	al heating s	ystems, inc	luding micr	o-CHP							
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 93.5000 0.0000 1716.5903	(202) (206) (208)
Jan Feb Space heating requirement	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
357.2077 266.4058		75.2828	16.4242	0.0000	0.0000	0.0000	0.0000	92.3728	236.3609	367.6549	(98)
Space heating efficiency (main hea 93.5000 93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating s 382.0403 284.9260		80.5164	17.5660	0.0000	0.0000	0.0000	0.0000	98.7944	252.7924	393.2138	(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 192.1393 169.3798	177.9510	159.6113	156.4790	139.9135	134.4611	147.4226	147.1238	165.5033	174.8896	187.5469	
Efficiency of water heater (217)m 86.4459 86.0171	85.0348	82.9430	80.7064	79.8000	79.8000	79.8000	79.8000	83.3291	85.6179	79.8000 86.5785	
Fuel for water heating, kWh/month 222.2654 196.9140	209.2684	192.4350	193.8867	175.3302	168.4976	184.7401	184.3656	198.6140	204.2675	216.6206	
Water heating fuel used Annual totals kWh/year										2347.2051	(219)
Space heating fuel - main system Space heating fuel - secondary										1716.5903 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, k Electricity for lighting (calculat Total delivered energy for all use	ed in Append	ix L)								30.0000 45.0000 75.0000 343.3842 4482.1795	(230e) (231) (232)
12a. Carbon dioxide emissions - Ir	dividual hea	ting system	s 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 wat Fuel factor (electricity) Emissions per m2 for lighting Emissions per m2 for pumps and far	er heating					Energy kWh/year 1716.5903 0.0000 2347.2051 75.0000 343.3842		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190 0.5190	1	Emissions ag CO2/year 370.7835 0.0000 506.9963 877.7798 38.9250 178.2164 1094.9212 12.0244 1.5500 2.4413	(263) (264) (265) (267) (268) (272) (272a) (272b)
Target Carbon Dioxide Emission Rat		2.0244 * 1.	55) + 2.441	3 + 0.5332,	rounded to	2 d.p.				0.5332 21.6100	





Property Reference	1B2P MF ET				Issued on Date	16/03/2021
Assessment Reference	3			Prop Type Ref		
Property	1B2P, x, Stratford Upon A	lvon, CV36				
SAP Rating		88 B	DER	16.94	TER	24.35
Environmental		90 B	% DER <ter< th=""><th></th><th>30.42</th><th></th></ter<>		30.42	
CO ₂ Emissions (t/ye	ear)	0.73	DFEE	27.29	TFEE	33.22
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>17.83</th><th></th></tfe<>	E	17.83	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	•)36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve		
DWELLING AS DESIGNED		
Mid-floor flat, total floor area 51 $\ensuremath{\text{m}}^2$		
This report covers items included within It is not a complete report of regulations.	ons compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 24.35 kgCO□/m² DER) 16.94 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)3 Dwelling Fabric Energy Efficiency (DFEE	3.2 kWh/m²/yr	
2 Fabric U-values Element Average External wall 0.15 (max. 0.30) Party wall 0.00 (max. 0.20) Floor (no floor) Roof (no roof) Openings 1.16 (max. 2.00)	Highest 0.15 (max. 0.70) OK OK OK	
2a Thermal bridging Thermal bridging calculated from linear	thermal transmittances for each junction	
3 Air permeability Air permeability at 50 pascals: Maximum	3.00 (design value)	OK
4 Heating efficiency	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	OK
6 Controls Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat Independent timer for DHW	OK OK
7 Low energy lights Percentage of fixed lights with low-ene Minimum	rgy fittings:100% 75%	OK
8 Mechanical ventilation Continuous supply and extract system Specific fan power:	0.53	
Maximum MVHR efficiency: Minimum:	1.5 89% 70%	OK
9 Summertime temperature		
Overheating risk (Midlands): Based on: Overshading: Windows facing East: Air change rate:	Not significant Average 8.06 m², No overhang 6.00 ach	OK
	Light-coloured curtain or roller blind, closed 10	0% of daylight hours
10 Key features Party wall U-value Door U-value Air permeability	0.00 W/m²K 1.00 W/m²K 3.0 m³/m²h	





	ONOFD	VVELLING	FEIVIISSI	ONS FUR	REGULAT	IONS CC	JIVIPLIAN	CE US	Jan 2014				
AP 2012 WORKSH					9.92, Januar NCE 09 J								
. Overall dwel													
								Area (m2)		y height (m)	(0)	Volume (m3)	40.1
round floor otal floor are welling volume		a)+(1b)+(1c	e) + (1d) + (1e)	(1n)	5	0.5000		50.5000	(1b) x 3a)+(3b)+(3c)+	2.5000 (3d)+(3e)		126.2500 126.2500	(4)
Ventilation					main	se	 econdary		other	tot	al m	3 per hour	
mber of chimn					heating 0 0	++	heating 0	+	0 =		0 * 40 = 0 * 20 =	0.0000	
mber of open mber of inter mber of passi	rmittent fa	ns			0	+	U	+	0 =		0 * 10 = 0 * 10 =	0.0000 0.0000 0.0000	(7a)
mber of fluel	less gas fi	res									0 * 40 =	0.0000	(7c)
nfiltration du essure test		eys, flues	and fans	= (6a) + (6b))+(7a)+(7b)+((7c) =				0.0000	Air change / (5) =	0.0000 Yes	(8)
easured/design nfiltration ra nmber of sides	ate											3.0000 0.1500 3	(18) (19)
melter factor									(20) = 1 -			0.7750	(20)
nfiltration ra	ate adjuste	d to includ	e shelter :	factor					(21) = (18)	x (20) =	0.1163	(21)
nd 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	
			1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
nd factor	1.2750 e 0.1482	1.2500 0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)
ind factor dj infilt rate Balanced mecha E mechanical v	e 0.1482 anical vent ventilation	0.1453 ilation wit	0.1424 h heat reco	overy					0.1163	0.1250	0.1308	0.5000	(23a)
ind factor dj infilt rate Balanced mecha	e 0.1482 anical vent ventilation	0.1453 ilation wit	0.1424 h heat reco	overy						0.1250	0.1308		(23a) (23c)
ind factor dj infilt rate Balanced mecha mechanical v balanced wit	e 0.1482 anical vent ventilation th heat rec	0.1453 ilation wit : overy: effi	0.1424 h heat reco	overy allowing	for in-use fa	ctor (from	m Table 4h)	=				0.5000 75.6500	(23a) (23c)
ind factor infilt rate Balanced mecha f mechanical v f balanced wit Effective ac	e 0.1482 anical vent. ventilation th heat reco	0.1453 ilation wit : overy: effi 0.2671	0.1424 h heat reco	overy allowing	for in-use fa	ctor (from	m Table 4h)	=				0.5000 75.6500	(23a) (23c)
ind factor ij infilt rate Salanced mecha mechanical v balanced wit ffective ac	e 0.1482 anical vent. ventilation th heat reconstruction of the construction of the co	0.1453 ilation wit: : : : : : : : 0.2671	0.1424 h heat reco	overy % allowing : 0.2496	for in-use fa 0.2467	0.2322	n Table 4h) 0.2322	0.2293	0.2380 A x U	0.2467 k	0.2525 -value	0.5000 75.6500 0.2583	(23a) (23c)
nd factor ij infilt rate salanced mecha mechanical v balanced wit fective ac Heat losses memnt pening Type 1	e 0.1482 anical vent. ventilation th heat reco	0.1453 ilation wit: covery: effi 0.2671	0.1424 h heat reco	overy 8 allowing : 0.2496	for in-use fa	0.2322 Net	n Table 4h) 0.2322	= 0.2293 U-value W/m2K	0.2380 A × U W/K 1.8900	0.2467 K	0.2525	0.5000 75.6500 0.2583	(23a) (23c) (25)
and factor If infilt rate alanced mecha imechanical v balanced wit fective ac Heat losses mement bening Type 1 bening Type 2 tternal Wall trridor Wall	e 0.1482 anical vent. ventilation th heat recommend of the commendation of the commend	0.1453 ilation wit: covery: effi 0.2671 oss paramet	0.1424 h heat reco ciency in 9 0.2642	overy % allowing : 0.2496	for in-use fa 0.2467	0.2322 Net	0.2322 0.2322 	= 0.2293 U-value W/m2K	0.2380 A x U W/K	0.2467 K	0.2525 -value	0.5000 75.6500 0.2583	(23a) (23c) (25) (25)
and factor if infilt rate all anced mechanical versions in the second se	e 0.1482 anical vent.ventilation th heat reconstruction of the construction of the construction of the construction of the construction of external of the construction of the construction of external of the construction of the	0.1453 ilation wit: covery: effi 0.2671 oss paramet	0.1424 h heat reco ciency in 9 0.2642	Overy 8 allowing: 0.2496 Gross m2	for in-use fa 0.2467 Openings m2	0.2322 Net	n Table 4h) 0.2322 tArea m2 8900 0.6500 6.6000 2.000	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065	0.2467 K	0.2525 -value	0.5000 75.6500 0.2583	(23a) (23c) (25) (25) (26) (27) (29a) (29a) (31) (33)
ind factor ij infilt rate Salanced mecha mechanical v balanced wit ffective ac Heat losses Lement bening Type 1 bening Type 2 ternal Wall pridor Wall bal net area abric heat los irty Wall irty Floor 1	e 0.1482 anical vent. ventilation th heat reco 0.2700 and heat 1. (Uw = 1.20 of externa ss, W/K = S:	0.1453 ilation wit: covery: effi 0.2671 oss paramet	0.1424 h heat reco ciency in 9 0.2642	Overy 8 allowing: 0.2496 Gross m2	for in-use fa 0.2467 Openings m2	0.2322 	Table 4h) 0.2322 LArea m2 8900 .0600 .6500 .2000 (26)(3	U-value W/m2K 1.0000 1.1450 0.1500	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900	0.2467 K	0.2525 -value	0.5000 75.6500 0.2583	(23a) (23c) (25) (25) (26) (27) (29a) (29a) (31)
ind factor dy infilt rate Salanced mecha mechanical v balanced wit fective ac . Heat losses . Heat losse	e 0.1482 anical vent. ventilation th heat recommend of the second of the	0.1453 ilation wit: covery: effi 0.2671 coss paramet l elements comm (A x U)	0.1424 h heat reco	0.2496 0.2496 0.2696 Gross m2 16.6000 16.6000	for in-use fa 0.2467 Openings m2 9.9500	0.2322 	n Table 4h) 0.2322 tArea m2 .8900 .0600 .6500 .2000 (26)(3	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065	0.2467 K	0.2525 -value	0.5000 75.6500 0.2583	(23a) (23c) (25) (25) (26) (27) (29a) (29a) (31) (32d) (32b) (35)
ind factor did infilt rate salanced mechas mechanical versions with the salanced with the salance salance with the salance salance heat los salance wall arry floor 1 arry Ceiling 1 arry	e 0.1482 anical vent. ventilation th heat recommend of the second of the	0.1453 ilation wit: covery: effi 0.2671 Days paramet Days paramet MP = Cm / T Psi) calcul	0.1424 h heat reco	Gross m2 16.6000 16.6000 m2K Appendix K	for in-use fa 0.2467 Openings m2 9.9500	0.2322 	n Table 4h) 0.2322 tArea m2 .8900 .0600 .6500 .2000 (26)(3	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065	0.2467 K	0.2525 -value	0.5000 75.6500 0.2583 A x K kJ/K	(23a) (23c) (25) (25) (26) (27) (29a) (31) (32) (32d) (32b) (35) (36)
nd factor ij infilt rate salanced mecha mechanical v balanced wit fective ac Heat losses mement bening Type 1 bening Type 2 tternal Wall brid heat los sty Wall rty Floor 1 remal mass pa sermal bridges stal fabric he entilation hea 88)m	e 0.1482 anical vent. ventilation th heat recommend of the second of externa ss, W/K = St arameter (The second of the second of	0.1453 ilation wit: covery: effi 0.2671 Days paramet Days paramet MP = Cm / T Psi) calcul	0.1424 h heat reco	Gross m2 16.6000 16.6000 m2K Appendix K	for in-use fa 0.2467 Openings m2 9.9500	0.2322 	n Table 4h) 0.2322 tArea m2 .8900 .0600 .6500 .2000 (26)(3	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065	0.2467 K	0.2525 -value kJ/m2K	0.5000 75.6500 0.2583 A x K kJ/K	(23a) (23c) (25) (25) (25) (29a) (29a) (31) (33) (32d) (32d) (32d) (35) (36) (37)
ind factor did infilt rate salanced mechas mechanical variations are salanced with salance	e 0.1482 anical vent. ventilation th heat recommend of the second of the	0.1453 ilation wit: covery: effi 0.2671 coss paramet l elements cum (A x U) MP = Cm / T Psi) calcul culated mon Feb	0.1424 h heat recording to the control of the contr	Gross m2 16.6000 16.6000 m2K Appendix K = 0.33 x (2.496)	Openings m2 9.9500	Net 1. 8. 6. 6. 6. 33. 40. 50. 50.	Table 4h) 0.2322 tArea m2 8900 .0600 .6500 (26)(3 .2300 .5000 Jul	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 0.0000	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000	0.2467 K	0.2525 E-value kJ/m2K + (36) = Nov	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (33) (32) (32d) (32b) (35) (36) (37) (38) (39)
ind factor dij infilt rate Salanced mechaf f mechanical v f balanced wit ffective ac Heat losses	e 0.1482 anical vent. ventilation th heat recommend of the second of external second of e	0.1453 ilation wit: covery: effi 0.2671 0.2671 Second 1 elements compared (A x U) MP = Cm / T Psi) calcul culated mon Feb 11.1265 29.9886 Feb	0.1424 h heat recording of the control of the contr	Gross m2 16.6000 16.6000 12K Appendix K; = 0.33 x (3 Apr 10.4000 29.2621 Apr	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May	Net 1 8 6 16 33 3 40 50 50 50 50 Jun 9 6735	Table 4h) 0.2322 Area m2 8900 .0600 .6500 .2000 (26)(3 .2300 .5000 Jul 9.6735 28.5356 Jul	= 0.2293 U-value W/m2K 1.0000 0.1500 0.1500 30) + (32) 0.0000 Aug 9.5524 28.4145	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep	0.2467 (33) Oct 10.2789 29.1410 Oct	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (32) (32d) (32b) (35) (36) (37) (38) (39) (39)
and factor ij infilt rate is alanced mecha imechanical v is balanced wit ffective ac Heat losses Lement Dening Type 1 Dening Type 2 Leternal Wall Dridor Wall Letternal Wall Letternal with area Letternal bridges Dening Type 2 Letternal mass pa	e 0.1482 anical vent. ventilation th heat recommend of the control	0.1453 ilation wit: covery: effi 0.2671 Description of the control of the contro	0.1424 h heat reconciency in solution of the concept of the concep	Gross m2 16.6000 16.6000 17.8 Appendix K; 18.4 Apr 10.4000 19.2621	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410	Net 1. 8. 6. 16. 33. 40. 50. 50. Jun 9.6735 28.5356	Table 4h) 0.2322 tArea m2 8900 .0600 .6500 (26)(3 .2300 .5000 Jul 9.6735 28.5356	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 0.0000 Aug 9.5524 28.4145	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778	0.2467 K (33) Oct 10.2789 29.1410	0.2525 E-value kJ/m2K + (36) = Nov 10.5211 29.3832	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318	(23a) (23c) (23c) (25) (25) (26) (27) (29a) (31) (32) (32d) (32b) (35) (36) (37) (38) (39) (39)
and factor ij infilt rate is alanced mecha imechanical v is balanced wit ffective ac Heat losses Lement Dening Type 1 Dening Type 2 Leternal Wall Dridor Wall Letternal Wall Letternal with area Letternal bridges Dening Type 2 Letternal mass pa	e 0.1482 anical vent. ventilation th heat recommend of the second of external second of e	0.1453 ilation wit: covery: effi 0.2671 0.2671 Second 1 elements compared (A x U) MP = Cm / T Psi) calcul culated mon Feb 11.1265 29.9886 Feb	0.1424 h heat recording of the control of the contr	Gross m2 16.6000 16.6000 12K Appendix K; = 0.33 x (3 Apr 10.4000 29.2621 Apr	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May	Net 1 8 6 16 33 3 40 50 50 50 50 Jun 9 6735	Table 4h) 0.2322 Area m2 8900 .0600 .6500 .2000 (26)(3 .2300 .5000 Jul 9.6735 28.5356 Jul	= 0.2293 U-value W/m2K 1.0000 0.1500 0.1500 30) + (32) 0.0000 Aug 9.5524 28.4145	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep 0.5699	0.2467 (33) Oct 10.2789 29.1410 Oct	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec 0.5866 0.5788	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (32) (32d) (32b) (35) (36) (37) (38) (39) (39)
nd factor j infilt rate alanced mecha mechanical v balanced wit fective ac Heat losses ement ening Type 1 ening Type 2 ternal Wall rridor Wall tal net area bric heat los rty Wall rty Ceiling 1 ermal mass pa ermal bridges tal fabric he ntilation hea 8)m at transfer c erage = Sum(3	e 0.1482 anical vent. ventilation th heat reconstruction of the second of external second	0.1453 ilation wit: covery: effi 0.2671 oss paramet l elements um (A x U) MP = Cm / T Psi) calcul culated mon Feb 11.1265 29.9886 Feb 0.5938	0.1424 h heat recording of the control of the contr	Gross m2 16.6000 16.6000 n2K Appendix K; = 0.33 x (2 Apr 10.4000 29.2621 Apr 0.5794	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May 0.5771	Net 1. 8. 6. 16. 33. 40. 50. 50. Jun 9.6735 28.5356 Jun 0.5651	Table 4h) 0.2322 LArea 2.8900 .06000 .65000 .20000 .223000 .50000 Jul 9.6735 28.5356 Jul 0.5651	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 30) + (32) 0.0000 Aug 9.5524 28.4145 Aug 0.5627	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep 0.5699	0.2467 K (33) Oct 10.2789 29.1410 Oct 0.5771	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov 0.5818	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec 0.5866 0.5788	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (32d) (32d) (32d) (32b) (35) (36) (37) (38) (39) (39) (40) (40)
nd factor ignifilt rate alanced mecha imechanical v balanced wit fective ac Heat losses H	e 0.1482 anical vent. ventilation th heat recommend to the second of external second of e	0.1453 ilation wit: covery: effi 0.2671 0.2671 Self and the self and	0.1424 h heat recording of the color of the	Gross m2 16.6000 16.6000 12K Appendix K, Apr 10.4000 29.2621 Apr 0.5794	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May 0.5771 31	Net 1 8 6 16 33 40 50 50 50 50 50 50 50 50 50 50 50 50 50	Table 4h) 0.2322 Area m2 8900 .6500 .6500 .2300 (26)(3 .2300 Jul 9.6735 28.5356 Jul 0.5651 31	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 0.1500 0.0500 4 (32) 0.0000 Aug 9.5524 28.4145 Aug 0.5627 31	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep 0.5699	0.2467 K (33) Oct 10.2789 29.1410 Oct 0.5771	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov 0.5818	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec 0.5866 0.5788	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (32d) (32d) (32d) (32b) (35) (36) (37) (38) (39) (39) (40) (40)
ind factor ignorized in the control of the control	e 0.1482 anical vent. ventilation th heat rec. 0.2700 and heat loos and heat loos ss, W/K = Si arameter (The seat loss at loss cal. Jan 11.2476 coeff 30.1097 39)m / 12 = Jan 0.5962 31	0.1453 ilation wit: covery: effi 0.2671 Dass paramet Das	O.1424 h heat recording of the control of the contr	Gross m2 16.6000 16.6000 12K Appendix K, Apr 10.4000 29.2621 Apr 0.5794	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May 0.5771 31	Net 1 8 6 16 33 40 50 50 50 50 50 50 50 50 50 50 50 50 50	Table 4h) 0.2322 Area m2 8900 .6500 .6500 .2300 (26)(3 .2300 Jul 9.6735 28.5356 Jul 0.5651 31	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 0.1500 0.0500 4 (32) 0.0000 Aug 9.5524 28.4145 Aug 0.5627 31	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep 0.5699	0.2467 K (33) Oct 10.2789 29.1410 Oct 0.5771	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov 0.5818	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec 0.5866 0.5788	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (33) (32) (32d) (32b) (35) (36) (37) (38) (39) (40) (40) (41)
ind factor did infilt rate salanced mechaf mechanical variations are salanced with factive ac salanced with factive ac salanced with factive ac salanced with factive ac salanced with faction of the fac	e 0.1482 anical vent. ventilation th heat recommend to the service of the service	0.1453 ilation wit: covery: effi 0.2671 Dass paramet Das	O.1424 h heat recording of the control of the contr	Gross m2 16.6000 16.6000 12K Appendix K, Apr 10.4000 29.2621 Apr 0.5794	Openings m2 9.9500 25)m x (5) May 10.2789 29.1410 May 0.5771 31	Net 1 8 6 16 33 40 50 50 50 50 50 50 50 50 50 50 50 50 50	Table 4h) 0.2322 Area m2 8900 .6500 .6500 .2300 (26)(3 .2300 Jul 9.6735 28.5356 Jul 0.5651 31	= 0.2293 U-value W/m2K 1.0000 1.1450 0.1500 0.1500 0.1500 0.0500 4 (32) 0.0000 Aug 9.5524 28.4145 Aug 0.5627 31	0.2380 A x U W/K 1.8900 9.2290 0.9975 2.4900 = 14.6065 0.0000 Sep 9.9157 28.7778 Sep 0.5699	0.2467 K (33) Oct 10.2789 29.1410 Oct 0.5771	0.2525 -value kJ/m2K + (36) = Nov 10.5211 29.3832 Nov 0.5818	0.5000 75.6500 0.2583 A x K kJ/K 250.0000 4.2556 18.8621 Dec 10.7632 29.6254 29.2318 Dec 0.5866 0.5788 31	(23a) (23c) (25) (25) (25) (26) (27) (29a) (31) (33) (32) (32d) (32d) (37) (38) (39) (39) (40) (40) (41)





CALCULAT	ION OF I	DWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ.			
	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992	(46)
Water storage Store volume	loss:											150.0000	(47)
a) If manufac Temperature	factor fro	m Table 2b	actor is kn	own (kWh/c	iay):							1.5000 0.5400	(49)
Enter (49) or Total storage	loss											0.8100	
If cylinder co	ontains ded	licated sola				24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
Primary loss	23.2624	22.6800 21.0112	23.2624		23.2624	24.3000 22.5120	25.1100 23.2624	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	
Total heat red	170.2113	150.2523	158.3339	142.6791	140.3592	126.1896	121.9274		132.2255	147.9136		166.3669	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 Solar inpu	0.0000 ut (sum of	0.0000 months) = Su	0.0000 am(63)m =	0.0000	
Output from w.		150.2523	158.3339	142.6791	140.3592	126.1896	121.9274			147.9136		166.3669	
Heat gains fro	om water he		month 75.2601	69.3254	69.2835	63.8427	63.1550	66.7627	65.8496	h/year) = Su 71.7954	73.5781		
	79.2094	70.3643	73.2001	69.3234	69.2633	03.0427	63.1330	00.7027	63.6496	71.7934	73.3701	77.9311	(63)
5. Internal ga													
Metabolic gain), Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains			85.2415	85.2415	85.2415			85.2415	85.2415	85.2415	85.2415	85.2415	(66)
Appliances ga:	13.4965 ins (calcul				5.5170 or L13a), al		5.0328 le 5	6.5418	8.7804	11.1488	13.0122	13.8716	(67)
Cooking gains					127.4834 L15a), also		111.1198	109.5785	113.4626	121.7312	132.1689	141.9788	(68)
Pumps, fans	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000		31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	
Losses e.g. e	-68.1932	-68.1932			-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	(71)
Water heating	106.4642	le 5) 104.7389	101.1561	96.2853	93.1230	88.6704	84.8857	89.7349	91.4578	96.4992	102.1918	104.7461	(72)
Total internal		315.3725	305.6671	290.1594	274.6959	259.5740	249.6108	254.4277	262.2732	277.9516	295.9453	309.1689	(73)
6. Solar gain:													
[Jan]			A	rea	Solar flux				DD.	3		Gains	
				m2	Table 6a	Speci:	fic data	Specific	data	Acces		W	
				m2	Table 6a W/m2						or		
East			8.0	m2 600	Table 6a W/m2 19.6403		0.4500	0		facto	or 5d		(76)
East 	39.4928	77.2563	8.0	m2 600 185.5576	Table 6a W/m2 19.6403	232.7924	0.4500	190.3750	.8000 147.9739	facto Table 6 0.770 91.6711	or 6d 00 49.2429	W 39.4928 32.4770	(83)
East	39.4928	77.2563	8.0	m2 600 185.5576	Table 6a W/m2 19.6403	232.7924	0.4500	190.3750	.8000	facto Table 6	or 6d 00 49.2429	W 39.4928	(83)
East 	39.4928 356.5584	77.2563 392.6289	127.2302 432.8973	m2 	Table 6a W/m2 19.6403 227.4078 502.1037	232.7924 492.3663	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739	facto Table 6 0.770 91.6711	or 6d 00 49.2429	W 39.4928 32.4770	(83)
East 	39.4928 356.5584	77.2563 392.6289	127.2302 432.8973	m2 	Table 6a W/m2 19.6403 227.4078 502.1037	232.7924 492.3663	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739	facto Table 6 0.770 91.6711	or 6d 00 49.2429	W 39.4928 32.4770	(83)
Solar gains Total gains	39.4928 356.5584 	77.2563 392.6289 ture (heati	8.0 127.2302 432.8973 ng season) in the livi	m2 	Table 6a W/m2 19.6403 227.4078 502.1037	232.7924 492.3663	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739	facto Table 6 0.770 91.6711	or 6d 00 49.2429	W 39.4928 32.4770	(83) (84)
Solar gains Total gains 7. Mean interr Temperature di Utilisation fo	39.4928 356.5584 anal tempera uring heati actor for g Jan 116.4723	77.2563 392.6289 ture (heati ng periods ains for li Feb 116.9426	8.0 127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167	m2 185.5576 475.7170 185.6576 475.7170 185.6576 475.7170	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9, 1 Table 9a) May 120.3439	232.7924 492.3663 Ch1 (C) Jun 122.8971	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739 410.2471 Sep 121.8629	Factor Table 6 0.770 91.6711 369.6227	Nov 119.3521	W 39.4928 32.4770 341.6459 21.0000 Dec 118.3765	(83) (84)
Solar gains Total gains 7. Mean inter- Temperature di Utilisation fo	39.4928 356.5584 all tempera arring heati actor for g Jan 116.4723 8.7648	77.2563 392.6289 tture (heati ing periods ains for li Feb 116.9426 8.7962	8.0 127.2302 432.8973 ng season) in the livi ving area; Mar 117.4167 8.8278	m2 185.5576 475.7170 187.7170 188.459 189.8459 19.8459 19.8459	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9, 1 Table 9a) May 120.3439 9.0229	232.7924 492.3663 Ph1 (C) Jun 122.8971 9.1931	Jul 122.8971 9.1931	190.3750 444.8027 Aug 123.4208 9.2281	.8000 147.9739 410.2471 Sep 121.8629 9.1242	Factor Table 6 0.770 91.6711 369.6227 Oct 120.3439 9.0229	Nov 19.3521 8.9568	W 39.4928 32.4770 341.6459 21.0000 Dec 118.3765 8.8918	(83) (84)
Solar gains Total gains 7. Mean inter Temperature di Utilisation fa tau alpha util living a:	39.4928 356.5584 anal tempera uring heati actor for g Jan 116.4723 8.7648 rea 0.9852	77.2563 392.6289 ture (heati- ng periods tains for li Feb 116.9426 8.7962 0.9651	8.0 127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167 8.8278 0.8984	m2 185.5576 475.7170 185.5576 475.7170 185.5576 185.5576 475.7170 185.5576 19.8459 19.8459 8.9897 0.7302	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9, 7 Table 9a) May 120.3439 9.0229 0.5388	232.7924 492.3663 Th1 (C) Jun 122.8971 9.1931 0.3709	Jul 122.8971 9.1931 0.2664	190.3750 444.8027 Aug 123.4208 9.2281 0.2939	.8000 147.9739 410.2471 Sep 121.8629 9.1242 0.4837	factor Table 6 0.770 91.6711 369.6227 Oct 120.3439 9.0229 0.7914	Nov 19.3521 8.9568 0.9578	W 39.4928 32.4770 341.6459 21.0000 Dec 118.3765 8.8918 0.9887	(83) (84)
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Solar gains Total gains Total gains 7. Mean inter Temperature di Utilisation for tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend MIT 2 Living area for MIT Temperature are adjusted MIT 8. Space heat:	39.4928 356.5584	77.2563 392.6289 Liture (heati Teb 116.9426 8.7962 0.9651 20.1624 20.8610 8 20 0 21.0000 20.4356 0.9570 20.1624 20.1624 20.1624 20.1624 20.1624 20.1625	8.0 127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167 8.8278 0.8984 20.3303 20.9409 22 000 20.4377 0.8798 20.3303 20.4377 20.6868 20.6868	m2	Table 6a W/m2 19.6403 227.4078 502.1037 mm Table 9, 7 Table 9a) May 120.3439 9.0229 0.5388 20.4499 20.9994 9 22 0.000 20.4507 0.5073 20.4499 20.4499 20.4507 20.6940	232.7924 492.3663 21.0000 20.4615 21.0000 21.0000 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	Jul 122.8971 9.1931 0.2664 20.4615 21.0000 2.1.0000 20.4615 0.2338 20.4615 20.4615 20.4615 20.4615 20.4615	Aug 123. 4208 9.2281 0.2939 20.4637 21.0000 20.4637 0.2596 20.4637 20.4637 20.4637 20.4637	Sep 121.8629 9.1242 0.4837 20.4570 20.9998 8 22 0 21.0000 20.4572 0.4572 20.4572 20.4576 20.4576 20.4576	Cct 120.3439 9.0229 0.7914 20.4291 20.9559 9 22 1.0000 20.4507 0.7574 20.4291 20.4291 20.4291 20.4291 20.4291 20.4507 Living area 20.6940	Nov 119,3521 8,9568 0,9578 20,2480 20,8956 8 22,20 21,0000 20,4464 0,9469 20,2480 20,2480 20,2480 20,2480 20,4464 4 / (4) = 20,6916	21.0000 Dec 118.3765 8.8918 0.9887 20.0037 20.7857 9 2 2 0 0 21.0000 20.4420 20.0037 20.0037 20.0037 20.0037 20.0037 20.4420 0.4430 20.6892 0.0000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
Solar gains Total gains Total gains 7. Mean internation Temperature di Utilisation for tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT The 2 util rest of 1 Tweekday Tweekend MIT 2 Living area for MIT Temperature are adjusted MIT	39.4928 356.5584 anal tempera aring heati actor for g Jan 116.4723 8.7648 rea 0.9852 20.0219 20.7974 9 22 0.0219 20.4334 house 0.9814 20.0219 20.4334 raction 20.6844 justment 20.6844	77.2563 392.6289 Liture (heati- ng periods ains for li Feb 116.9426 8.7962 0.9651 20.1624 20.8610 0 21.0000 20.4356 0.9570 20.1624 20.1624 20.1624 20.4356 20.6856	127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167 8.8278 0.8984 20.3303 20.9409 9 22 0 21.0000 20.4377 0.8798 20.3303 20.3303 20.3303 20.4377 20.6868 20.6868	m2	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9a) May 120.3439 9.0229 0.5388 20.4499 20.9994 22 0 21.0000 20.4507 0.5073 20.4499 20.4499 20.4507 20.6940 20.6940	232.7924 492.3663 Th1 (C) Jun 122.8971 9.1931 0.3709 20.4615 21.0000 20.4615 20.4615 20.4615 20.4615 20.7001	Jul 122.8971 9.1931 0.2664 20.4615 21.0000 20.4615 0.2338 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	190.3750 444.8027 Aug 123.4208 9.2281 0.2939 20.4637 21.0000 20.4637 0.2596 20.4637 20.4637 20.4637 20.4637	Sep 121.8629 9.1242 0.4837 20.4570 20.9998 8 22 0 21.0000 20.4572 0.4458 20.4570 20.4570 20.4576 20.6976	Oct 120.3439 9.0229 0.7914 20.4291 20.4507 0.7574 20.4291 20.4291 20.4507 Living area 20.6940 20.6940	Nov 119.3521 8.9568 0.9578 20.2480 20.4804 20.4464 0.9469 20.2480 20.2	21.0000 Dec 118.3765 8.8918 0.9887 20.0037 20.7857 22 0.0037 20.0037 20.0037 20.0037 20.0037 20.0037 20.0037 20.0037 20.0037	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
Solar gains Total gains Total gains Total gains Total gains T. Mean internation Temperature di Utilisation for tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT The 2 util rest of 1 Tweekday Tweekend MIT 2 Living area for MIT Temperature accadinated MIT 8. Space heat	39.4928 356.5584 mal tempera arring heating factor for gran 116.4723 8.7648 rea 0.9852 20.0219 20.7974 9 22.0020 20.4334 nouse 0.9814 20.0219 20.0219 20.0219 20.02434 rection 20.6844 djustment 20.6844 djustment Jan 0.9832	77.2563 392.6289 Liture (heati- ng periods ains for li Feb 116.9426 8.7962 0.9651 20.1624 20.1624 20.4356 0.9570 21.0000 20.4356 20.6856 20.6856	127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167 8.8278 0.8984 20.3303 20.9409 9 22 0 021.0000 20.4377 0.8798 20.3303 20.3303 20.4377 20.6868 20.6868	m2	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9a, 1 Table 9a) 120.3439 9.0229 0.5388 20.4499 20.9994 22 0 21.0000 20.4507 0.5073 20.4499 20.44597 20.6940 20.6940	232.7924 492.3663 Th1 (C) Jun 122.8971 9.1931 0.3709 20.4615 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	Jul 122.8971 9.1931 0.2664 20.4615 21.0000 2.1.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	190.3750 444.8027 Aug 123.4208 9.2281 0.2939 20.4637 21.0000 2.1.0000 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637	Sep 121.8629 9.1242 0.4837 20.4570 20.4572 20.4570 20.4572 20.6976 20.6976	Oct 120.3439 9.0229 0.7914 20.4291 20.4507 0.7574 20.4291 20.4507 Living area 20.6940 0ct 0.7728	Nov 119.3521 8.9568 0.9578 20.2480 20.4864 0.9469 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480	21.0000 Dec 118.3765 8.8918 0.9887 20.0037 20.7857 22 0037 20.4420 0.9857 20.0037 20.4420 0.4420 0.4420 0.6892	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)
Solar gains Total gains Total gains Total gains 7. Mean intern Temperature du Utilisation for tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT The 2 util rest of D Tweekday Tweekend MIT 2 Living area for MIT Temperature ac adjusted MIT 8. Space heat: Utilisation Useful gains Ext temp.	39.4928 356.5584 anal tempera arring heati garan 116.4723 8.7648 rea 0.9852 20.0219 20.7974 0 21.0000 20.4334 rouse 0.9814 20.0219 20.0219 20.0219 20.0219 20.0219 20.04334 reaction 20.6844 djustment 20.6844 djustment 20.6844 djustment 20.6855643 350.5643 4.3000	77.2563 392.6289 Liture (heati	127.2302 432.8973 ng season) in the livi ving area, Mar 117.4167 8.8278 0.8984 20.3303 20.9409 22 21.000 20.4377 0.8798 20.3303 20.4377 20.6868 20.6868	m2	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9, 7 Table 9a) May 120.3439 9.0229 0.5388 20.4499 20.9994 22 000 20.4507 0.5073 20.4499 20.4507 20.6940 May 0.5213 261.7394	232.7924 492.3663 Th1 (C) Jun 122.8971 9.1931 0.3709 20.4615 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	Jul 122.8971 9.1931 0.2664 20.4615 21.0000 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	190.3750 444.8027 Aug 123.4208 9.2281 0.2939 20.4637 21.0000 2.1.0000 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637	Sep 121.8629 9.1242 0.4837 20.4570 20.9998 8 22 0 21.0000 20.4572 0.4570 20.45	Oct 120.3439 9.0229 0.7914 20.4291 20.4507 0.7574 20.4291 20.4507 Living area 20.6940 20.6940	Nov 119.3521 8.9568 0.9578 20.2480 20.4864 0.9469 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480 20.2480	21.0000 Dec 118.3765 8.8918 0.9887 20.0037 20.7857 22 0037 20.4420 0.9857 20.0037 20.4420 0.4420 0.4420 0.6892	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)
Solar gains Total gains Total gains 7. Mean inter Temperature di Utilisation for tau alpha util living a: Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of l Tweekday Tweekend MIT 2 Living area for MIT Temperature ac adjusted MIT 8. Space heat Utilisation Useful gains	39.4928 356.5584 anal tempera arring heati actor for g Jan 116.4723 8.7648 rea 0.9852 20.0219 20.7974 9 22 0 21.0000 20.4334 nouse 0.9814 20.0219 20.4334 raction 20.6844 djustment 20.6844 justment 20.6844 djustment 20.6844 djustment 20.6844 djustment 20.6844 djustment 20.6844	77.2563 392.6289 Liture (heati	8.0 127.2302 432.8973 mg season) in the livi ving area, Mar 117.4167 8.8278 0.8984 20.3303 20.9409 9 22 000 20.4377 0.8798 20.3303 20.4377 20.6868 20.6868	m2	Table 6a W/m2 19.6403 227.4078 502.1037 m Table 9, 7 Table 9a) May 120.3439 9.0229 0.5388 20.4499 20.9994 22 000 20.4507 0.5073 20.4499 20.4507 20.6940 May 0.5213 261.7394	232.7924 492.3663 2h1 (C) Jun 122.8971 9.1931 0.3709 20.4615 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	Jul 122.8971 9.1931 0.2664 20.4615 21.0000 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615 20.4615	190.3750 444.8027 Aug 123.4208 9.2281 0.2939 20.4637 21.0000 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637 20.4637	Sep 147.9739 410.2471 Sep 121.8629 9.1242 0.4837 20.4570 20.9998 8 22 0 21.0000 20.4572 0.4458 20.4570 20.4570 20.4570 20.4570 20.4570 20.6976	Oct 120.3439 9.0229 0.7914 20.4291 20.9859 22 0 21.0000 20.4507 Living area 20.6940 20.6940 0ct 0.7728 285.6382 10.6000 294.1502	Nov 19.3521 8.9568 0.9578 20.2480 20.8956 21.0000 20.4464 0.9469 20.2480 20.2480 20.2480 20.2480 20.2480 20.4664 a / (4) = 20.6916 20.6916	21.0000 Dec 118.3765 8.8918 0.9887 20.0037 20.7857 20.0037 20.4420 0.9857 20.0037 20.6892 0.4420 0.4430 20.6892 Dec 0.9871 337.2439 4.2000	(83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF D	WELLING	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
106.2166 Space heating Space heating per m2	64.6096	29.1307	3.9674	0.2646	0.0000	0.0000	0.0000	0.0000	6.3329	50.9368	112.5333 373.9920 7.4058	(98)
8c. Space cooling require												
Not applicable												
9a. Energy requirements - Fraction of space heat fr Fraction of space heat fr Efficiency of main space	Individual om secondar om main sys	heating sy ry/supplement stem(s)	ystems, inc	luding micr	o-CHP						0.0000 1.0000 113.7426	(202)
Efficiency of secondary/s Space heating requirement		y heating s	system, %								100.0000 328.8056	
Jan Space heating requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
106.2166 Space heating efficiency	64.6096	29.1307	3.9674	0.2646	0.0000	0.0000	0.0000	0.0000	6.3329	50.9368	112.5333	(98)
	113.7426	113.7426		113.7426	0.0000	0.0000	0.0000	0.0000	113.7426	113.7426	113.7426	(210)
93.3833 Water heating requirement	56.8033		3.4881	0.2326	0.0000	0.0000	0.0000	0.0000	5.5678	44.7826	98.9368	(211)
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 170.2113 Efficiency of water heate	150.2523	158.3339	142.6791	140.3592	126.1896	121.9274	132.7779	132.2255	147.9136	155.4690	166.3669 178.1250	
(217)m 178.1250 Fuel for water heating, k	Wh/month	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	
95.5572 Water heating fuel used Annual totals kWh/year Space heating fuel - main Space heating fuel - seco		88.8892	80.1006	78.7981	70.8433	68.4505	74.5420	74.2319	83.0392	87.2809	93.3990 979.4840 328.8056 0.0000	(219) (211)
Electricity for pumps and (BalancedWithHeatReco mechanical ventilation Total electricity for the Electricity for lighting Total delivered energy fo	very, Datak fans (SFP above, kWh (calculated	= 0.0	6625)	1.2500, SFP	= 0.6625)						102.0416 102.0416 238.3516 1648.6828	(231) (232)
12a. Carbon dioxide emiss								Post or a			Post and and	
Space heating - main syst Space heating - secondary Water heating (other fuel Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year							Energy kWh/year 328.8056 0.0000 979.4840 102.0416 238.3516		ion factor kg CO2/kWh 0.5190 0.5190 0.5190 0.5190 0.5190	k	Emissions g CO2/year 170.6501 0.0000 508.3522 679.0023 52.9596 123.7045 855.6664	(263) (264) (265) (267) (268)
Dwelling Carbon Dioxide E	mission Rat	e (DER)									16.9400	
DER Total Floor Area Assumed number of occupan CO2 emission factor in Ta 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	ts ble 12 for nces, equat g, equation fset from k tricity ger	electricity tion (L14) n (L16) piofuel CHP heration, ki	y displaced Wh/m²/year	from grid			ON TECHNOLOG	GIES		TFA N EF	16.9400 50.5000 1.7048 0.5190 3.1667 37.5358 0.0000 0.0000 37.5358	ZC2 ZC3 ZC4 ZC5 ZC6 ZC6
				. *2								





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) 126.2500 (1b) - (3b) (m) 2.5000 (2b) 50.5000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 50.5000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 126.2500 (5) main secondary total m3 per hour heating 0 0 0 * 40 = 0 * 20 = 2 * 10 = 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 20.0000 (7a) 0.0000 Air changes per hour 20.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1584 (8) Pressure test Measured/design AP50 0.4084 (18) Infiltration rate Number of sides sheltered 3 (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 0.4036 0.3957 0.3482 0.3403 0.3007 0.3007 0.2928 0.3165 0.3403 0.3561 0.3719 (22b) 0.3877 Effective ac 3. Heat losses and heat loss parameter A x U W/K 1.8900 Element Gross Openings NetArea U-value K-value W/m2K 1.0000 1.3258 m2 1.8900 (26) TER Opaque door TER Opening Type (Uw = 1.40) External Wall 8.0600 10.6856 (27) (29a) 16.6000 9.9500 6.6500 0.1800 EXTERNAL WALL Corridor Wall Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 16.6000 0.1800 2.9880 (29a) (26)...(30) + (32) = 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) 3.1150 (36) (33) + (36) = Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan
(38)m 24.2239
Heat transfer coeff Feb 24.0922 Apr 23.3565 May 23.2430 Dec 23.7126 (38) 23.9631 43.9678 43.2321 43.1187 42.5904 42.5904 42.4926 43.1187 44.0995 Average = Sum(39)m / 12 43.8387 43.3482 43.5882 (39) 43.2316 (39) Aug 0.8414 Jan 0.8733 Feb 0.8706 May 0.8538 Jun 0.8434 Apr 0.8561 0.8538 0.8681 0.8434 0.8584 HLP (average) 0.8561 (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) 1.7048 (42) 74.6897 (43) Jul Feb Jun Sep Oct Apr May Aug Nov Daily hot water use 82.1587 82.1587 (44) 117.9945 (45) 1175.1599 (45) 76.1835 70.2083 67.2207 70.2083 73.1959 Energy conte 121.8389 Energy content (annual) 99.5412 108.6570 Total = Sum(45)m = Distribution loss (46)m = 0.15 x (45)m 18.2758 15.9842 16.4942 14.3801 13.7980 11.9066 11.0333 12.6608 12.8120 14.9312 16.2986 17.6992 (46) Water storage loss: Store volume
a) If manufacturer declared loss factor is known (kWh/day): 150.0000 (47) 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss 0.5400 (49) 0.7527 (55)





CALCULAT	ION OF T	TARGET E	MISSION	IS 09.	lan 2014								
If cylinder co	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325 23.2624	21.0745 21.0112	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat req			ng calculate 156.5564 0.0000	ed for each 140.9590 0.0000	138.5817 0.0000	124.4694	120.1499	131.0004	130.5054	146.1361	153.7489	164.5894	
Output from w/	h							Solar inp	ut (sum of	months) = Si	am (63) m =	0.0000	(63)
Wash and as four		148.6468		140.9590	138.5817	124.4694	120.1499			146.1361 h/year) = Su		164.5894 1723.7773	
Heat gains fro	77.7874	69.1001	73.8381	67.9493	67.8615	62.4665	61.7330	65.3407	64.4735	70.3734	72.2019	76.5091	(65)
5. Internal ga													
Metabolic gain (66)m	Jan 85.2415	Feb	Mar 85.2415	Apr 85.2415	May 85.2415	Jun 85.2415	Jul 85.2415	Aug 85.2415	Sep 85.2415	Oct 85.2415	Nov 85.2415	Dec 85.2415	(66)
Lighting gains								6.6994	8.9920	11.4174	13.3258	14.2058	
Appliances gai	148.5325	150.0738	146.1898	137.9211	127.4834	117.6735	111.1198	109.5785	113.4626	121.7312	132.1689	141.9788	(68)
Cooking gains	31.5241	31.5241	31.5241	ion L15 or 31.5241 3.0000	115a), also 31.5241 3.0000	31.5241	5 31.5241 3.0000	31.5241 3.0000	31.5241 3.0000	31.5241 3.0000	31.5241	31.5241	
Pumps, fans Losses e.g. ev		3.0000 (negative value) -68.1932			-68.1932	3.0000 -68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	3.0000 -68.1932	
Water heating	gains (Tab			94.3740	91.2117	86.7591	82.9744	87.8236	89.5465	94.5879	100.2805	102.8348	
Total internal	gains	316.7501		291.4259	275.9175	260.7749	250.8208	255.6740	263.5735	279.3089	297.3476	310.5919	
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	or	Gains W	
East			8.0	600	19.6403		0.6300	0	.7000	0.770	00	48.3787	(76)
Solar gains Total gains	48.3787 366.8582	94.6390 411.3891	155.8569 462.8477	227.3081 518.7340	278.5746 554.4921	285.1706 545.9456	271.4941 522.3148	233.2094 488.8834	181.2681 444.8416	112.2971 391.6061	60.3225 357.6701	39.7843 350.3762	
7. Mean intern													
Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9, '							21.0000	(85)
Utilisation fa	Jan 79.5234	Feb 79.7616	ving area, mar Mar 79.9966	Apr 81.1189	May 81.3324	Jun 82.3412	Jul 82.3412	Aug 82.5308	Sep 81.9497	Oct 81.3324	Nov 80.9017	Dec 80.4562	
alpha util living ar	6.3016	6.3174	6.3331	6.4079	6.4222	6.4894	6.4894	6.5021	6.4633	6.4222	6.3934	6.3637	
ucii iiving ui	0.9937	0.9862	0.9596	0.8686	0.6957	0.4965	0.3585	0.3992	0.6472	0.9163	0.9852	0.9952	(86)
MIT Th 2	20.2717	20.4079 20.1925	20.6246 20.1947	20.8575 20.2050	20.9701 20.2069	20.9970 20.2159	20.9997 20.2159	20.9994 20.2176	20.9855 20.2124	20.8239 20.2069	20.5087 20.2030	20.2473 20.1989	,
util rest of h	0.9919 19.2240	0.9821 19.4224	0.9482 19.7311	0.8379 20.0494	0.6450 20.1805	0.4369 20.2141	0.2948 20.2158	0.3316 20.2173	0.5800 20.2022	0.8883 20.0158	0.9801 19.5775		
Living area fr	action	19.8589	20.1269	20.4073		20.5609	20.5630		fLA =	Living area	a / (4) =	0.4430	(91)
Temperature ad adjusted MIT		19.8589	20.1269	20.4073	20.5303	20.5609	20.5630	20.5638	20.5492	20.3738	19.9900	0.0000 19.6614	
8. Space heati													
Utilisation Useful gains Ext temp.		403.1745		Apr 0.8463 438.9825 8.9000		Jun 0.4633 252.9293 14.6000		Aug 0.3616 176.7765 16.4000		Oct 0.8948 350.4250 10.6000	Nov 0.9784 349.9554 7.1000	347.7364	(95)
Heat loss rate	W 678.6066	657.7110	597.3831	497.4865	380.7495	253.8766	168.7871	176.9289	275.9852	421.4314	558.7585	673.9330	(97)
Space heating	kWh	1.0000		1.0000		0.0000	0.0000	0.0000	0.0000		1.0000	242.6903	(98)
Space heating Space heating											/ (4) =	1020.3656 20.2053	(98)
8c. Space cool													
Not applicable													





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individua											
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	ry/supplemen stem(s) stem 1 (in ^s	ntary system								0.0000 1.0000 93.5000 0.0000 1091.3001	(202) (206) (208)
Jan Feb Space heating requirement	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
234.5704 171.0485	118.3080	42.1229	8.4585	0.0000	0.0000	0.0000	0.0000	52.8288	150.3382	242.6903	(98)
Space heating efficiency (main heat: 93.5000 93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system) 250.8774 182.9396	126.5326	45.0512	9.0465	0.0000	0.0000	0.0000	0.0000	56.5014	160.7895	259.5618	(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 168.4338 148.6468	156.5564	140.9590	138.5817	124.4694	120.1499	131.0004	130.5054	146.1361	153.7489	164.5894	
Efficiency of water heater (217)m 85.6975 85.1889	84.0788	82.0315	80.3465	79.8000	79.8000	79.8000	79.8000	82.3863	84.7541	79.8000 85.8482	
Fuel for water heating, kWh/month 196.5447 174.4908 Water heating fuel used	186.2021	171.8353	172.4801	155.9767	150.5638	164.1609	163.5406	177.3791	181.4058	191.7215 2086.3013	
Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary										1091.3001 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, kWI Electricity for lighting (calculated Total delivered energy for all uses		ix L)								30.0000 45.0000 75.0000 244.0946 3496.6960	(230e) (231) (232)
12a. Carbon dioxide emissions - Ind	ividual heat	ing system	s 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 wate: Fuel factor (electricity) Emissions per m2 for lighting Emissions per m2 for pumps and fans Target Carbon Dioxide Emission Rate	r heating					Energy kWh/year 1091.3001 0.0000 2086.3013 75.0000 244.0946		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190	1	Emissions GG CO2/year 235.7208 0.0000 450.6411 686.3619 38.9250 126.6851 851.9720 13.5913 1.5500 2.5086 0.7708 24.3500	(263) (264) (265) (267) (268) (272) (272a) (272b) (272c)





Property Reference	1B2P MF ET				Issued on Date	16/03/2021
Assessment Reference	2			Prop Type Ref		
Property	1B2P, x, Stratford Upon A	von, CV36				
SAP Rating		87 B	DER	18.58	TER	24.35
Environmental		89 B	% DER <ter< th=""><th></th><th>23.68</th><th></th></ter<>		23.68	
CO ₂ Emissions (t/ye	ear)	0.78	DFEE	32.80	TFEE	33.22
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>1.26</th><th></th></tfe<>	E	1.26	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve	ed Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Mid-floor flat, total floor area 51 $\ensuremath{\text{m}}^2$		
This report covers items included within It is not a complete report of regulation	ons compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 24.35 kgCO□/m² (DER) 18.58 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)3 Dwelling Fabric Energy Efficiency (DFEE	33.2 kWh/m²/yr 33.8 kWh/m²/yrOK	
2 Fabric U-values		
Element Average	Highest	
External wall 0.18 (max. 0.30)	0.18 (max. 0.70) OK	
Party wall 0.00 (max. 0.20)	- OK	
Floor (no floor) Roof (no roof)		
	1.40 (max. 3.30) OK	
	thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
4 Heating efficiency Main heating system:	Heat pump with radiators or underfloor - Elec	tric
Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS		
Secondary heating system:		
	None	
5 Cylinder insulation		
5 Cylinder insulation	Measured cylinder loss: 1.50 kWh/day	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89		ок
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	Measured cylinder loss: 1.50 kWh/day OK Yes	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat	ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control	ок
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat	ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-energy	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW orgy fittings:100% 75% 0.53 1.5 89%	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands):	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MYHR efficiency: Minimum: 9 Summertime temperature Oversheating risk (Midlands): Based on: Overshading:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average	OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70%	OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach Light-coloured curtain or roller blind, close	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MYHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains: 10 Key features	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach Light-coloured curtain or roller blind, close	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach Light-coloured curtain or roller blind, close	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 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 (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains: 10 Key features Party wall U-value	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach Light-coloured curtain or roller blind, close	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Continuous supply and extract system Specific fan power: Maximum MYHR efficiency: Minimum: 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing East: Air change rate: Blinds/curtains: 10 Key features Party wall U-value Door U-value Door U-value	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% 0.53 1.5 89% 70% Not significant Average 8.06 m², No overhang 6.00 ach Light-coloured curtain or roller blind, close 0.00 W/m²K 1.00 W/m²K	OK





CALCULATION	ON OF D	WELLIN	G EMISSI	ONS FOR	REGULAT	IONS CO	OMPLIAN	ICE 09	9 Jan 2014				
SAP 2012 WORKSH													
CALCULATION OF	DWELLING EN	MISSIONS F	OR REGULATI	ONS COMPLIAN	NCE 09	Jan 2014							
1. Overall dwel	ling dimens	sions											
Ground floor								Area (m2) 50.5000		ey height (m)	(0)-)	Volume (m3)	(1) (2)
Total floor are Dwelling volume		a)+(1b)+(1	c)+(1d)+(1e)(ln)	!	50.5000			(1b) x 3a)+(3b)+(3c)	2.5000 +(3d)+(3e)		126.2500	(1b) - (3b (4) (5)
2. Ventilation	rate												
					main heating		econdary heating		other	tota	al m3	per hour	
Number of chimn Number of open	flues				Ō 0	++	ō 0	+ +	0 =		0 * 40 = 0 * 20 = 0 * 10 =	0.0000	(6b)
Number of inter Number of passi Number of fluel	ve vents										0 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 0.0000	(7b)
Infiltration du	e to chimne	eys, flues	and fans	= (6a)+(6b)	+ (7a) + (7b) +	(7c) =				0.0000	Air changes / (5) =	0.0000	(8)
Pressure test Measured/design Infiltration ra Number of sides	te											Yes 3.0000 0.1500 3	(18) (19)
Shelter factor Infiltration ra	te adjusted	d to inclu	de shelter	factor					(20) = 1 - (2	[0.075 x 1) = (18) :		0.7750 0.1163	
Wind speed Wind factor Adj infilt rate	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 mecha	0.1482 nical venti		0.1424 th heat rec	0.1279 overy	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	
If mechanical v If balanced wit			iciency in	% allowing f	for in-use fa	actor (fro	m Table 4h)	=				0.5000 75.6500	
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583	(25)
3. Heat losses	and heat lo	ss parame	ter										
Element				Gross m2	Openings m2		m2	U-value W/m2K	A x	K 1	-value kJ/m2K	A x K kJ/K	
Opening Type 1 Opening Type 2 External Wall	(Uw = 1.40)			16.6000	9.9500	8	.8900 .0600 .6500	1.0000 1.3258 0.1800	1.890 10.685 1.197	6			(26) (27) (29a)
Corridor Wall Total net area				16.6000		16	.6000 .2000	0.1800	2.988	D			(29a) (31)
Fabric heat los Party Wall Party Floor 1 Party Ceiling 1		ım (A x U)				50	(26) (3 .2300 .5000 .5000	30) + (32) 0.0000	= 16.760 0.000				(33) (32) (32d) (32b)
Thermal mass pa Thermal bridges Total fabric he	(Sum(L x E									(33)	+ (36) =	250.0000 6.8736 23.6342	(36)
Ventilation hea	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m Heat transfer c	34.8818	11.1265 34.7607	11.0054 34.6396	10.4000 34.0342	10.2789 33.9131	9.6735 33.3077	9.6735 33.3077	9.5524 33.1866		10.2789	10.5211 34.1553	10.7632 34.3975	(39)
Average = Sum(3 HLP HLP (average)	Jan 0.6907	Feb 0.6883	Mar 0.6859	Apr 0.6739	May 0.6715	Jun 0.6596	Jul 0.6596	Aug 0.6572	Sep 0.6644	Oct 0.6715	Nov 0.6763	34.0039 Dec 0.6811 0.6733	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30		(41)
4. Water heatin	g energy re	equirement	s (kWh/year)									
Assumed occupan Average daily h	су											1.7048 74.6897	
Daily hot water	Jan use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content Distribution lo	82.1587 121.8389 (annual)	79.1711 106.5611 = 0.15 × (76.1835 109.9615 45)m	73.1959 95.8671	70.2083 91.9868	67.2207 79.3776	67.2207 73.5550	70.2083 84.4055		76.1835 99.5412 Total = St	79.1711 108.6570 um(45)m =	82.1587 117.9945 1175.1599	(45)





CALCULAT	TION OF I	DWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ.			
	18.2758	15.9842	16.4942	14.3801	13.7980	11.9066	11.0333	12.6608	12.8120	14.9312	16.2986	17.6992 (46)
Water storage Store volume	loss:											150.0000 (47)
a) If manufa Temperature Enter (49) or	factor from	m Table 2b	actor is kno	own (kWh/c	iay):							1.5000 (0.5400 (0.8100 (48) 49)
Total storage	loss 25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder c		icated sola 22.6800		24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (57)
Primary loss Total heat re	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (
Solar input			158.3339			126.1896	121.9274	0.0000	132.2255 0.0000 ut (sum of	147.9136 0.0000 months) = St	0.0000	166.3669 (0.0000 (0.0000 (63)
Output from w		150.2523	158.3339	142.6791	140.3592	126.1896	121.9274					166.3669 (1744.7059 (
Heat gains fr	om water he 79.2094	ating, kWh/ 70.3845		69.3254	69.2835	63.8427	63.1550	66.7627	65.8496	71.7954	73.5781	77.9311 (65)
5. Internal games Metabolic gai:													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul 85.2415	Aug 85.2415	Sep 85.2415	Oct 85.2415	Nov 85.2415	Dec	66)
Lighting gain	s (calculat	ed in Appen	dix L, equa	tion L9 or	85.2415 L9a), also s 5.5170	see Table 5		6.5418	8.7804	11.1488	13.0122	85.2415 (
Appliances ga		ated in App	endix L, eq	uation L13		lso see Tab	le 5	109.5785		121.7312	132.1689	13.8716 (
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or	L15a), also	see Table	5	31.5241	31.5241			141.9788 (
Pumps, fans	31.5241 0.0000	31.5241	31.5241 0.0000	0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 0.0000	0.0000	0.0000	31.5241 0.0000	31.5241 0.0000	31.5241 (0.0000 (
Losses e.g. e	-68.1932	-68.1932	-68.1932		-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932 (71)
Water heating	106.4642	104.7389	101.1561	96.2853	93.1230	88.6704	84.8857	89.7349	91.4578	96.4992	102.1918	104.7461 (72)
Total interna		315.3725	305.6671	290.1594	274.6959	259.5740	249.6108	254.4277	262.2732	277.9516	295.9453	309.1689 (73)
6. Solar gain													
6. Solar gain													
[Jan]				rea m2	Solar flux Table 6a	0	g		FF	Acces		Gains	
				IIIZ	W/m2	or '	ric data Table 6b	Specific or Tab	data le 6c	facto Table (W	
East			8.0	600	W/m2 19.6403		0.4500	0			5d	w 39.4928 (76)
East	39.4928	77.2563	8.0	600 	W/m2 19.6403	232.7924	0.4500	190.3750	.8000	Table (5d		83)
Solar gains Total gains	39.4928 356.5584	77.2563 392.6289 ture (heati	127.2302 432.8973	185.5576 475.7170	W/m2 19.6403 227.4078 502.1037	232.7924 492.3663	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739	Table (0.770)	49.2429	39.4928 (32.4770 (83)
Solar gains Total gains 7. Mean inter Temperature di	39.4928 356.5584 nal tempera	77.2563 392.6289 ture (heati	127.2302 432.8973 in the livin	185.5576 475.7170	227.4078 502.1037	232.7924 492.3663	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739	Table (0.770)	49.2429	39.4928 (32.4770 (83) 84)
Solar gains Total gains 7. Mean inter Temperature d Utilisation f	39.4928 356.5584 	77.2563 392.6289 ture (heati ng periods ains for li Feb	8.0 127.2302 432.8973 in the living area, in Mar	185.5576 475.7170 475.7170 area fronil,m (see	W/m2 19.6403 227.4078 502.1037 om Table 9, Table 9a) May	232.7924 492.3663 Ph1 (C) Jun	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739 410.2471	Table 6 0.776 91.6711 369.6227	5d 49.2429 345.1882	39.4928 (32.4770 (341.6459 (21.0000 (83) 84)
Solar gains Total gains 7. Mean inter- Temperature d Utilisation f	39.4928 356.5584 	77.2563 392.6289 ture (heati ng periods ains for li Feb	8.0 127.2302 432.8973 in the living area, in Mar	185.5576 475.7170 475.7170 area fr nil,m (see	W/m2 19.6403 227.4078 502.1037 om Table 9, 5 Table 9a) May 103.4096	232.7924 492.3663 Ph1 (C) Jun	0.4500 221.6278 471.2386	190.3750 444.8027	.8000 147.9739 410.2471	Table 6 0.776 91.6711 369.6227	5d 49.2429 345.1882	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536	83) 84)
Solar gains Total gains 7. Mean inter Temperature d Utilisation f	39.4928 356.5584 anal tempera uring heati actor for g Jan 100.5380 7.7025	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882	8.0 127.2302 432.8973 ing season) in the livin ving area, 1 Mar 101.2409 7.7494	185.5576 475.7170 ang area fro nil,m (see Apr 103.0418 7.8695	W/m2 19.6403 227.4078 502.1037 om Table 9, Table 9a) May 103.4096 7.8940	232.7924 492.3663 Ph1 (C) Jun 105.2892	Jul 105.2892 8.0193	190.3750 444.8027	.8000 147.9739 410.2471 Sep 104.5293 7.9686	Oct 103.4096 7.8940	49.2429 345.1882 Nov 102.6765	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969	83) 84) 85)
Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a	39.4928 356.5584 anal tempera 	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798	127.2302 432.8973 	185.5576 475.7170 185.5576 475.7170 189.00 1	W/m2 19.6403 227.4078 502.1037 m Table 9, Table 9a) May 103.4096 7.8940 0.6221	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327	Jul 105.2892 8.0193	190.3750 444.8027 Aug 105.6734 8.0449	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617	Oct 103.4096 7.8940 0.8657	Mov 102.6765 7.8451 0.9762	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (83) 84) 85)
Solar gains Total gains 7. Mean inter- Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16	39.4928 356.5584 anal tempera 	77.2563 392.6289 ture (heati	8.0 127.2302 432.8973 ing season) in the living area, ing area, ing area, ing area, ing area, ing area, ing area and	185.5576 475.7170 area from area from 11, m (see Apr 103.0418 7.8695 0.8139 20.2733 20.9533 8	W/m2 19.6403 227.4078 502.1037 om Table 9, 17 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9	232.7924 492.3663 Ph1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 9	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8	Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9	Nov 102.6765 7.8451 0.9762 20.0460 20.8416 8	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 9	83) 84) 85)
Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9	39.4928 356.5584 	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0	8.0 127.2302 432.8973 in the living rate, 101.2409 7.7494 0.9400 20.1253 20.8833 9 22 0	185.5576 475.7170 185.5576 475.7170 area from all, m (see Apr 103.0418 7.8695) 0.8139 20.2733 20.9533 8 22 0	W/m2 19.6403 227.4078 502.1037 m Table 9, 7 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 9 21 10	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 9	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 20	Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9	Nov 102.6765 7.8451 0.9762 20.0460 20.8416 8 22	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 9 22 0	83) 84) 85)
Solar gains Total gains 7. Mean inter- Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2	39.4928 356.5584 	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0	127.2302 432.8973 ing season) in the living ving area, i Mar 101.2409 7.7494 0.9400 20.1253 20.8833 9	185.5576 475.7170 area fro nii,m (see Apr 103.0418 7.8695 0.8139 20.2733 20.9533 8 22 21.000	W/m2 19.6403 227.4078 502.1037 DM Table 9, Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 22 0 21.0000	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 9	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 9	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22	Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9	Nov 102.6765 7.8451 0.9762 20.0460 20.8416 8 22 21.000	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 9 22 0	83) 84) 85) 86)
Solar gains Total gains Total gains 7. Mean inter: Temperature d'Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	39.4928 356.5584	77.2563 392.6289 ture (heati	127.2302 432.8973 in the livin ving area, ving area, vi	185.5576 475.7170 185.5576 475.7170 189.000000000000000000000000000000000000	W/m2 19.6403 227.4078 502.1037 m Table 9, 1 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0 0 21.0000 20.3660 0.5818	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 9 21 00 21.0000 20.3767 0.3907	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 22.000 20.3767 0.2669	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0 21.0000 20.3788 0.2968	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0 21.0000 20.3724 0.5117	Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9 22 0 021.0000 20.3660 0.8332	Nov 102.6765 7.8451 0.9762 20.0460 20.8416 8 22 0 0 21.0000 20.3618	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 9 22 0 21.0000 (20.3575 (0.9912 (83) 84) 85) 86)
Solar gains Total gains Total gains 7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekend	39.4928 356.5584	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0 21.0000 20.35712 0.9744 19.9549 19.9549	127.2302 432.8973 in the livirying area, 19 Mar 101.2409 7.7494 0.9400 20.1253 20.8833 9 22 0 21.0000 20.3553 0.9258 20.1253 20.1253	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 186.5576	W/m2 19.6403 227.4078 502.1037 m Table 9, 17 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0 21.0000 20.3660 0.5818 20.3114 20.3114	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 21 0.21.0000 20.3767 0.3907 20.3267 20.3267	Jul 105.2892 8.0193 0.3110 20.3269 22.0200 21.0000 20.3767 0.2669 20.3269 20.3269	Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0.21.0000 20.3788 0.2968 20.3292 20.3292	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0.21.0000 20.3724 0.5117 20.3212 20.3212	Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9 22 0.21.0000 20.3660 0.8332 20.2635 20.2635	Nov 102.6765 7.8451 0.9762 20.0460 21.0000 20.3618 0.9690 20.0460 20.0460 20.0460	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 0 21.0000 (20.3575 (0.9912 (19.8213 19.8213	83) 84) 85) 86) 87) 88) 89)
Solar gains Total gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 MIT Th 2 util rest of Tweekday Tweekend MIT 2 Living area f	39.4928 356.5584 nal tempera uring heati actor for g Jan 100.5380 7.7025 rea 0.9910 19.8349 20.7516 9 22 0 21.0000 20.3490 house 0.9885 19.8349 19.8349 20.3490 raction	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 20.000 20.3512	8.0 127.2302 432.8973 in the living area, in Mar 101.2409 7.7494 0.9400 20.1253 20.8833 9 22 0 21.0000 20.3533 0.9258 20.1253 20.1253 20.1253 20.1253	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 187.8695 188.9533 20.2733 20.2733 20.2733 20.2733 20.2733 20.2733 20.2733	W/m2 19.6403 227.4078 502.1037 m Table 9, Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0 0.5818 20.3114 20.3144 20.3144 20.3160	232.7924 492.3663 Ph1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 21 0 21.0000 20.3767 0.3967 20.3267 20.3267 20.3267 20.3267 20.3267	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 0.21.0000 20.3767 0.2669 20.3269 20.3269 20.3269 20.3269	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0 21.0000 20.3788 0.2968 20.3292 20.3788	.8000 147.9739 410.2471 Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0 21.0000 20.3724 0.5117 20.3212 20.3212 20.3212 20.3212 20.3212 20.3212 40.3212 20.3212 20.3214 Elementary of the second of the s	Oct 103.4096 7.8940 0.8657 20.2635 20.2635 20.2635 20.2635 20.2635 20.3660 Living area	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.969 0.21.0000 20.3618 0.969 0.0460 20.0460 20.0460 20.0460 20.0460	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 9 22 0 21.0000 (20.3575 (0.99213 19.8213 19.8213 20.3575 (0.4430 (83) 84) 85) 86) 87) 88) 89) 90) 91)
Solar gains Total gains Total gains 7. Mean inter- Temperature d' Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of i	39.4928 356.5584 anal tempera	77.2563 392.6289 ture (heati	127.2302 432.8973 in the livirying area, 19 Mar 101.2409 7.7494 0.9400 20.1253 20.8833 9 22 0 21.0000 20.3553 0.9258 20.1253 20.1253	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576	W/m2 19.6403 227.4078 502.1037 m Table 9, 1 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0.0000 0.5818 20.3114 20.3114 20.3660 20.6469	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 9 21 0 21.0000 20.3767 20.3267 20.3267 20.3267 20.3267 20.3267 20.3767	Jul 105.2892 8.0193 0.3110 20.3269 22.0200 21.0000 20.3767 0.2669 20.3269 20.3269	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0 21.0000 20.3788 0.2968 20.3292 20.3788	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0 21.0000 20.3724 0.5117 20.3212 20.3212 20.3212 20.3212 20.3212 20.3212	Oct 103.4096 7.8940 0.8657 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2636 20.2635 20.2635 20.3660 Living area 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.969 0.21.0000 20.3618 0.969 0.0460 20.0460 20.0460 20.0460 20.0460	39.4928 (32.4770 (341.6459 (21.0000 (Dec (101.9536 (7.7969 (0.9931 (19.8213 (0.3575 (0.9912 (19.8213 (19.8213 (0.3575 (0.4430 (20.6421 (0.0000 (0.90	83) 84) 85) 86) 87) 88) 89) 90) 91) 92)
Solar gains Total gains Total gains 7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekend MIT 2 Living area f MIT Temperature a	39.4928 356.5584	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20.0 0.21.0000 21.0000 20.3512 0.9744 19.9549 19.9549 20.3512 20.6386 20.6386	8.0 127.2302 432.8973 in the livin, wing area, ying area, ying area, 20.8833 9.22 0.21.000 20.3533 0.9258 20.1253 20.1253 20.1253 20.1253 20.1253 20.1253	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 20.0418 20.2733 20.2733 20.3639 0.7827 20.2733 20.2733 20.3639 20.6457 20.6457	W/m2 19.6403 227.4078 502.1037 m Table 9, 17 Table 90 7.8940 0.6221 20.3114 20.3747 9 22 0 021.0000 20.3660 0.5818 20.3114 20.3114 20.3114 20.3660 20.6469	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 21 00 21.0000 20.3767 0.3967 20.3267 20.3267 20.3267 20.3267 20.3767	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 0.21.000 20.3767 0.2669 20.3269 20.3269 20.3767 20.6528	Aug 105.6734 8.0449 0.3432 20.3292 20.9781 22 0.21.0000 20.3788 0.2968 20.3292 20.3292 20.3788 20.3292 20.3788	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0.21.0000 20.3724 0.5117 20.3212 20.3724 1614 = 20.6504	Oct 103.4096 7.8940 0.8657 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2636 20.2635 20.2635 20.3660 Living area 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.9690 20.0460 20.0460 20.0460 20.0460 20.0460 20.3618	39.4928 (32.4770 (341.6459 (21.0000 (Dec (101.9536 (7.7969 (20.3575 (20.3575 (19.8213 (83) 84) 85) 86) 87) 88) 89) 90) 91) 92)
Solar gains Total gains Total gains 7. Mean inter: Temperature d'Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT	39.4928 356.5584	77.2563 392.6289 ture (heati relation feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0 21.0000 20.3512 0.9744 19.9549 20.3512 20.6386	8.0 127.2302 432.8973 in the living area, in	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 185.	W/m2 19.6403 227.4078 502.1037 Table 9, Table 9a) Table 9a) 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 00 21.0000 20.3660 0.5818 20.3114 20.3114 20.3660 20.6469	232.7924 492.3663 Ph1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 21 0 21.0000 20.3767 0.3907 20.3267 20.3267 20.3267 20.3767 20.3267 20.3767	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 0.21.0000 20.3767 0.2669 20.3269 20.3269 20.3767 20.6528 20.6528	Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0 21.0000 20.3788 0.2968 20.3292 20.3788 20.6540	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0.21.0000 20.3724 0.5117 20.3212 20.3724 1614 = 20.6504	Oct 103.4096 7.8940 0.8657 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2635 20.2636 20.2635 20.2635 20.3660 Living area 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.9690 20.0460 20.0	39.4928 (32.4770 (341.6459 (21.0000 (Dec (101.9536 (7.7969 (20.3575 (20.3575 (19.8213 (83) 84) 85) 86) 87) 88) 89) 90) 91) 92)
Solar gains Total gains Total gains 7. Mean inter- Temperature d' Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of f. Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT 8. Space heat	39.4928 356.5584	77.2563 392.6289 ture (heati	8.0 127.2302 432.8973 in the livin, wing area, was represented by the living area, was represented b	185.5576 475.7170 185.5576 475.	W/m2 19.6403 227.4078 502.1037 m Table 9, 17 Table 90 7.8940 0.6221 20.3114 20.3747 9 22 00 21.0000 20.3660 0.5818 20.3114 20.3114 20.3114 20.3660 20.6469	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 21.0000 20.3767 0.3907 20.3267 20.3267 20.3267 20.3767 20.3267 20.3767	0.4500 221.6278 471.2386 471.2386 Jul 105.2892 8.0193 0.3110 20.3269 22.000 21.000 20.3767 0.2669 20.3269 20.3767 20.6528 20.6528	Aug 105.6734 8.0449 0.3432 20.3292 20.9781 22 20.3788 0.2968 20.3292 20.3788 0.2968 20.3292 20.3788 20.6540	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0.21.0000 20.3724 0.5117 20.3212 20.3724 0.5117 20.3212 20.3724 20.6504	Table 6 0.770 91.6711 369.6227 Oct 103.4096 7.8940 0.8657 20.2635 20.9453 9 22 0 021.0000 20.3660 0.8332 20.2635 20.2635 20.2635 20.2635 20.3660 Living area 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.9690 20.0460 20.0460 20.3618 4 / (4) = 20.6445	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9536 7.7969 0.9931 (19.8213 20.7422 0 21.0000 (22.03575 (0.9912 (19.8213 19.8213 19.8213 20.3575 (0.4430 (0.0000 20.6421 (Dec	83) 84) 85) 86) 87) 88) 89) 90) 91) 92)
Solar gains Total gains Total gains 7. Mean inter Temperature d Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekend MIT 2 Living area f. MIT Temperature a adjusted MIT 8. Space heat	39.4928 356.5584	77.2563 392.6289 ture (heati repriods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0 21.0000 20.3512 0.9744 19.9549 20.3512 20.6386 20.6386	8.0 127.2302 432.8973 ing season) in the living area, 101,2409 7.7494 0.9400 20.1253 20.8833 9 22 0 21.0000 20.3533 0.9258 20.1253 20.1253 20.1253 20.3533 20.6398 20.6398	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 187.8695 188.39 20.2733 20.9533 21.0000 20.3639 0.7827 20.2733 20.2733 20.3639 20.6457 20.6457	W/m2 19.6403 227.4078 502.1037 Table 9, Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0 21.0000 20.3660 0.5818 20.3114 20.3114 20.3660 20.6469 20.6469	232.7924 492.3663 Ph1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267 20.3267	Jul 105.2892 8.0193 0.3110 20.3269 20.9780 0.21.0000 20.3767 0.2669 20.3269 20.3269 20.3767 20.6528 20.6528	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0 21.0000 20.3788 20.3292 20.3292 20.3788 20.6540 20.6540	Sep 104,5293 7,9686 0.5617 20.3212 20.9768 8 22 0 21.0000 20.3724 0.5117 20.3212 20.3212 20.3212 20.3212 20.3214 4 LA = 20.6504 20.6504	Oct 103.4096 7.8940 0.8657 20.2635 20.2635 20.3660 Living are: 20.6469 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.9002 20.3618 0.9062 20.0460 20.3618 0.90460 20.3618 0.90460 20.3645 20.6445	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9336 7.7969 (0.9931 (19.8213 (19.8	83) 84) 85) 86) 87) 88) 89) 90) 91) 92) 93)
Solar gains Total gains Tamperature d Utilisation f Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of f Tweekday Tweekend MIT 2 Living area f MIT Temperature a adjusted MIT 8. Space heat Utilisation	39.4928 356.5584 anal tempera	77.2563 392.6289 ture (heati ng periods ains for li Feb 100.8882 7.7259 0.9798 19.9549 20.8049 8 20 0 21.0000 20.3512 0.9744 19.9549 20.3512 20.6386 20.6386	8.0 127.2302 432.8973 in the livitying area, 18 Mar 101.2409 7.7494 0.9400 20.1253 20.8833 0.21.0000 20.3533 0.9258 20.1253 20.1253 20.1253 20.1253 20.6398 20.6398	185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 185.5576 475.7170 187.8695 0.8139 20.2733 20.3639 20.6457	W/m2 19.6403 227.4078 502.1037 m Table 9, 7 Table 9a) May 103.4096 7.8940 0.6221 20.3114 20.9747 9 22 0.01.0000 20.3660 0.5818 20.3114 20.3144 20.3660 20.6469 20.6469	232.7924 492.3663 Th1 (C) Jun 105.2892 8.0193 0.4327 20.3267 20.9779 9 21 0 21.0000 20.3767 20.3267	0.4500 221.6278 471.2386 Jul 105.2892 8.0193 0.3110 20.3269 20.9780 0 21.0000 20.3767 0.2669 20.3269 20.3269 20.3767 20.6528 20.6528	190.3750 444.8027 Aug 105.6734 8.0449 0.3432 20.3292 20.9781 9 22 0.0000 20.3788 20.3292 20.3788 20.6540 20.6540	Sep 104.5293 7.9686 0.5617 20.3212 20.9768 8 22 0 21.0000 20.3724 0.5117 20.3212 20.3212 20.3212 20.3212 20.3212 20.6504 20.6504	Oct 103.4096 7.8940 0.8657 20.2635 20.3660 20.2635 20.2635 20.3660 20.6469 20.6469 20.6469	Nov 102.6765 7.8451 0.9762 20.0460 20.3618 0.9690 20.0460 20.0460 20.0460 20.0460 20.0460 20.0460 20.0460 20.0460 20.0460 20.0460 30.0460 20.0460 30.0460 20.0460 30.0	39.4928 (32.4770 (341.6459 (21.0000 (Dec 101.9336 7.7969 (0.9931 (19.8213 (19.8	83) 84) 85) 86) 87) 88) 99) 91) 92) 93)





CALCULATIO	N OF D	WELLING	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
Space heating Space heating per	61.4365 r m2	109.8713	64.0861	14.8672	1.6947	0.0000	0.0000	0.0000	0.0000	20.2293	91.4059	168.5979 632.1888 12.5186	(98)
8c. Space cooling	g requirem	nent											
Not applicable													
9a. Energy requir	rements -	Individual	heating sy	stems, inc	luding micr	o-CHP							
Fraction of space Fraction of space Efficiency of mai Efficiency of sec Space heating rec	e heat from the	om secondar om main sys neating sys	ry/supplemer stem(s) stem 1 (in %	ntary system								0.0000 1.0000 129.4322 100.0000 488.4323	(202) (206) (208)
One of heather and	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	61.4365		64.0861	14.8672	1.6947	0.0000	0.0000	0.0000	0.0000	20.2293	91.4059	168.5979	(98)
	29.4322	129.4322	129.4322	129.4322	129.4322	0.0000	0.0000	0.0000	0.0000	129.4322	129.4322	129.4322	(210)
	24.7266		49.5133	11.4864	1.3093	0.0000	0.0000	0.0000	0.0000	15.6292	70.6206	130.2596	(211)
Water heating red	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)
	70.2113		158.3339	142.6791	140.3592	126.1896	121.9274	132.7779	132.2255	147.9136	155.4690	166.3669	
	78.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	
Water heating fue Annual totals kWh	95.5572 el used h/year	84.3522	88.8892	80.1006	78.7981	70.8433	68.4505	74.5420	74.2319	83.0392	87.2809	93.3990 979.4840	(219)
Space heating fue Space heating fue												488.4323 0.0000	
Electricity for process (BalancedWith mechanical ver Total electricity Electricity for 1 Total delivered electricity for process for 1 total delivered electricity for process for 1 total delivered electricity for process for 1 total delivered electricity electri	hHeatRecov ntilation y for the lighting (ery, Datab fans (SFP above, kWh (calculated	= 0.6	5625)	1.2500, SFP	= 0.6625)						102.0416 102.0416 238.3516 1808.3094	(231) (232)
12a. Carbon dioxi													
Space heating - m Space heating - s Water heating (of Space and water h Pumps and fans Energy for light! Total CO2, kg/yea Dwelling Carbon I	main syste secondary ther fuel) heating ing ar	em 1						Energy kWh/year 488.4323 0.0000 979.4840 102.0416 238.3516		ion factor kg CO2/kWh 0.5190 0.5190 0.5190 0.5190 0.5190	k	Emissions g CO2/year 253.4963 0.0000 508.3522 761.8485 52.9596 123.7045 938.5126 18.5800	(263) (264) (265) (267) (268) (272)
16 CO2 EMISSIONS DER Total Floor Area Assumed number of CO2 emission fact CO2 emissions frc CO2 emissions frc Total CO2 emissions Residual CO2 emis Additional allow Resulting CO2 emi Net CO2 emissions	f occupant tor in Tak om appliar om cooking ons ssions off able elect issions of	is ple 12 for pless, equat g, equation first from h cricity gen	electricity tion (L14) n (L16) priofuel CHP meration, kW	/ displaced Wh/m²/year	from grid		TY GENERATI(ON TECHNOLOG	GIES		TFA N EF	18.5800 50.5000 1.7048 0.5190 17.4292 3.1667 39.1758 0.0000 0.0000 0.0000 39.1758	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) 126.2500 (1b) - (3b) (m) 2.5000 (2b) 50.5000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 50.5000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 126.2500 (5) main secondary total m3 per hour heating 0 0 0 * 40 = 0 * 20 = 2 * 10 = 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 20.0000 (7a) 0.0000 Air changes per hour 20.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1584 (8) Pressure test Measured/design AP50 0.4084 (18) Infiltration rate Number of sides sheltered 3 (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 0.4036 0.3957 0.3482 0.3403 0.3007 0.3007 0.2928 0.3165 0.3403 0.3561 0.3719 (22b) 0.3877 Effective ac 3. Heat losses and heat loss parameter A x U W/K 1.8900 Element Gross Openings NetArea U-value K-value W/m2K 1.0000 1.3258 m2 1.8900 (26) TER Opaque door TER Opening Type (Uw = 1.40) External Wall 8.0600 10.6856 (27) (29a) 16.6000 9.9500 6.6500 0.1800 EXTERNAL WALL Corridor Wall Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) 16.6000 0.1800 2.9880 (29a) (26)...(30) + (32) = 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) 3.1150 (36) (33) + (36) = Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan
(38)m 24.2239
Heat transfer coeff Feb 24.0922 Apr 23.3565 May 23.2430 Dec 23.7126 (38) 23.9631 43.9678 43.2321 43.1187 42.5904 42.5904 42.4926 43.1187 44.0995 Average = Sum(39)m / 12 43.8387 43.3482 43.5882 (39) 43.2316 (39) Aug 0.8414 Jan 0.8733 Feb 0.8706 May 0.8538 Jun 0.8434 Apr 0.8561 0.8538 0.8681 0.8434 0.8584 HLP (average) 0.8561 (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) 1.7048 (42) 74.6897 (43) Jul Feb Jun Sep Oct Apr May Aug Nov Daily hot water use 82.1587 82.1587 (44) 117.9945 (45) 1175.1599 (45) 76.1835 70.2083 67.2207 70.2083 73.1959 Energy conte 121.8389 Energy content (annual) 99.5412 108.6570 Total = Sum(45)m = Distribution loss (46)m = 0.15 x (45)m 18.2758 15.9842 16.4942 14.3801 13.7980 11.9066 11.0333 12.6608 12.8120 14.9312 16.2986 17.6992 (46) Water storage loss: Store volume
a) If manufacturer declared loss factor is known (kWh/day): 150.0000 (47) 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss 0.5400 (49) 0.7527 (55)





CALCULAT	ION OF T	TARGET E	MISSION	IS 09.	lan 2014								
If cylinder co	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325 23.2624	21.0745 21.0112	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat req			ng calculate 156.5564 0.0000	ed for each 140.9590 0.0000	138.5817 0.0000	124.4694	120.1499	131.0004	130.5054	146.1361	153.7489	164.5894	
Output from w/	h							Solar inp	ut (sum of	months) = Si	am (63) m =	0.0000	(63)
Wash and as four		148.6468		140.9590	138.5817	124.4694	120.1499			146.1361 h/year) = Su		164.5894 1723.7773	
Heat gains fro	77.7874	69.1001	73.8381	67.9493	67.8615	62.4665	61.7330	65.3407	64.4735	70.3734	72.2019	76.5091	(65)
5. Internal ga													
Metabolic gain (66)m	Jan 85.2415	Feb	Mar 85.2415	Apr 85.2415	May 85.2415	Jun 85.2415	Jul 85.2415	Aug 85.2415	Sep 85.2415	Oct 85.2415	Nov 85.2415	Dec 85.2415	(66)
Lighting gains								6.6994	8.9920	11.4174	13.3258	14.2058	
Appliances gai	148.5325	150.0738	146.1898	137.9211	127.4834	117.6735	111.1198	109.5785	113.4626	121.7312	132.1689	141.9788	(68)
Cooking gains	31.5241	31.5241	31.5241	ion L15 or 31.5241 3.0000	115a), also 31.5241 3.0000	31.5241	5 31.5241 3.0000	31.5241 3.0000	31.5241 3.0000	31.5241 3.0000	31.5241	31.5241	
Pumps, fans Losses e.g. ev		3.0000 (negative value) -68.1932			-68.1932	3.0000 -68.1932	-68.1932	-68.1932	-68.1932	-68.1932	-68.1932	3.0000 -68.1932	
Water heating	gains (Tab			94.3740	91.2117	86.7591	82.9744	87.8236	89.5465	94.5879	100.2805	102.8348	
Total internal	gains	316.7501		291.4259	275.9175	260.7749	250.8208	255.6740	263.5735	279.3089	297.3476	310.5919	
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data le 6c	Acces facto Table 6	or	Gains W	
East			8.0	600	19.6403		0.6300	0	.7000	0.770	00	48.3787	(76)
Solar gains Total gains	48.3787 366.8582	94.6390 411.3891	155.8569 462.8477	227.3081 518.7340	278.5746 554.4921	285.1706 545.9456	271.4941 522.3148	233.2094 488.8834	181.2681 444.8416	112.2971 391.6061	60.3225 357.6701	39.7843 350.3762	
7. Mean intern													
Temperature du	ring heati	ng periods	in the livi	ng area fro	om Table 9, '							21.0000	(85)
Utilisation fa	Jan 79.5234	Feb 79.7616	ving area, mar Mar 79.9966	Apr 81.1189	May 81.3324	Jun 82.3412	Jul 82.3412	Aug 82.5308	Sep 81.9497	Oct 81.3324	Nov 80.9017	Dec 80.4562	
alpha util living ar	6.3016	6.3174	6.3331	6.4079	6.4222	6.4894	6.4894	6.5021	6.4633	6.4222	6.3934	6.3637	
ucii iiving ui	0.9937	0.9862	0.9596	0.8686	0.6957	0.4965	0.3585	0.3992	0.6472	0.9163	0.9852	0.9952	(86)
MIT Th 2	20.2717	20.4079 20.1925	20.6246 20.1947	20.8575 20.2050	20.9701 20.2069	20.9970 20.2159	20.9997 20.2159	20.9994 20.2176	20.9855 20.2124	20.8239 20.2069	20.5087 20.2030	20.2473 20.1989	,
util rest of h	0.9919 19.2240	0.9821 19.4224	0.9482 19.7311	0.8379 20.0494	0.6450 20.1805	0.4369 20.2141	0.2948 20.2158	0.3316 20.2173	0.5800 20.2022	0.8883 20.0158	0.9801 19.5775		
Living area fr	action	19.8589	20.1269	20.4073		20.5609	20.5630		fLA =	Living area	a / (4) =	0.4430	(91)
Temperature ad adjusted MIT		19.8589	20.1269	20.4073	20.5303	20.5609	20.5630	20.5638	20.5492	20.3738	19.9900	0.0000 19.6614	
8. Space heati													
Utilisation Useful gains Ext temp.		403.1745		Apr 0.8463 438.9825 8.9000		Jun 0.4633 252.9293 14.6000		Aug 0.3616 176.7765 16.4000		Oct 0.8948 350.4250 10.6000	Nov 0.9784 349.9554 7.1000	347.7364	(95)
Heat loss rate	W 678.6066	657.7110	597.3831	497.4865	380.7495	253.8766	168.7871	176.9289	275.9852	421.4314	558.7585	673.9330	(97)
Space heating	kWh	1.0000		1.0000		0.0000	0.0000	0.0000	0.0000		1.0000	242.6903	(98)
Space heating Space heating											/ (4) =	1020.3656 20.2053	(98)
8c. Space cool													
Not applicable													





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individua											
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	ry/supplemen stem(s) stem 1 (in ^s	ntary system								0.0000 1.0000 93.5000 0.0000 1091.3001	(202) (206) (208)
Jan Feb Space heating requirement	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
234.5704 171.0485	118.3080	42.1229	8.4585	0.0000	0.0000	0.0000	0.0000	52.8288	150.3382	242.6903	(98)
Space heating efficiency (main heat: 93.5000 93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system) 250.8774 182.9396	126.5326	45.0512	9.0465	0.0000	0.0000	0.0000	0.0000	56.5014	160.7895	259.5618	(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 168.4338 148.6468	156.5564	140.9590	138.5817	124.4694	120.1499	131.0004	130.5054	146.1361	153.7489	164.5894	
Efficiency of water heater (217)m 85.6975 85.1889	84.0788	82.0315	80.3465	79.8000	79.8000	79.8000	79.8000	82.3863	84.7541	79.8000 85.8482	
Fuel for water heating, kWh/month 196.5447 174.4908 Water heating fuel used	186.2021	171.8353	172.4801	155.9767	150.5638	164.1609	163.5406	177.3791	181.4058	191.7215 2086.3013	
Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary										1091.3001 0.0000	
Electricity for pumps and fans: central heating pump main heating flue fan Total electricity for the above, kWI Electricity for lighting (calculated Total delivered energy for all uses		ix L)								30.0000 45.0000 75.0000 244.0946 3496.6960	(230e) (231) (232)
12a. Carbon dioxide emissions - Ind	ividual heat	ing system	s 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 wate: Fuel factor (electricity) Emissions per m2 for lighting Emissions per m2 for pumps and fans Target Carbon Dioxide Emission Rate	r heating					Energy kWh/year 1091.3001 0.0000 2086.3013 75.0000 244.0946		ion factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190	1	Emissions GG CO2/year 235.7208 0.0000 450.6411 686.3619 38.9250 126.6851 851.9720 13.5913 1.5500 2.5086 0.7708 24.3500	(263) (264) (265) (267) (268) (272) (272a) (272b) (272c)





Property Reference	5 Bed Detached				Issued on Date	16/03/2021
Assessment	3			Prop Type Ref		
Reference						
Property	x, Mill Lane, Taplow, Buck	kinghamshire,	SL6			
SAP Rating		86 B	DER	12.38	TER	22.89
Environmental		88 B	% DER <ter< th=""><th></th><th>45.92</th><th></th></ter<>		45.92	
CO ₂ Emissions (t/ye	ear)	2.13	DFEE	47.61	TFEE	61.01
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>21.97</th><th></th></tfe<>	E	21.97	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	*	036031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve		
DWELLING AS DESIGNED		
Detached House, total floor area 207 $\ensuremath{\text{m}}^2$		
This report covers items included within It is not a complete report of regulation		
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE) Dwelling Carbon Dioxide Emission Rate (
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) 6 Dwelling Fabric Energy Efficiency (DFEE		
2 Fabric U-values		
External wall 0.15 (max 0.30)	Highest 0.15 (max. 0.70) OK	
Floor 0.10 (max. 0.25)	0.10 (max. 0.70) OK	
1001 0.10 (man: 0.20)	0.10 (max. 0.35) OK 1.20 (max. 3.30) OK	
2a Thermal bridging		
	thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	
Primary pipework insulated:	Yes	OK
6 Controls Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat Independent timer for DHW	OK OK
7 Low energy lights Percentage of fixed lights with low-ene	rgy fittings:100%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power: Maximum	0.71 1.5	OK
MVHR efficiency:	86%	077
Minimum:	70%	OK
Based on:	Slight	OK
Overshading: Windows facing North East:	Average 18.48 m², No overhang	
Windows facing South East:	1.56 m², No overhang	
Windows facing South West: Windows facing North West:	15.26 m², No overhang 12.74 m², No overhang	
Air change rate: Blinds/curtains:	4.00 ach None	
	None	
10 Key features Roof U-value	0.10 W/m ² K	
Roof U-value	0.10 W/m²K	
Floor U-value Door U-value	0.10 W/m ² K 1.00 W/m ² K	
	0.025 W/m ² K 3.0 m ³ /m ² h	





CALCULATION OF DWELLING EMISSIONS FOR	REGULA [*]	TIONS CO	OMPLIAN	ICE 09	9 Jan 2014				
SAP 2012 WORKSHEET FOR New Build (As Designed) (Version	9 92. Janua	ry 2014)							
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIAN	ICE 09	Jan 2014							
1. Overall dwelling dimensions									
				Area (m2)		rey height (m)		Volume (m3)	
Ground floor First floor Second floor				79.9000 91.2000 35.9000	(1c) x	2.4500 (2.8700 (2.0500 ((2c) =	261.7440	(1b) - (3b (1c) - (3c (1d) - (3d
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)(1n)$ Dwelling volume	2	07.0000			3a)+(3b)+(3c)			531.0940	(4)
2. Ventilation rate									
	main heating		econdary heating		other	tota		3 per hour	
Number of chimneys Number of open flues Number of intermittent fans	0	+	0	+	0 =	=	0 * 40 = 0 * 20 = 0 * 10 =	0.0000 0.0000 0.0000	(6b)
Number of passive vents Number of flueless gas fires							0 * 10 = 0 * 40 =	0.0000	(7b)
Infiltration due to chimneys, flues and fans = (6a)+(6b)	+(7a)+(7b)+	(7c) =					Air changes / (5) =	0.0000	(8)
Pressure test Measured/design AP50 Infiltration rate								Yes 3.0000 0.1500	
Number of sides sheltered Shelter factor					(20) = 1			0.8500	
Infiltration rate adjusted to include shelter factor					(2	21) = (18) x	(20) =	0.1275	(21)
Jan Feb Mar Apr Wind speed 5.1000 5.0000 4.9000 4.4000 Wind factor 1.2750 1.2500 1.2250 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 0.1626 0.1594 0.1562 0.1403 Balanced mechanical ventilation with heat recovery	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	
If mechanical ventilation: If balanced with heat recovery: efficiency in % allowing f	for in-use f	actor (from	m Table 4h)	=				0.5000 73.1000	
Effective ac 0.2971 0.2939 0.2907 0.2748	0.2716	0.2556	0.2556	0.2524	0.2620	0.2716	0.2779	0.2843	(25)
3. Heat losses and heat loss parameter									
Element Gross m2 Opening Type 1	Openings m2		tArea m2 .0700	U-value W/m2K 1.0000	A x W, 2.070	K k	value J/m2K	A x K kJ/K	(26)
Opening Type 2 (Uw = 1.20) Opening Type 3 (Uw = 1.20) Floor 1		6	.0400 .7500 .9000	1.1450 1.1450 0.1000	55.00° 7.729 7.990	90			(27) (27a) (28a)
External 286.2000 Garage 15.4000 Main Roof 48.3000	48.0400 2.0700 4.5000	238 13	.1600 .3300 .8000	0.1500 0.1500 0.1000	35.72 1.999 4.380	10 95			(29a) (29a) (30)
Sloped Roof 56.8000 Total net area of external elements Aum(A, m2)	2.2500	54.	.5500 .6000	0.1000	5.45	50			(30) (31)
Fabric heat loss, $W/K = Sum (A \times U)$ Thermal mass parameter (TMP = Cm / TFA) in $kJ/m2K$			(26)(30) + (32)	= 120.35) [250.0000	
Thermal bridges (Sum(L \times Psi) calculated using Appendix K) Total fabric heat loss						(33)	+ (36) =	12.3737 132.7289	
Ventilation heat loss calculated monthly (38)m = 0.33 x (2	May 47.5943	Jun 44.8011	Jul 44.8011	Aug 44.2425	Sep 45.9184	Oct 47.5943	Nov 48.7116	Dec 49.8289	(38)
Heat transfer coeff 184.7923 184.2337 183.6750 180.8818 Average = Sum(39)m / 12 =	180.3232	177.5300	177.5300	176.9713	178.6472	180.3232	181.4405	182.5578 180.7422	
Jan Feb Mar Apr HLP 0.8927 0.8900 0.8873 0.8738	May 0.8711	Jun 0.8576	Jul 0.8576	Aug 0.8549	Sep 0.8630	Oct 0.8711	Nov 0.8765	Dec 0.8819	(40)
HLP (average) Days in month 31 28 31 30	31	30	31	31		31	30	0.8732	
12 10 31 30	J-1	33	01	31	30	V-	53	31	/
4. Water heating energy requirements (kWh/year)									
Assumed occupancy								3.0110	
Average daily hot water use (litres/day) Jan Feb Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	105.7119 Dec	(43)
Daily hot water use 116.2831 112.0546 107.8261 103.5976	99.3692	95.1407	95.1407	99.3692	-	107.8261	112.0546	116.2831	(44)





CALCULAT	ION OF I	DWELLIN	IG EMISSI	ONS FOR	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014	ļ			
Energy conte Energy content Distribution 1	(annual)			135.6853	130.1932	112.3469	104.1059	119.4630	120.8898	140.8854 Total = S		167.0032 1663.2593	
Water storage	25.8667		23.3451	20.3528	19.5290	16.8520	15.6159	17.9195	18.1335	21.1328	23.0681	25.0505	(46)
Store volume a) If manufac Temperature Enter (49) or	factor fro (54) in (5	m Table 2b	Eactor is kn	own (kWh/c	lay):							150.0000 1.5000 0.5400 0.8100	(48) (49)
Total storage	25.1100		25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder co	25.1100		25.1100 23.2624		25.1100	24.3000 22.5120	25.1100	25.1100	24.3000	25.1100	24.3000		
Primary loss Total heat req	quired for	water heati	ng calculat	ed for each			23.2624 152.4783	23.2624	22.5120 167.7018	23.2624 189.2578	22.5120		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 months) = S	0.0000	0.0000	(63)
Output from w/	220.8168		204.0061	182.4973	178.5656	159.1589	152.4783			189.2578 Th/year) = S		215.3756 2232.8053	
Heat gains fro			90.4461	82.5650	81.9872	74.8049	73.3131	78.4194	77.6455	85.5423	88.5839	94.2265	(65)
5. Internal ga	ains (see T	able 5 and	5a)										
Metabolic gain	ns (Table 5), Watts	Mar			Jun			Con	Oct	Nov	Dec	
(66)m Lighting gains	150.5513		150.5513		May 150.5513	150.5513		Aug 150.5513	Sep 150.5513				(66)
Appliances gai	33.6678	29.9034	24.3191	18.4111	13.7625	11.6189	12.5546	16.3190	21.9033	27.8113	32.4599	34.6035	(67)
Cooking gains	377.6504	381.5692	371.6939	350.6705	324.1322	299.1900	282.5271	278.6082	288.4836	309.5070	336.0452	360.9874	(68)
	0.0000	0.0000	0.0000	0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	
	-120.4410	-120.4410			-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	(71)
Water heating	129.0802	1e 5) 126.6383	121.5674	114.6735	110.1978	103.8957	98.5392	105.4024	107.8409	114.9762	123.0332	126.6485	(72)
Total internal		606.2763	585.7458	551.9206	516.2580	482.8701	461.7863	468.4950	486.3932	520.4599	559.7037	590.4049	(73)
6. Solar gains	3												
[Jan]				rea m2	Solar flux Table 6a W/m2		g fic data Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
Northeast Southeast Southwest			18.4 1.5 15.2	m2 800 600 600	Table 6a W/m2 11.2829 36.7938 36.7938	Speci or	fic data Table 6b 0.4500 0.4500 0.4500	Specific or Tab	data le 6c .7000 .7000 .7000	fact Table 0.77 0.77 0.77	or 6d 00 00 00	45.5164 12.5298 122.5669	(77) (79)
Northeast Southeast			18.4 1.5 15.2 12.7 6.7	m2 	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000	Speci or	fic data Table 6b 	Specific or Tab	data le 6c .7000 .7000	fact Table 0.77 0.77	or 6d 00 00 00 00	W 45.5164 12.5298	(77) (79) (81)
Northeast Southeast Southwest Northwest Horizontal	261.7461	489.9778	18.4 1.5 15.2 12.7 6.7	m2 800 600 600 400 500 	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000	Speci or 	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 1400.7886	Specific or Tab	data le 6c .7000 .7000 .7000 .7000 .7000	fact Table 0.77 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00 00 00	45.5164 12.5298 122.5669 31.3787 49.7543	(77) (79) (81) (82)
Northeast Southeast Southwest Northwest Horizontal	261.7461 870.3099	489.9778 1096.2541 ture (heati	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170	m2	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867	Speci or 	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 14500 1400.7886 1862.5748	Specific or Tab	data le 6c .7000 .7000 .7000 .7000 .7000	fact Table 0.77 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00 00 00	45.5164 12.5298 122.5669 31.3787 49.7543	(77) (79) (81) (82)
Northeast Southeast Southwest Northwest Horizontal 	261.7461 870.3099 nal tempera	489.9778 1096.2541 ture (heati	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170	m2	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867	Speci or	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 14500 1400.7886 1862.5748	Specific or Tab	data le 6c .7000 .7000 .7000 .7000 .7000	fact Table 0.77 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00 00 00	45.5164 12.5298 122.5669 31.3787 49.7543	(77) (79) (81) (82) (83) (84)
Northeast Southeast Southwest Northwest Horizontal	261.7461 870.3099 hal tempera arring heati actor for g Jan 77.7900 6.1860	489.9778 1096.2541 ture (heati	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170	m2	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867	Speci or	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 14500 1400.7886 1862.5748	Specific or Tab	data le 6c .7000 .7000 .7000 .7000 .7000	fact Table 0.77 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00 00 00	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422	(77) (79) (81) (82) (83) (84)
Northeast Southeast Southwest Northwest Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	261.7461 870.3099 hal tempera arring heati actor for g Jan 77.7900 6.1860	489.9778 1096.2541 ture (heati- ng periods ains for li Feb 78.0259	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632	m2 800 600 600 400 500 1140.3010 1692.2215	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 mm Table 9, 7 Table 9a) May 79,7180	Speci or	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 1400.7886 1862.5748	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123	fact Table 0.77 0.77 0.77 1.00 571.9132 1092.3731	or 6d 00 00 00 00 00 00 321.7184 881.4221	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422	(77) (79) (81) (82) (83) (84)
Northeast Southwest Southwest Northwest Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar Tweekday Tweekend 24 / 16	261.7461 870.3099 all tempera arring heati actor for g Jan 77.7900 6.1860	489.9778 1096.2541 ture (heati- ng periods ains for li Feb 78.0259 6.2017	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175	m2 800 600 600 400 500 1140.3010 1692.2215 ng area froni,m (see Apr 79.4718 6.2981	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 om Table 9, Table 9a) May 79.7180 6.3145	Speci or 1480.2312 1963.1013 Th1 (C) Jun 80.9722 6.3981	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 1400.7886 1862.5748 Jul 80.9722 6.3981	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123	fact Table 0.77 0.77 0.77 1.00 571.9132 1092.3731	or 6d 00 00 00 00 00 00 321.7184 881.4221 Nov 79.2271 6.2818	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095	(77) (79) (81) (82) (83) (84)
Northeast Southwest Northwest Northwest Horizontal	261.7461 870.3099 mal tempera aring heati actor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0	489.9778 1096.2541 ture (heati- 	780.5713 1366.3170 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 9	m2 800 600 600 400 500	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 1426.928 19426.928 19426.928 19426.928 19426.928 19426.928 19426.928 19426.928 19426.928 19	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.9995 2 2 2 0	Specific or Table of	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 22 0	fact Table 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 0	Nov 79.2271 6.2818 0.9991 19.1425 20.4933 8 22 0	45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9	(77) (79) (81) (82) (83) (84) (85)
Northeast Southeast Southwest Northwest Horizontal	261.7461 870.3099 all tempera all tempera r77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0 21.0000 20.1737	489.9778 1096.2541 ture (heati- ng periods ains for li Feb 78.0259 6.2017 0.9987 18.9762 20.4238 8	780.5713 1366.3170 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 9	m2 800 600 600 500 1140.3010 1692.2215 ang area frc nil,m (see Apr 79.4718 6.2981 0.9470 19.8618 20.8190 8 22	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 om Table 9, Table 9a) May 79.7180 6.3145 0.7923 20.1309 20.9575 9	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.9995 9 222	Specific or Tab o o o	data le 6c .7000	fact Table 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9	or 6d 00 00 00 00 00 321.7184 881.4221 Nov 79.2271 6.2818 0.9991 19.1425 20.4933 82 22	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 22 0.21.0000 21.0000	(77) (79) (81) (82) (83) (84) (85)
Northeast Southeast Southwest Northwest Horizontal	261.7461 870.3099 nal tempera paring heati actor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 00 21.0000 20.1737 nouse 0.9996	489.9778 1096.2541 ture (heati- 	18.4 1.5.2 15.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 9 22.0 0 21.0000 20.1783 0.9895	m2 800 600 600 600 500	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 m Table 9, Table 9a) May 79.7180 6.3145 0.7923 20.1309 20.9575 9 22 00 21.0000 20.1921 0.7431	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.9995 9 22 00 20.2037 0.3432	Aug 81.2279 6.4152 0.4915 20.2051 20.2060 0.4081	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 22 0 0 21.0000 20.1990 0.7403	fact Table 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 0 21.0000 20.1921 0.9790	Nov 79.2271 6.2818 0.9991 19.1425 20.4933 8 22 0 21.0000 20.1875	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 22 0 21.0000 20.1829 0.9998	(77) (79) (81) (82) (83) (84) (85) (85)
Northeast Southeast Southwest Northwest Horizontal	261.7461 870.3099 nal tempera rring heati actor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0.21.0000 21.0000 20.1737 rouse 0.9996 18.7352	489.9778 1096.2541 ture (heati- ng periods ains for li Feb 78.0259 6.2017 0.9987 18.9762 20.4238 20 0.21.0000 20.1760 0.9982 18.9762 18.9762	18.4 1.5 15.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 22 0.21.0000 20.1783 0.9895 19.3685 19.3685	m2	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 om Table 9, Table 9a) May 79.7180 6.3145 0.7923 20.1309 20.9575 9 22 0 21.0000 20.1921 0.7431 20.1309 20.1309	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.2032 20.2033 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2032 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2022 20.2	Aug 81.2279 6.4152 0.4915 20.2051 20.2051 20.2051 20.2051 20.2051 20.2051 20.2051	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 82 20 21.0000 20.1990 0.7403 20.1571 20.1571 20.1571	fact Table 0.77 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 0 21.0000 20.1921 0.9790 19.7299 19.7299	Nov 79.2271 6.2818 0.9991 19.1425 20.4933 8 22 0.21.0000 20.1875 0.9988 19.1425 19.1425	W 45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 22 0.21.0000 20.1829 0.9998 18.7095 18.7095 18.7095	(77) (79) (81) (82) (83) (84) (85) (86)
Northeast Southwest Southwest Northwest Horizontal Solar gains Total gains Total gains Temperature du Utilisation fa tau alpha util living ar Tweekday Tweekend 24 / 9 16 / 9 MIT Th 2 util rest of h Tweekday Tweekend	261.7461 870.3099 mal tempera mal tempera mal tempera mal tempera 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0 21.0000 20.1737 nouse 0.9996 18.7352 18.7352 20.1737	489.9778 1096.2541 ture (heati	18.4 1.5.2 15.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 0 21.0000 20.1783 0.9895 19.3685	m2 800 600 600 400 500	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 Table 9a) May 79.7180 6.3145 0.7923 20.1309 20.9575 9 22 1.0000 20.1921 0.7431 20.1309	Speci or	fic data Table 6b 0.4500 0.4500 0.4500 0.4500 0.4500 1400.7886 1862.5748 Jul 80.9722 6.3981 0.4184 20.2033 20.9995 22 0 21.0000 20.2037 0.3432 20.2033	Aug 81.2279 6.4152 0.4915 20.2051 20.2060 0.4081 20.2051	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 21.0000 21.0000 20.1990 0.7403 20.1571 20.1571 20.1591	fact Table 0.77 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 0.0000 20.1921 0.9790 19.7299	Nov 79.2271 6.2818 0.9991 19.1425 20.1875 20.1875 20.1875 20.1875	45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 21.0000 20.1829 0.9998 18.7095 18.7095 20.1829 0.3031	(77) (79) (81) (82) (83) (84) (85) (85) (86) (87) (88) (89)
Northeast Southwest Northwest Northwest Horizontal	261.7461 870.3099 all tempera aring heati actor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0.21.0000 20.1737 rouse 0.9996 18.7352 18.7352 20.1737 raction 20.4242	489.9778 1096.2541 	780.5713 1366.3170 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 22 0.21.0000 20.1783	m2	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 Table 9a) May 79.7180 0.7923 20.1309 20.9575 9 22 0 21.0000 20.1921 0.7431 20.13309 20.1921	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.2033 20.2033 20.2033 20.2033	Aug 81.2279 6.4152 0.4915 20.2051 20.2060 0.4081 20.2051 20.2051 20.2060	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 22 0 21.0000 20.1990 0.7403 20.1571 20.1571 20.1571 20.1571	fact Table 0.77 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 0 21.0000 20.1921 0.9790 19.7299 19.7299 19.7299 20.1921: Living are	Nov 79.2271 6.2818 0.9991 19.1425 20.1875 20.1875 20.1875 20.1875	45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 22.0000 20.1829 0.3031 20.3031 20.4306 0.3031	(77) (79) (81) (82) (83) (84) (85) (85) (86)
Northeast Southwest Northwest Northwest Horizontal	261.7461 870.3099 nal tempera ring heati rictor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0 21.0000 20.1737 rouse 0.9996 18.7352 18.7352 20.1737 rouse 18.7352 20.1737 rouse 20.4242 reaction 20.4242 reaction 20.4242 reaction 20.4242	489.9778 1096.2541 ture (heati	18.4 1.5.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 22 0.21.0000 20.1783 0.9895 19.3685 19.3685 20.1783 20.4274 20.4274	m2 800 600 600 600 400 500	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 20	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.2037 20.4451 20.4451	Specific or Table of	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 22 21.0000 20.1990 0.7403 20.1571 20.19571 20.19571 20.19571 20.1990 flA = 20.4418	fact Table 0.77 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 00000 20.1921 0.9790 19.7299 19.7299 19.7299 20.1921 5 Living are 20.4370	Nov 79.2271 6.2818 0.9991 19.1425 20.4933 8 22 0.21.0000 20.1875 0.9988 19.1425 19.1425 19.1425 20.4338	45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 22.0000 20.1829 0.3031 20.3031 20.4306 0.3031	(77) (79) (81) (82) (83) (84) (85) (85) (86)
Northeast Southwest Northwest Northwest Horizontal	261.7461 870.3099 nal tempera ring heati rictor for g Jan 77.7900 6.1860 rea 0.9997 18.7352 20.3181 9 22 0 21.0000 20.1737 rouse 0.9996 18.7352 18.7352 20.1737 rouse 18.7352 20.1737 rouse 20.4242 reaction 20.4242 reaction 20.4242 reaction 20.4242	489.9778 1096.2541 ture (heati	18.4 1.5.2 12.7 6.7 780.5713 1366.3170 in the livi ving area, Mar 78.2632 6.2175 0.9923 19.3685 20.5972 22 0.21.0000 20.1783 0.9895 19.3685 19.3685 20.1783 20.4274 20.4274	m2 800 600 600 600 400 500	Table 6a W/m2 11.2829 36.7938 36.7938 11.2829 26.0000 1426.9288 1943.1867 m Table 9, Table 9a) May 79.7180 6.3145 0.7923 20.1309 20.9575 9 22 00 21.0000 20.1921 0.7431 20.1309 20.1309 20.1921 20.4370	Speci or	Jul 80.9722 6.3981 0.4184 20.2033 20.2037 20.4451 20.4451	Specific or Table of	data le 6c .7000 .7000 .7000 .7000 .7000 .7000 .7000 904.6191 1391.0123 Sep 80.4658 6.3644 0.8068 20.1571 20.9659 8 22 21.0000 20.1990 0.7403 20.1571 20.19571 20.19571 20.19571 20.1990 flA = 20.4418	fact Table 0.77 0.77 0.77 0.77 1.00 571.9132 1092.3731 Oct 79.7180 6.3145 0.9860 19.7299 20.7533 9 22 00000 20.1921 0.9790 19.7299 19.7299 19.7299 20.1921 5 Living are 20.4370	Nov 79.2271 6.2818 0.9991 19.1425 20.4933 8 22 0.21.0000 20.1875 0.9988 19.1425 19.1425 19.1425 20.4338	45.5164 12.5298 122.5669 31.3787 49.7543 218.5972 809.0021 21.0000 Dec 78.7422 6.2495 0.9998 18.7095 20.3037 9 22.0000 20.1829 0.3031 20.3031 20.4306 0.3031	(77) (79) (81) (82) (83) (84) (85) (85) (86)





CALCULATION OF	DWELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
Utilisation 0.9997 Useful gains 870.0056 Ext temp. 4.3000	0.9984 1094.4866 4.9000	0.9905 1353.2825 6.5000	0.9355 1583.0591 8.9000	0.7588 1474.4209 11.7000	0.5243 1029.3212 14.6000	0.3661 681.9110 16.6000	0.4336 714.2070 16.4000	0.7620 1059.8933 14.1000	0.9815 1072.1371 10.6000	0.9989 880.4356 7.1000	0.9998 808.8258 4.2000	(95)
Heat loss rate W 2979.6252 Month fracti 1.0000	2860.3723 1.0000	2558.1131 1.0000	2086.5457	1575.4864 1.0000	1037.6739	682.6140 0.0000	716.1456 0.0000	1132.9526	1773.8419 1.0000	2419.2913	2963.0204 1.0000	
Space heating kWh 1569.5570 Space heating Space heating per m2	1186.6752	896.3939	362.5103	75.1927	0.0000	0.0000	0.0000	0.0000		1107.9761	1602.7208 7323.0943 35.3773	(98)
8c. Space cooling requi Not applicable	rement											
9a. Energy requirements												
Fraction of space heat Fraction of space heat Efficiency of main space Efficiency of secondary Space heating requirement	from seconda from main sy e heating sy /supplementa	ry/suppleme rstem(s) rstem 1 (in	ntary syste %)								0.0000 1.0000 291.0025 100.0000 2516.5057	(202) (206) (208)
Jan Space heating requireme:	Feb nt	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1186.6752			75.1927	0.0000	0.0000	0.0000	0.0000	522.0683	1107.9761	1602.7208	(98)
Space heating fuel (mai:		rstem)	291.0025	291.0025	0.0000	0.0000	0.0000	0.0000	291.0025	291.0025	291.0025	
Water heating requireme:			124.5729	25.8392	0.0000	0.0000	0.0000	0.0000	179.4034	380.7445	550.7584	
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 requireme:	nt 194.5122	204.0061	182.4973	178.5656	159.1589	152.4783	167.8354	167.7018	189.2578	200.5994	215.3756	(64)
Efficiency of water hea		178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	(216)
Fuel for water heating, 123.9673	kWh/month 109.1998	114.5298	102.4546	100.2474	89.3524	85.6018	94.2234	94.1484	106.2500	112.6172	120.9126	(219)
Water heating fuel used Annual totals kWh/year Space heating fuel - ma Space heating fuel - se	in system										1253.5047 2516.5057 0.0000	(211)
Electricity for pumps a (BalancedWithHeatRe- mechanical ventilati Total electricity for ti Electricity for lighting Total delivered energy	covery, Data on fans (SFP he above, kW g (calculate	ed in Append	8875)	1.2500, SFP	= 0.8875)						575.0420 575.0420 594.5840 4939.6364	(231) (232)
12a. Carbon dioxide emi	ssions - Ind	lividual hea	ting system	s including	micro-CHP							
Space heating - main sy Space heating - seconda Water heating (other fu Space and water heating Pumps and fans Energy for lighting Total CO2, kg/year	stem 1 ry el)						Energy kWh/year 2516.5057 0.0000 1253.5047 575.0420 594.5840		ion factor kg CO2/kWh 0.5190 0.5190 0.5190 0.5190		Emissions GG CO2/year 1306.0664 0.0000 650.5690 1956.6354 298.4468 308.5891 2563.6713	(263) (264) (265) (267) (268) (272)
Dwelling Carbon Dioxide	Emission Ra	te (DER)									12.3800	(273)
16 CO2 EMISSIONS ASSOCIA	ATED WITH AP	PLIANCES AN	D COOKING A	ND SITE-WID	E ELECTRICI	TY GENERATI	ON TECHNOLO	GIES			12.3800	ZC1
Total Floor Area Assumed number of occup-										TFA N	207.0000 3.0110	
CO2 emission factor in CO2 emissions from appl	iances, equa	tion (L14)	y displaced	from grid						EF	0.5190 10.8110	
CO2 emissions from cook Total CO2 emissions Residual CO2 emissions											0.9240 24.1150 0.0000	ZC4
Resulting CO2 emissions Additional allowable ele Resulting CO2 emissions Net CO2 emissions	ectricity ge	eneration, k		electricity	generation						0.0000 0.0000 0.0000 24.1150	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) 195.7550 (1b) - (3b) (m2) 79.9000 (1b) (m) 2.4500 (2b) Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln) Dwelling volume 261.7440 (1c) - (3c) 73.5950 (1d) - (3d) 91.2000 (1c) 35.9000 (1d) 2.8700 2.8700 (2c) 2.0500 (2d) $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 2. Ventilation rate secondary total heating heating 0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = Number of chimneys 0.0000 (6a) Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0.0000 (6b) 40.0000 (7a) 0.0000 (7b) 40 = 0.0000 (7c) Air changes Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 40.0000 / (5) Pressure test Measured/design AP50 Yes 5.0000 Infiltration rate Number of sides sheltered 0.3253 (18) 2 (19) $(20) = 1 - [0.075 \times (19)] = (21) = (18) \times (20) =$ Shelter factor 0.8500 (20) 0.2765 (21) Infiltration rate adjusted to include shelter factor Dec 4.7000 (22) 1.1750 (22a) Jan 5.1000 Mar 4.9000 May 4.3000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 4.4000 Wind speed Wind factor 5.0000 3.8000 3.8000 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 Adj infilt rate 0.2765 0.3526 0.2973 Effective ac 3. Heat losses and heat loss parameter A x U W/K 2.0700 A x K kJ/K Openings NetArea W/m2K 1.0000 kJ/m2K m2 2.0700 (26) TER Opaque door TER Opening Type (Uw = 1.40)
TER Room Window (Uw = 1.70)
Floor 1 43.5600 6.1200 79.9000 1.3258 1.5918 0.1300 57.7500 9.7416 10.3870 (27) 43.5600 External 242.6400 0.1800 43.6752 2.3994 (29a) Garage Main Roof Sloped Roof 15.4000 48.3000 2.0700 13.3300 0.1800 (29a) 44.2200 54.7600 (30) (30) Total net area of external elements Aum(A, m2) 486.6000 138.8906 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) =(33) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) (33) + (36) =Total fabric heat loss 157.4351 (37) Aug 93.3636 Nov 96.1108 Dec 96.8813 (38) Sep 94.3310 93.6777 93.6777 Heat transfer coeff 255.9580 255.5351 255.1205 253.1731 252.8088 250.7987 251.7660 254.3164 (39) 251.1127 251.1127 252.8088 253.5459 Average = Sum(39)m / 12 = May 1.2213 Aug 1.2116 Sep 1.2163 1.2231 HLP (average) 1.2365 1.2345 1.2325 1.2131 1.2131 1.2213 1.2249 1.2286 (40) 1.2231 (40) 31 28 31 30 31 30 31 31 30 31 (41) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) Feb Jan Mar Apr Mav Jun J111 Aug Sep Oct Nov Dec Daily hot water use
116.2831
Energy conte 172.4444 112.0546 107.8261 150.8210 155.6337 130.1932 135.6853 104.1059 120.8898 Energy content (annual) Total = Sum(45)m =1663.2593 (45) Distribution loss (46) 23.3451 25.0505 (46) 19.5290 23.0681



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



CALCULATION OF TARGET EMISSIONS 09 Jan 2014	
Water storage loss:	
Store volume a) If manufacturer declared loss factor is known (kWh/day): Temperature factor from Table 2b Enter (49) or (54) in (55)	150.0000 (47) 1.3938 (48) 0.5400 (49) 0.7527 (55)
Total storage loss	5798 23.3325 (56)
	798 23.3325 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 23.2624 22.5120 23.2624 22. Total heat required for water heating calculated for each month	
219.0393 192.9067 202.2286 180.7771 176.7882 157.4387 150.7008 166.0579 165.9816 187.4803 198. Solar input 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000 (63)
219.0393 192.9067 202.2286 180.7771 176.7882 157.4387 150.7008 166.0579 165.9816 187.4803 198. Total per year (kWh/year) = Sum(64):	
Heat gains from water heating, kWh/month 94.6137 83.8166 89.0241 81.1888 80.5652 73.4288 71.8911 76.9974 76.2693 84.1203 87.	92.8045 (65)
5. Internal gains (see Table 5 and 5a)	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	Dec 5513 150.5513 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1599 34.6035 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	360.9874 (68)
38.0551 38.055	38.0551 (69) 3.0000 (70)
-120.4410 -120.4	410 -120.4410 (71)
127.1689 124.7270 119.6561 112.7623 108.2865 101.9845 96.6279 103.4911 105.9296 113.0649 121. Total internal gains	
609.6525 607.3650 586.8345 553.0093 517.3467 483.9588 462.8750 469.5837 487.4819 521.5486 560.	7925 591.4936 (73)
6. Solar gains	
[Jan] Area Solar flux g FF Access	Gains
m2 Table 6a Specific data Specific data factor W/m2 or Table 6b or Table 6c Table 6d	W
Northeast 16,7600 11,2829 0.6300 0.7000 0.7700 Southeast 1.4100 36.7938 0.6300 0.7000 0.7700 Southwest 13.8400 36.7938 0.6300 0.7000 0.7700	57.7921 (75) 15.8550 (77)
Northwest 11.5500 11.2829 0.6300 0.7000 0.7700 Horizontal 6.1200 26.0000 0.6300 0.7000 1.0000	155.6263 (79) 39.8269 (81) 63.1547 (82)
Solar gains 332.2549 621.9697 990.8505 1447.4980 1811.3513 1879.0171 1778.1707 1496.2407 1148.3189 725.9789 408. Total gains 941.9074 1229.3348 1577.6850 2000.5073 2328.6980 2362.9759 2241.0456 1965.8245 1635.8009 1247.5275 969.	
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	21.0000 (85)
tau 56.1616 56.2545 56.3459 56.7793 56.8612 57.2452 57.2452 57.3169 57.0967 56.8612 56.	5959 56.5241 7797 4.7683
	9985 0.9996 (86)
MIT 19.5112 19.7098 20.0446 20.4799 20.8140 20.9597 20.9915 20.9829 20.8458 20.3728 19. Th 2 19.8909 19.8925 19.8941 19.9016 19.9030 19.9095 19.9095 19.9107 19.9070 19.9030 19. util rest of house	19.4774 (87) 19.8972 (88)
0.9992 0.9969 0.9862 0.9322 0.7761 0.5480 0.3689 0.4427 0.7782 0.9769 0. MIT 2 17.8959 18.1873 18.6756 19.2980 19.7282 19.8844 19.9066 19.9040 19.7829 19.1596 18. Living area fraction fLA = Living area / (4	9978 0.9995 (89) 1065 17.8509 (90) = 0.3031 (91)
Temperature adjustment	3458 18.3439 (92) 0.0000
adjusted MIT 18.3856 18.6488 19.0906 19.6563 20.0574 20.2104 20.2355 20.2311 20.1051 19.5274 18.	18.3439 (93)
8. Space heating requirement	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	
Useful gains 940.7129 1223.8731 1549.9349 1854.6539 1827.4755 1359.2566 905.7256 945.0077 1298.2270 1213.8460 966. Ext temp. 4.3000 4.9000 6.5000 8.9000 11.7000 14.6000 16.6000 16.4000 14.1000 10.6000 7.	0.9991 (94) 148 868.2220 (95) .000 4.2000 (96)
Heat loss rate W 3605.3183 3513.3119 3212.1268 2723.1959 2112.8146 1408.8312 912.9220 960.8260 1511.8892 2256.9256 2978. Month fracti 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 1.0000 1. Space heating kWh	.059 3597.0363 (97) 0000 1.0000 (97a)
	9850.2053 (98) 9850.2053 (98) = 47.5855 (99)





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

			0.0000 1.0000 93.5000 0.0000 10534.9790	(202) (206) (208)
Sep	Oct	Nov	Dec	
0.0000	776.0512	1448.6336	2030.2378	(98)
0.0000	93.5000	93.5000	93.5000	(210)
0.0000	830.0013	1549.3408	2171.3773	(211)
0.0000	0.0000	0.0000	0.0000	(215)
165 0016	107 4003	100 0703	212 5001	(64)
			79.8000	(216)
207.9970	212.5653	223.3131		
			45.0000 75.0000 594.5840	(230e) (231) (232)
			kg CO2/year 2275.5555 0.0000 557.1544 2832.7098 38.9250 308.5891 3180.2239 13.6846 1.5500 1.4908	(261) (263) (264) (265) (267) (268) (272) (272a)
	0.0000 0.0000 0.0000 0.0000 165.9816 79.8000 207.9970	0.0000 776.0512 0.0000 93.5000 0.0000 830.0013 0.0000 0.0000 165.9816 187.4803 79.8000 88.1989 207.9970 212.5653 Emission factor kg CC2/kWh 0.2160 0.0000 0.2160 0.0000 0.2160 0.5190	0.0000 776.0512 1448.6336 0.0000 93.5000 93.5000 0.0000 830.0013 1549.3408 0.0000 0.0000 0.0000 165.9816 187.4803 198.8793 79.8000 88.1989 89.0585 207.9970 212.5653 223.3131 Emission factor kg COZ/kWh 0.2160 0.0000 0.2160 0.5190	Sep Oct Nov Dec 0.0000 776.0512 1448.6336 2030.2378 0.0000 93.5000 93.5000 93.5000 0.0000 830.0013 1549.3408 2171.3773 0.0000 0.0000 0.0000 0.0000 165.9816 187.4803 198.8793 213.5981 79.8000 79.8000 88.1989 89.0585 89.3594 207.9970 212.5653 223.3131 239.0326 2579.4184 10534.9790 0.0000 45.0000 45.0000 75.0000 594.5840 13783.9814 Emission factor Emissions kg CO2/kWh kg CO2/year kg CO2/kWh kg CO2/year 0.2160 275.5555 0.0000 0.2160 557.1544 2832.7098 0.5190 38.9250





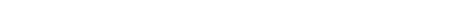
Property Reference	5 Bed Detached				Issued on Date	16/03/2021
Assessment Reference	2			Prop Type Ref		
Property	x, Mill Lane, Taplow, Buck	kinghamshire,	SL6			
SAP Rating		82 B	DER	15.59	TER	22.89
Environmental		84 B	% DER <ter< th=""><th></th><th>31.89</th><th></th></ter<>		31.89	
CO ₂ Emissions (t/ye	ear)	2.74	DFEE	57.84	TFEE	61.01
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>5.20</th><th></th></tfe<>	E	5.20	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID	T296-0001
Client						





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

	d Document L1A, 2013 Edition, England							
DWELLING AS DESIGNED								
Detached House, total floor area 207 $\ensuremath{\text{m}}^2$								
This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.								
la TER and DER Fuel for main heating:Electricity								
Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (DER) 15.59 kgCOU/m2OK							
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)6 Dwelling Fabric Energy Efficiency (DFEE	1.0 kWh/m²/yr							
2 Fabric U-values	Highest							
	0.18 (max. 0.70) OK							
Floor 0.16 (max. 0.25)	0.16 (max. 0.70) OK							
1001 0.14 (max. 0.20)	0.16 (max. 0.35) OK 1.40 (max. 3.30) OK							
2a Thermal bridging	thermal transmittances for each junction							
3 Air permeability								
Air permeability at 50 pascals:	5.00 (design value) 10.0	OK						
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric							
Secondary heating system:	None							
	None							
5 Cylinder insulation								
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day							
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day	OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	ok						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control	OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	Measured cylinder loss: 1.50 kWh/day OK Yes							
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat	ok ok						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley):	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW argy fittings:100% 75%	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Slight Average 18.48 m², No overhang	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW argy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East: Windows facing South West:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 1.526 m², No overhang	OK OK						
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overshading: Windows facing North East: Windows facing South East: Windows facing South East: Windows facing South West: Windows facing North West: Windows facing North West: Windows facing North West: Air change rate:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW argy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 15.26 m², No overhang 12.74 m², No overhang 12.74 m², No overhang 14.00 ach	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East: Windows facing South East: Windows facing South West: Windows facing North West: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW argy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 15.26 m², No overhang 15.26 m², No overhang	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East: Windows facing North West: Windows facing North West: Air change rate: Blinds/curtains: 10 Key features	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 15.26 m², No overhang 12.74 m², No overhang 14.00 ach None	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East: Windows facing South West: Windows facing North West: Air change rate: Blinds/curtains: 10 Key features Roof U-value	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW Progy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 15.26 m², No overhang 12.74 m², No overhang 4.00 ach None 0.11 W/m²K	OK OK						
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Thames Valley): Based on: Overshading: Windows facing North East: Windows facing South East: Windows facing North West: Windows facing North West: Air change rate: Blinds/curtains: 10 Key features	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% Slight Average 18.48 m², No overhang 1.56 m², No overhang 15.26 m², No overhang 12.74 m², No overhang 14.00 ach None	OK OK						







CALCULATION	ON OF D	WELLING	G EMISSI	ONS FOR	R REGULAT	TIONS CO	OMPLIAN	ICE 09	9 Jan 2014				
SAP 2012 WORKSH						 ry 2014) Jan 2014							
1. Overall dwel	ling dimen	sions											
Ground floor First floor Second floor Total floor are Dwelling volume	a TFA = (1					07.0000		Area (m2) 79.9000 91.2000 35.9000	(1b) x (1c) x	ey height (m) 2.4500 2.8700 2.0500 +(3d)+(3e)	(2c) = (2d) =	261.7440 73.5950	(1b) - (3 (1c) - (3 (1d) - (3 (4) (5)
2. Ventilation													
					main	s	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 = 4 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 40.0000 0.0000	(6b) (7a) (7b)
Infiltration du Pressure test Measured/design Infiltration ra Number of sides	AP50		and fans	= (6a)+(6b	o)+(7a)+(7b)+	(7c) =				40.0000	Air change	0.0753 Yes 5.0000 0.3253	
Shelter factor Infiltration ra	te adjuste	d to include	de shelter	factor					(20) = 1 - (2		x (19)] = x (20) =	0.8500 0.2765	
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 Effective ac	0.3526 0.5621	0.3456 0.5597	0.3387 0.5574	0.3042 0.5463	0.2973 0.5442	0.2627 0.5345	0.2627 0.5345	0.2558 0.5327		0.2973 0.5442	0.3111 0.5484	0.3249 0.5528	
3. Heat losses													
Element Opening Type 1 Opening Type 2 Opening Type 3 Floor 1 External Garage Main Roof Sloped Roof				Gross m2 286.2000 15.4000 48.3000 56.8000	Openings m2 48.0400 2.0700 4.5000 2.2500	2 48 6 79 238 13 43	tArea m2 .0400 .7500 .9000 .1600 .3300 .8000 .5500	U-value W/m2K 1.0000 1.3258 1.3258 0.1600 0.1800 0.1700 0.1100 0.1600	A x W/ 2.070 63.689 8.948 12.784 42.868 2.266 4.818 8.728	K 0 4 9 0 8 1	K-value kJ/m2K	A x K kJ/K	(26) (27) (27a) (28a) (29a) (29a) (30) (30)
Total net area Fabric heat los			Aum(A, m2)			486	.6000 (26)(30) + (32)	= 146.173	2			(31) (33)
Thermal mass pa Thermal bridges Total fabric he	(Sum(L x				()					(33)	+ (36) =	250.0000 19.0041 165.1773	(36)
Ventilation hea	t loss cal Jan	culated mor	nthly (38)m Mar	= 0.33 x (25)m x (5) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	98.5229 oeff 263.7002	98.1000 263.2773	97.6854	95.7381 260.9154	95.3737 260.5510	93.6777 258.8550	93.6777 258.8550	93.3636 258.5409	94.3310	95.3737 260.5510	96.1108 261.2881	96.8813 262.0586	(39)
Average = Sum(3 HLP	9)m / 12 = Jan 1.2739	Feb 1.2719	Mar 1.2699	Apr 1.2605	May 1.2587	Jun 1.2505	Jul 1.2505	Aug 1.2490	Sep 1.2537	Oct 1.2587	Nov 1.2623	260.9136 Dec 1.2660	
HLP (average) Days in month	31	28	31	30	31	30	31	31	30	31	30	1.2605	(40)
4. Water heating	g energy r cy	equirements	s (kWh/year)								3.0110 105.7119	
Average daily D	ot water u Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
Daily hot water Energy conte Energy content	use 116.2831 172.4444	112.0546	107.8261	103.5976	99.3692 130.1932	95.1407	95.1407	99.3692 119.4630	103.5976	107.8261 140.8854	112.0546 153.7874 Sum (45)m =	116.2831 167.0032	(45)
Distribution lo		= 0.15 x (4	45)m 23.3451	20.3528	19.5290	16.8520	15.6159	17.9195	18.1335	21.1328	23.0681	25.0505	



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



CALCULAT	ION OF I	OWELLIN	IG EMISS	ONS FOR	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014				
Water storage loss: Store volume a) If manufacturer declared loss factor is known (kWh/day): Temperature factor from Table 2b (kWh/day): 0.5400 (49)													
Enter (49) or Total storage	(54) in (5											0.8100	
If cylinder co	25.1100		25.1100 ar storage	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
Primary loss Total heat req	25.1100 23.2624	22.6800 21.0112	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	
Solar input		194.5122 0.0000			178.5656 0.0000	159.1589 0.0000	152.4783 0.0000	167.8354	0.0000	189.2578	200.5994	215.3756	(63)
Output from w/		194.5122	204.0061	182.4973	178.5656	159.1589	152.4783	167.8354	out (sum of :	189.2578	200.5994	0.0000 215.3756	(64)
Heat gains fro	m water he			82.5650	81.9872	74.8049	73.3131	Total p 78.4194	per year (kW	h/year) = Si 85.5423	um (64) m = 88.5839	2232.8053 94.2265	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gain), Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	150.5513	150.5513	150.5513	150.5513	150.5513	150.5513	150.5513			150.5513	150.5513	150.5513	(66)
Appliances gai	33.6678	29.9034	24.3191	18.4111	13.7625	11.6189	12.5546	16.3190	21.9033	27.8113	32.4599	34.6035	(67)
Cooking gains					324.1322 L15a), also			278.6082	288.4836	309.5070	336.0452	360.9874	(68)
Pumps, fans	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	38.0551 0.0000	
Losses e.g. ev					-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	-120.4410	(71)
Water heating			121.5674	114.6735	110.1978	103.8957	98.5392	105.4024	107.8409	114.9762	123.0332	126.6485	(72)
Total internal		606.2763	585.7458	551.9206	516.2580	482.8701	461.7863	468.4950	486.3932	520.4599	559.7037	590.4049	(73)
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tak	FF data ole 6c	Acce: factor Table	or	Gains W	
Northeast Southeast Southwest Northwest Horizontal			18.4	800 600 600 400				(((0.7000 0.7000 0.7000 0.7000	0.77 0.77 0.77 0.77 1.00	00 00 00	45.5164 12.5298 122.5669 31.3787 49.7543	(77) (79) (81)
											201 7101	010 5070	(00)
Solar gains Total gains					1426.9288 1943.1867							218.5972 809.0021	
7. Mean intern													
Temperature du Utilisation fa				nil,m (see		Th1 (C) Jun	Jul	Aug	Sep	Oct	Nov	21.0000 Dec	(85)
tau alpha util living ar		54.6002 4.6400	54.6863 4.6458	55.0945 4.6730	55.1715 4.6781	55.5330 4.7022	55.5330 4.7022		55.3932		55.0159 4.6677	54.8541 4.6569	
,	0.9996	0.9986	0.9945	0.9741	0.9013	0.7483	0.5865	0.6707	0.9105	0.9914	0.9990	0.9997	(86)
Tweekday Tweekend	17.7599 19.9864	18.0133 20.0979	18.4617 20.2960		19.5738 20.8068		19.8722 20.9866			19.0011 20.5321		17.7219 19.9677	
24 / 16 24 / 9	9 22	8 20	22	22	22	9 21	9 22		8		8 22	9 22	
16 / 9 MIT Th 2	0 21.0000	21.0000	21.0000	21.0000	21.0000	21.0000		21.0000	21.0000	0 21.0000		0 21.0000	(87)
util rest of h	ouse		19.8645				19.8798			19.8733		19.8676	
Mara a lada sa	0.9994		18.4617	19.0688	19.5738	19.8233	0.4496 19.8722	19.8650	19.6740	0.9865 19.0011	18.2707	0.9996 17.7219	(89)
MIT 2			18.4617 19.8645	19.0688 19.8719			19.8722 19.8798		19.8773	19.0011 19.8733	19.8705		
Living area fr	20.2065	20.2076	20.2087	20.2139	20.2149	20.2194	20.2194	20.2202	fLA = 20.2176	Living area 20.2149			
Temperature ad adjusted MIT		20.2076	20.2087	20.2139	20.2149	20.2194	20.2194	20.2202	20.2176	20.2149	20.2129	0.0000 20.2109	(93)
8. Space heati	ng require	ment											
									Com	Cat	Marr	Dan	
Utilisation Useful gains Ext temp. Heat loss rate	869.8384 4.3000	1094.3539	1356.9051	1636.2100		1342.2557	918.1230	950.0369	1215.8579		880.2634	Dec 0.9996 808.6960 4.2000	(95)





CALCULAT	TION OF	DWELLIN	IG EMISS	ONS FOR	R REGULA	ATIONS CO	OMPLIAN	ICE 09	Jan 2014	1			
Month fracti Space heating	1.0000	4030.1496 1.0000	3603.5121 1.0000	2951.9697 1.0000	2218.5572 1.0000	1454.6051	936.8951 0.0000	987.6829 0.0000	1587.5787 0.0000	2505.1634 1.0000	3426.2461 1.0000	4195.7838 1.0000	
Space heating Space heating	2473.5844	1972.8547	1671.4756	947.3470	387.4233	0.0000	0.0000	0.0000	0.0000	1060.6397		2519.9933 12866.4256 62.1566	(98)
8c. Space coo													
Not applicabl													
9a. Energy re	quirements	- Individua	al heating s	ystems, inc	luding micr	O-CHP							
Fraction of s Fraction of s Efficiency of Efficiency of Space heating	pace heat f main space secondary/	rom main sy heating sy supplementa	ystem(s) ystem 1 (in	%)	em (Table 11	.)						0.0000 1.0000 294.5306 100.0000 4368.4518	(202) (206) (208)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	2473.5844	1972.8547	1671.4756		387.4233	0.0000	0.0000	0.0000	0.0000	1060.6397	1833.1076	2519.9933	(98)
Space heating	294.5306	294.5306	294.5306		294.5306	0.0000	0.0000	0.0000	0.0000	294.5306	294.5306	294.5306	(210)
Water heating	839.8396	669.8302	567.5050	321.6464	131.5393	0.0000	0.0000	0.0000	0.0000	360.1119	622.3828	855.5966	(211)
,	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		it											
Efficiency of		194.5122 er	204.0061	182.4973	178.5656	159.1589	152.4783	167.8354	167.7018	189.2578	200.5994	215.3756 178.1250	
(217)m Fuel for wate		178.1250 kWh/month	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250		
Water heating	fuel used	109.1998	114.5298	102.4546	100.2474	89.3524	85.6018	94.2234	94.1484	106.2500	112.6172	120.9126 1253.5047	
Annual totals Space heating Space heating	fuel - mai											4368.4518 0.0000	
Electricity f Total electri Electricity f Total deliver	city for th or lighting	e above, k (calculate	ed in Append	ix L)								0.0000 594.5840 6216.5405	(232)
12a. Carbon d								Energy	Emico	ion factor		Emissions	
Space heating	r = main sys	tem 1						kWh/year 4368.4518		kg CO2/kWh 0.5190	ŀ	g CO2/year 2267.2265	
Space heating Water heating	- secondar	У						0.0000		0.5190 0.5190		0.0000	(263)
Space and wat Pumps and fan	er heating	/						0.0000		0.0000		2917.7955	(265)
Energy for li Total CO2, kg	ghting							594.5840		0.5190		308.5891 3226.3845	(268)
Dwelling Carb		Emission Ra	ate (DER)									15.5900	
16 CO2 EMISSI	ONS ASSOCIA	TED WITH A	PPLIANCES AN	D COOKING A	AND SITE-WID	DE ELECTRICI	TY GENERATI	ON TECHNOLO	OGIES				
DER Total Floor A											TFA	15.5900 207.0000	ZC1
Assumed numbe CO2 emission	factor in T	able 12 for		y displaced	l from grid						N EF	3.0110 0.5190	
CO2 emissions	from cooki											10.8110	ZC3
Total CO2 emi Residual CO2 Additional al	emissions c											27.3250 0.0000 0.0000	ZC5
Resulting CO2 Net CO2 emiss	emissions				electricity	generation						0.0000 27.3250	ZC7
												27.3230	





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) 195.7550 (1b) - (3b) (m2) 79.9000 (1b) (m) 2.4500 (2b) Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln) Dwelling volume 261.7440 (1c) - (3c) 73.5950 (1d) - (3d) 91.2000 (1c) 35.9000 (1d) 2.8700 2.8700 (2c) 2.0500 (2d) $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 2. Ventilation rate secondary total heating heating 0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = Number of chimneys 0.0000 (6a) Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0.0000 (6b) 40.0000 (7a) 0.0000 (7b) 40 = 0.0000 (7c) Air changes Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 40.0000 / (5) Pressure test Measured/design AP50 Yes 5.0000 Infiltration rate Number of sides sheltered 0.3253 (18) 2 (19) $(20) = 1 - [0.075 \times (19)] = (21) = (18) \times (20) =$ Shelter factor 0.8500 (20) 0.2765 (21) Infiltration rate adjusted to include shelter factor Dec 4.7000 (22) 1.1750 (22a) Jan 5.1000 Mar 4.9000 May 4.3000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 4.4000 Wind speed Wind factor 5.0000 3.8000 3.8000 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 Adj infilt rate 0.2765 0.3526 0.2973 Effective ac 3. Heat losses and heat loss parameter A x U W/K 2.0700 A x K kJ/K Openings NetArea W/m2K 1.0000 kJ/m2K m2 2.0700 (26) TER Opaque door TER Opening Type (Uw = 1.40)
TER Room Window (Uw = 1.70)
Floor 1 43.5600 6.1200 79.9000 1.3258 1.5918 0.1300 57.7500 9.7416 10.3870 (27) 43.5600 External 242.6400 0.1800 43.6752 2.3994 (29a) Garage Main Roof Sloped Roof 15.4000 48.3000 2.0700 13.3300 0.1800 (29a) 44.2200 54.7600 (30) (30) Total net area of external elements Aum(A, m2) 486.6000 138.8906 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) =(33) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) (33) + (36) =Total fabric heat loss 157.4351 (37) Aug 93.3636 Nov 96.1108 Dec 96.8813 (38) Sep 94.3310 93.6777 93.6777 Heat transfer coeff 255.9580 255.5351 255.1205 253.1731 252.8088 250.7987 251.7660 254.3164 (39) 251.1127 251.1127 252.8088 253.5459 Average = Sum(39)m / 12 = May 1.2213 Aug 1.2116 Sep 1.2163 1.2231 HLP (average) 1.2365 1.2345 1.2325 1.2131 1.2131 1.2213 1.2249 1.2286 (40) 1.2231 (40) 31 28 31 30 31 30 31 31 30 31 (41) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) Feb Jan Mar Apr Mav Jun J111 Aug Sep Oct Nov Dec Daily hot water use
116.2831
Energy conte 172.4444 112.0546 107.8261 150.8210 155.6337 130.1932 135.6853 104.1059 120.8898 Energy content (annual) Total = Sum(45)m =1663.2593 (45) Distribution loss (46) 23.3451 19.5290 23.0681 25.0505 (46)



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



CALCULATION OF TARGET EMISSIONS 09 Jan 2014											
Water storage loss:											
Store volume a) If manufacturer declared loss factor is known (kWh/day): Temperature factor from Table 2b Enter (49) or (54) in (55)	150.0000 (47) 1.3938 (48) 0.5400 (49) 0.7527 (55)										
Total storage loss	798 23.3325 (56)										
	798 23.3325 (57)										
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 23.2624 22.5120 22.5120 22.5120 22.5120 22.5120 22.5120 22.5120 2											
219.0393 192.9067 202.2286 180.7771 176.7882 157.4387 150.7008 166.0579 165.9816 187.4803 198.8 Solar input 0.0000	000 0.0000 (63)										
219.0393 192.9067 202.2286 180.7771 176.7882 157.4387 150.7008 166.0579 165.9816 187.4803 198. Total per year (kWh/year) = Sum(64):											
Heat gains from water heating, kWh/month 94.6137 83.8166 89.0241 81.1888 80.5652 73.4288 71.8911 76.9974 76.2693 84.1203 87.:	92.8045 (65)										
5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	Dec 513 150.5513 (66)										
33.6678 29.9034 24.3191 18.4111 13.7625 11.6189 12.5546 16.3190 21.9033 27.8113 32. Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
377.6504 381.5692 371.6939 350.6705 324.1322 299.1900 282.5271 278.6082 288.4836 309.5070 336.0 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
38.0551 38.055											
-120.4410 -120.4	410 -120.4410 (71)										
127.1689 124.7270 119.6561 112.7623 108.2865 101.9845 96.6279 103.4911 105.9296 113.0649 121.70tal internal gains											
609.6525 607.3650 586.8345 553.0093 517.3467 483.9588 462.8750 469.5837 487.4819 521.5486 560.	925 591.4936 (73)										
6. Solar gains											
[Jan] Area Solar flux g FF Access	Gains										
m2 Table 6a Specific data Specific data factor W/m2 or Table 6b or Table 6c Table 6d	W										
Northeast 16.7600 11.2829 0.6300 0.7000 0.7700 Southeast 1.4100 36.7938 0.6300 0.7000 0.7700 Southwest 13.8400 36.7938 0.6300 0.7000 0.7700	57.7921 (75) 15.8550 (77)										
Northwest 11.5500 11.2829 0.6300 0.7000 0.7700 Horizontal 6.1200 26.0000 0.6300 0.7000 1.0000	155.6263 (79) 39.8269 (81) 63.1547 (82)										
Solar gains 332.2549 621.9697 990.8505 1447.4980 1811.3513 1879.0171 1778.1707 1496.2407 1148.3189 725.9789 408.3 Total gains 941.9074 1229.3348 1577.6850 2000.5073 2328.6980 2362.9759 2241.0456 1965.8245 1635.8009 1247.5275 969.3											
7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct No	21.0000 (85)										
tau 56.1616 56.2545 56.3459 56.7793 56.8612 57.2452 57.2452 57.3169 57.0967 56.8612 56.0											
	985 0.9996 (86)										
MIT 19.5112 19.7098 20.0446 20.4799 20.8140 20.9597 20.9915 20.9829 20.8458 20.3728 19.87 Th 2 19.8909 19.8925 19.8941 19.9016 19.9030 19.9095 19.9095 19.9107 19.9070 19.9030 19.0011 util rest of house	19.4774 (87) 19.8972 (88)										
0.9992 0.9969 0.9862 0.9322 0.7761 0.5480 0.3689 0.4427 0.7782 0.9769 0. MIT 2 17.8959 18.1873 18.6756 19.2980 19.7282 19.8844 19.9066 19.9040 19.7829 19.1596 18. Living area fraction fLA = Living area / (4											
Temperature adjustment	458 18.3439 (92) 0.0000										
adjusted MIT 18.3856 18.6488 19.0906 19.6563 20.0574 20.2104 20.2355 20.2311 20.1051 19.5274 18.4	458 18.3439 (93)										
8. Space heating requirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct No											
Useful gains 940.7129 1223.8731 1549.9349 1854.6539 1827.4755 1359.2566 905.7256 945.0077 1298.2270 1213.8460 966. Ext temp. 4.3000 4.9000 6.5000 8.9000 11.7000 14.6000 16.6000 16.4000 14.1000 10.6000 7.3	968 0.9991 (94) 148 868.2220 (95) 000 4.2000 (96)										
Heat loss rate W 3605.3183 3513.3119 3212.1268 2723.1959 2112.8146 1408.8312 912.9220 960.8260 1511.8892 2256.9256 2978. Month fracti 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 1.0000	059 3597.0363 (97) 000 1.0000 (97a)										
	9850.2053 (98) 9850.2053 (98) = 47.5855 (99)										





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Sep Oct 0.0000 776.0512	0.0000 (201) 1.0000 (202) 93.5000 (206) 0.0000 (208) 10534.9790 (211) Nov Dec
-	1.0000 (202) 93.5000 (206) 0.0000 (208) 10534.9790 (211)
-	1.0000 (202) 93.5000 (206) 0.0000 (208) 10534.9790 (211)
-	1.0000 (202) 93.5000 (206) 0.0000 (208) 10534.9790 (211)
-	Nov Dec
0.0000 776.0512	
	1448.6336 2030.2378 (98)
0.0000 93.5000	93.5000 93.5000 (210)
0.0000 830.0013	1549.3408 2171.3773 (211)
0.0000 0.0000	0.0000 0.0000 (215)
165 0016 107 4002	198.8793 213.5981 (64)
	79.8000 (216)
207.9970 212.5653	223.3131 239.0326 (219) 2579.4184 (219)
	10534.9790 (211) 0.0000 (215)
	30.0000 (230c) 45.0000 (230e) 75.0000 (231) 594.5840 (232) 13783.9814 (238)
Emission factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190	kg C02/year 2275.5555 (261) 0.0000 (263) 557.1544 (264) 2832.7098 (265) 38.9250 (267)
	0.0000 830.0013 0.0000 0.0000 165.9816 187.4803 79.8000 88.1989 207.9970 212.5653 Emission factor kg CO2/kWh 0.2160 0.0000 0.2160 0.5190





Property Reference	4 Bed End Terrace			Issued on Date	16/03/2021				
Assessment	3	Prop Type Ref							
Reference									
Property	Type H, x, Mill Lane, Taplo	Type H, x, Mill Lane, Taplow , Buckinghmashire, SL6							
SAP Rating		86 B	DER	13.50	TER	22.19			
Environmental		88 B	% DER <ter< th=""><th></th><th colspan="4">39.17</th></ter<>		39.17				
CO ₂ Emissions (t/ye	ear)	1.50	DFEE	41.44	TFEE	50.49			
General Requirements Compliance Pass % DFEE <tfee 17.93<="" th=""><th></th></tfee>									
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult		036031622,		Assessor ID	T296-0001			
Client									





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

REGULATIONS COM		d Document L1A, 2013 Edition, England	
DWELLING AS DES	IGNED		
End-Terrace Hou	se, total floor area 131	. m²	
It is not a com	ers items included withi plete report of regulati	ons compliance.	
la TER and DER Fuel for main h Fuel factor:1.5 Target Carbon D Dwelling Carbon	eating:Electricity 5 (electricity) ioxide Emission Rate (TE Dioxide Emission Rate (R) 22.19 kgCO□/m² DER) 13.50 kgCO□/m°OK	
1b TFEE and DFE Target Fabric E Dwelling Fabric	nergy Efficiency (TFEE)5 Energy Efficiency (DFEE	0.5 kWh/m²/yr	
2 Fabric U-valu	es		
Element External wall	0 15 (max 0 30)	Highest 0.15 (max. 0.70) OK	
Party wall	0.00 (max. 0.20)	- OK	
11001	0.10 (max. 0.20)	0.10 (max. 0.70) OK 0.10 (max. 0.35) OK	
Openings		1.20 (max. 3.30) OK	
2a Thermal brid Thermal bridgin	ging g calculated from linear	thermal transmittances for each junction	
3 Air permeabil	itv		
Air permeabilit Maximum		3.00 (design value) 10.0	OK
4 Heating effic Main heating sy Mitsubishi ECOD		Heat pump with radiators or underfloor - Electric	
Secondary heati	ng system:	None	
5 Cylinder insu	lation		
Hot water stora Permitted by DB	ge	Measured cylinder loss: 1.50 kWh/day	
refullited by DB			
Primary pipewor	k insulated:	OK Yes	OK
	k insulated:		OK
	k insulated:	Yes	ok ok
6 Controls	k insulated: ontrols:	Yes	
6 Controls Space heating c	k insulated: ontrols: ols:	Yes Time and temperature zone control Cylinderstat	ok ok
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum	k insulated: ontrols: ols: ghts ixed lights with low-ene	Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
6 Controls Space heating c Hot water contr	ontrols: ols: ghts ixed lights with low-ene	Yes Time and temperature zone control Cylinderstat Independent timer for DHW crgy fittings:100%	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp	ontrols: ols: ghts ixed lights with low-ene	Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75%	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po	ontrols: ols: ghts ixed lights with low-ene	Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MYHR efficiency	wer:	Yes Time and temperature zone control Cylinderstat Independent timer for DHW cray fittings:100% 75% 0.88 1.5 84%	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum	wer:	Yes Time and temperature zone control Cylinderstat Independent timer for DHW regy fittings:100% 75% 0.88 1.5	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MYHR efficiency Minimum: 9 Summertime te Overheating ris Based on:	ontrols: ols: ghts ixed lights with low-ene ntilation ly and extract system wer: :	Yes Time and temperature zone control Cylinderstat Independent timer for DHW cryy fittings:100% 75% 0.88 1.5 84% 70%	OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overshading: Overshading:	k insulated: ontrols: ols: ghts ixed lights with low-ene ntilation ly and extract system wer: : mperature k (Thames Valley):	Yes Time and temperature zone control Cylinderstat Independent timer for DHW cry fittings:100% 75% 0.88 1.5 84% 70% Slight Average	OK OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing:	wer: controls: cols: cols:	Yes Time and temperature zone control Cylinderstat Independent timer for DHW Progy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang	OK OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing	k insulated: ontrols: ols: ghts ixed lights with low-ene ntilation ly and extract system wer: : mperature k (Thames Valley): North: East: South:	Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang	OK OK OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum	wer: controls: cols: ghts ixed lights with low-ene ntilation ly and extract system wer: : mperature k (Thames Valley): North: East: South: :	Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 19.45 m², No overhang 4.00 ach	OK OK
6 Controls Space heating of Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows facing Windows facing Air change rate Blinds/curtains	k insulated: ontrols: ols: ghts ixed lights with low-ene ntilation ly and extract system wer: : mperature k (Thames Valley): North: East: South:	Yes Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang	OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MYHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows facing Windows facing Windows facing Air change rate Blinds/curtains 10 Key features	wer: mperature k (Thames Valley): North: East: South: :	Time and temperature zone control Cylinderstat Independent timer for DHW cry fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 19.45 m², No overhang 19.40 ach Dark-coloured curtain or roller blind, closed 100	OK
6 Controls Space heating of Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows facing Windows facing Air change rate Blinds/curtains	wer: mperature k (Thames Valley): North: East: South: :	Time and temperature zone control Cylinderstat Independent timer for DHW cray fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 19.45 m², No overhang 19.45 m², No overhang 4.00 ach Dark-coloured curtain or roller blind, closed 100	OK
6 Controls Space heating c Hot water contr 7 Low energy li Percentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows facing Windows facing Windows facing Windows facing Air change rate Blinds/curtains 10 Key features Party wall U-va Roof U-value Roof U-value	wer: mperature k (Thames Valley): North: East: South: :	Yes Time and temperature zone control Cylinderstat Independent timer for DHW Try fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 4.00 ach Dark-coloured curtain or roller blind, closed 100 0.00 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K	OK
Hot water controls Space heating c Hot water controls The	wer: mperature k (Thames Valley): North: East: South: :	Time and temperature zone control Cylinderstat Independent timer for DHW Progy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 4.00 ach Dark-coloured curtain or roller blind, closed 100 0.00 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K	OK
Hot water controls Space heating c Hot water controls Those energy lipercentage of f Minimum 8 Mechanical ve Continuous supp Specific fan po Maximum MVHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows facing Windows facing Air change rate Blinds/curtains 10 Key features Party wall U-va Roof U-value Roof U-value Roof U-value Ploor U-value Door U-value	k insulated:	Time and temperature zone control Cylinderstat Independent timer for DHW Progy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 4.00 ach Dark-coloured curtain or roller blind, closed 100 0.00 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K 0.10 W/m²K	OK
Hot water controls Space heating controls Space heating controls Town energy lipercentage of fininum 8 Mechanical ve Continuous supp Specific fan po Maximum MYHR efficiency Minimum: 9 Summertime te Overheating ris Based on: Overshading: Windows facing Windows	k insulated:	Time and temperature zone control Cylinderstat Independent timer for DHW rrgy fittings:100% 75% 0.88 1.5 84% 70% Slight Average 4.12 m², No overhang 18.88 m², No overhang 19.45 m², No overhang 19.45 m², No overhang 10.00 m/m² k 0.10 m/m² k	OK





CALCULATI	ON OF D	WELLING	EMISSI	ONS FOR	REGULA1	TIONS CO	OMPLIAN	ICE 09	9 Jan 2014				
SAP 2012 WORKSF CALCULATION OF					9.92, Janua NCE 09	ry 2014) Jan 2014							
1. Overall dwel													
Ground floor First floor Second floor Total floor are Dwelling volume	ea TFA = (1a					30.5000		Area (m2) 47.3000 47.3000 35.9000	(1b) x (1c) x	ey height (m) 2.6500 2.8500 2.0900 +(3d)+(3e)	(2c) = (2d) =	134.8050	(1b) - (3b) (1c) - (3c) (1d) - (3d) (4) (5)
2. Ventilation	rate												
Number of chimr Number of open Number of inter Number of passi Number of fluel	neys flues mittent far				main heating 0		econdary 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 du Pressure test Measured/design Infiltration ra Number of sides	n AP50 nte	eys, flues	and fans	= (6a)+(6b)	+(7a)+(7b)+	(7c) =				0.0000	Air change / (5) =	0.0000 Yes 3.0000 0.1500	
Shelter factor Infiltration ra	ite adjusted	d to includ	e shelter :	Factor					(20) = 1 - (2	[0.075 x 1) = (18)		0.8500 0.1275	
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 mecha If mechanical v	0.1626 nnical vent:		0.1562 h heat rec	0.1403 overy	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	
If balanced wit Effective ac	0.3056	0.3024	0.2992	& allowing f	0.2801	0.2641	0.2641	0.2609	0.2705	0.2801	0.2864	71.4000	
3. Heat losses													
Opening Type 1 Opening Type 6 Opening Type 11 Floor 1 ext wall Dwarf wall flat roof skeiling ff ceiling Total net area Fabric heat los Party Wall	(Uw = 1.20) (Uw = 1.20)) 0) 1 elements	:	Gross m2 101.3000 36.9000 29.2000 10.2000 10.7000	Openings m2 46.3100 3.0000	42 3 3 47 54 36 26 10 10 235	tArea m2 4500	U-value W/m2K 1.1450 1.0000 1.1450 0.1000 0.1500 0.1500 0.1000 0.1000 0.1000 0.1000 0.1000	W/ 48.606 3.860 3.435 4.732 8.248 5.535 2.620 1.020	K 9 0 1 1 0 0 5 0 0 0 0 0 0 5 5	-value kJ/m2K	A x K kJ/K	(27) (26) (27a) (28a) (29a) (29a) (30) (30) (30) (31) (33) (33) (32)
Thermal mass pa Thermal bridges Total fabric he	S (Sum(L x)									(33)	+ (36) =	250.0000 11.3844 90.5119	(36)
Ventilation head (38)m Heat transfer of	Jan 33.7982	reb 33.4456	thly (38)m Mar 33.0930	= 0.33 x (2 Apr 31.3302	25)m x (5) May 30.9776	Jun 29.2148	Jul 29.2148	Aug 28.8622	Sep 29.9199	Oct 30.9776	Nov 31.6828	Dec 32.3879	(38)
	124.3100	123.9575	123.6049	121.8421	121.4895	119.7266	119.7266	119.3741	120.4318	121.4895	122.1946	122.8998 121.7539	
HLP HLP (average)	Jan 0.9526	Feb 0.9499	Mar 0.9472	Apr 0.9337	May 0.9310	Jun 0.9174	Jul 0.9174	Aug 0.9147	Sep 0.9228	Oct 0.9310	Nov 0.9364	Dec 0.9418 0.9330	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4. Water heatin	ng energy re	equirements	(kWh/year									2.8963	(42)
Average daily h		se (litres/ Feb	day) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	102.9865 Dec	





CALCULA	TION OF I	DWELLIN	IG EMISS	IONS FOI	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014	l			
Daily hot wate	er use												
Energy conte Energy conten	t (annual)	146.9327	105.0462 151.6214	100.9268 132.1872	96.8073 126.8367	92.6879 109.4505	92.6879 101.4219	96.8073 116.3832	100.9268 117.7731	105.0462 137.2533 Total = S	109.1657 149.8227 um(45)m =	162.6977	(45)
Distribution	25.1998		22.7432	19.8281	19.0255	16.4176	15.2133	17.4575	17.6660	20.5880	22.4734	24.4047	
Store volume a) If manufa Temperature Enter (49) or	factor fro	m Table 2b	Factor is kn	own (kWh/	day):							150.0000 1.5000 0.5400 0.8100	(48) (49)
Total storage			25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
If cylinder co		icated sola 22.6800 21.0112	25.1100	24.3000	25.1100	24.3000 22.5120	25.1100 23.2624	25.1100 23.2624	24.3000 22.5120	25.1100 23.2624	24.3000 22.5120	25.1100	(57)
Total heat re-	quired for		ing calculat 199.9938 0.0000			156.2625 0.0000	149.7943 0.0000	164.7556 0.0000	164.5851 0.0000 out (sum of	185.6257 0.0000	196.6347	211.0701 0.0000 0.0000	(63)
Output from w		190.6239	199.9938	178.9992	175.2091	156.2625	149.7943	164.7556	164.5851 per year (kW	185.6257	196.6347	211.0701	(64)
Heat gains fr			month 89.1120	81.4018	80.8711	73.8419	72.4207	77.3953	76.6092	84.3346	87.2656	92.7949	
5. Internal g													
Metabolic gai: (66)m	Jan	Feb	Mar 144.8137	Apr 144.8137	May 144.8137	Jun 144.8137	Jul 144.8137	Aug 144.8137	Sep 144.8137	Oct 144.8137	Nov 144.8137	Dec 144.8137	(66)
Lighting gain	26.5956	23.6220	19.2107	14.5437	10.8716	9.1783	9.9175	12.8911	17.3024	21.9693	25.6415	27.3348	(67)
Appliances ga	298.3222	301.4178	293.6169	277.0096	256.0459	236.3430	223.1802	220.0845	227.8855	244.4928	265.4565	285.1594	(68)
Cooking gains	37.4814		37.4814	37.4814		37.4814	37.4814 0.0000	37.4814 0.0000	37.4814 0.0000	37.4814	37.4814 0.0000	37.4814	
Pumps, fans Losses e.g. e		(negative v			-115.8510	0.0000		-115.8510		0.0000	-115.8510	0.0000	
Water heating	gains (Tab	le 5)	119.7742	113.0581	108.6978	102.5582	97.3397	104.0260	106.4016	113.3530	121.2023	124.7243	
Total interna	l gains		499.0459	471.0556		414.5235	396.8814	403.4457	418.0336	446.2592	478.7443	503.6627	
	310.4333	310.1303	499.0409	471.0000	442.0004	414.5255	330.0014	103.1137	410.0330	110.2332	170.7413	303.0027	(73)
6. Solar gain	s												
6. Solar gain	s				Solar flux Table 6a	:	g		FF : data	Acce fact Table	or	Gains W	
6. Solar gain	s 			rea m2	Solar flux Table 6a W/m2	Speci	g fic data Table 6b	Specific or Tab			or 6d		(74)
6. Solar gain	s 		4.1 18.8 19.4 3.0	rea m2 200 800 500 000	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000	Speci	g fic data Table 6b 0.4500 0.4500 0.4500 0.4500	Specific or Tab	data le 6c	fact Table	or 6d 00 00 00	W	(76) (78)
6. Solar gain. [Jan] North East South Horizontal	311.1237	547.6445	4.1 18.6 19.4 3.0	rea m2 200 800 500 000	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000	Speci or	g.fic data Table 6b 0.4500 0.4500 0.4500 0.4500	Specific or Tab	e data ble 6c 0.7000 0.7000 0.7000 0.7000 871.0278	fact Table 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00	9.5634 80.9456 198.5017 22.1130	(76) (78) (82)
6. Solar gain. [Jan] North East South Horizontal Solar gains Total gains	311.1237 829.5789	547.6445 1063.8428	4.1 18.8 19.4 3.0 787.5910 1286.6369	rea m2	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782	Speci or 	g.fic data Table 6b 0.4500 0.4500 0.4500 0.4500 1140.7624 1537.6438	Specific or Tab	e data ble 6c 0.7000 0.7000 0.7000 0.7000 871.0278	fact Table 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00	9.5634 80.9456 198.5017 22.1130	(76) (78) (82)
6. Solar gain. [Jan] North East South Horizontal Solar gains Total gains 7. Mean inter- Temperature di	311.1237 829.5789 	547.6445 1063.8428 ture (heati	4.1 18.6 19.4 3.0 787.5910 1286.6369	m2 200 800 500 000 1025.8198 1496.8754	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782	Speci or or 1188.5425 1603.0661	gfic data Table 6b 0.4500 0.4500 0.4500 0.4500 1140.7624 1537.6438	Specific or Tab	e data ble 6c 0.7000 0.7000 0.7000 0.7000 871.0278	fact Table 0.77 0.77 0.77 1.00	or 6d 00 00 00 00 00	9.5634 80.9456 198.5017 22.1130	(76) (78) (82) (83) (84)
6. Solar gain. [Jan] North East South Horizontal Total gains 7. Mean inter: Temperature d Utilisation f.	311.1237 829.5789 	547.6445 1063.8428 ture (heati	4.1 18.8 19.4 3.0 787.5910 1286.6369 ing season) in the livi	200 800 500 000 1025.8198 1496.8754	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 om Table 9, Table 9a) May	1188.5425 1603.0661	g fic data Table 6b 0.4500 0.4500 0.4500 0.4500 1140.7624 1537.6438	Specific or Tab	: data :le 6c 1.7000 1.7000 1.7000 1.7000 871.0278 1289.0614	fact Table 0.77 0.77 1.00 616.4251 1062.6844	or 6d 00 00 00 00 376.0860 854.8303	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec	(76) (78) (82) (83) (84)
6. Solar gain. [Jan] North East South Horizontal Solar gains Total gains 7. Mean inter- Temperature di	311.1237 829.5789 and tempera uring heati actor for g Jan 72.9024 5.8602	547.6445 1063.8428 ture (heating periods ains for life Feb 73.1098 5.8740	4.1 18.8 19.4 3.0 787.5910 1286.6369 ing season) in the livi ving area, Mar 73.3183 5.8879	200 800 500 000 	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 om Table 9, Table 9a) May 74.5949 5.9730	1188.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462	gfic data Table 6b 0.4500 0.4500 0.4500 0.4500 1140.7624 1537.6438	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167	fact Table 0.77 0.77 0.77 1.00 616.4251 1062.6844	or 6d 00 00 00 00 376.0860 854.8303	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159	(76) (78) (82) (83) (84)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter: Temperature d Utilisation f tau alpha util living a	311.1237 829.5789 and tempera 	547.6445 1063.8428 ture (heati- ng periods ains for li Feb 73.1098 5.8740 0.9882	4.1 18.8 19.4 3.0 787.5910 1286.6369 101 (19.8) 101 (19.8) 101 (19.8) 101 (19.8) 103 (19	200 800 500 000 1025.8198 1496.8754 	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 Dm Table 9, Table 9a) May 74.5949 5.9730 0.6686	1188.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462	Jul 75.6933 6.0462 0.3423	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167 8.0168 871.0278 1289.0614	fact Table 0.77 0.77 1.00 616.4251 1062.6844 Oct 74.5949 5.9730 0.9194	or 6d 00 00 00 00 376.0860 854.8303 Nov 74.1645 5.9443 0.9915	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982	(76) (78) (82) (83) (84)
6. Solar gain: [Jan] North East South Horizontal 7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend	311.1237 829.5789 nal tempera 	547.6445 1063.8428 ture (heati ng periods ains for li Feb 73.1098 5.8740 0.9882 19.2067 20.5440	4.1 18.8 19.4 3.0 787.5910 1286.6369 ing season) in the livi ving area, Mar 73.3183 5.8879 0.9554 19.6115 20.7280	1025.8198 1496.8754 1025.8198 1496.8754 1025.8198 1496.8754 1025.8198 1025.8	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 m Table 9, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794	Speci or 1188.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977	Jul 75.6933 6.0462 0.3423 20.1526 20.9997	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167 0.6275 20.1367 20.9893	fact Table 0.77 0.77 0.77 1.00 616.4251 1062.6844	or 6d 00 00 00 376.0860 854.8303 Nov 74.1645 5.9443 0.9915 19.3162 20.5881	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721	(76) (78) (82) (83) (84)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9	311.1237 829.5789 	547.6445 1063.8428 ture (heating periods ains for lifeb 73.1098 5.8740 0.9882 19.2067 20.5440 8	4.1 18.8 19.4 3.0 787.5910 1286.6369 19.615 19.615 20.7280 9	rea m2 200 800 500 000 1025.8198 1496.8754 ng area fr. nil,m (see Apr 74.3791 5.9586 0.8497 19.9759 20.9020 8 22	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 com Table 9, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 9 22	Il88.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977	Jul 75.6933 6.0462 0.3423 0.3423 0.34500 0.4	Specific or Tab O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167 0.6275 20.1367 20.9893 8 22	fact Table 0.777 0.77 0.77 1.00 616.4251 1062.6844 Oct 74.5949 5.9730 0.9194 19.9082 20.8612 9	or 6d 00 00 00 376.0860 854.8303 Nov 74.1645 5.9443 0.9915 19.3162 20.5881 8 22	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721	(76) (78) (82) (83) (84)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter. Temperature d Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT	311.1237 829.5789 	547.6445 1063.8428 ture (heating periods ains for life Feb 73.1098 5.8740 0.9882 19.2067 20.5440 8 20 0 21.0000	4.1 18.8 19.4 3.0 787.5910 1286.6369 ing season) in the livitying area, Mar 73.3183 5.8879 0.9554 19.6115 20.7280 922 021.0000	ng area fr. 1025.8198 1496.8754 ng area fr. 11,m (see Apr 74.3791 5.9586 0.8497 19.9759 20.9020 822 021.0000	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 om Table 9a, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 9 22 0 21.0000	Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21 0.0000	Jul 75.6933 6.0462 0.3423 20.1526 20.9997 9 22 0.21.0000	Specific or Tab 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167 20.9893 822 0.1000 0.00	fact Table 0.777 0.77 0.77 1.00 616.4251 1062.6844 Oct 74.5949 5.9730 0.9194 19.9082 20.8612 922 021.0000	Or 6d 00 00 00 00 376.0860 854.8303 Nov 74.1645 5.9443 0.9915 19.3162 20.5881 822 0 21.0000	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 922 021.0000	(76) (78) (82) (83) (84) (85) (86)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter. Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9	311.1237 829.5789 	547.6445 1063.8428 ture (heating periods ains for life periods ains for 20.5440 0.9882 19.2067 20.5440 8 20 0.21.0000 20.1253	4.1. 18.8. 19.4. 3.0. 787.5910 1286.6369 ing season) in the liviving area, Mar 73.3183 5.8879 0.9554 19.6115 20.7280 22 0 21.0000 20.1276	ng area froil, m (see Apr 74.3791 5.9586 0.8497 19.9759 20.9020 20.1390	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 Dom Table 9, Table 9a) 74.5949 5.9730 0.6686 20.1137 20.9794 9 22 0 21.0000 20.1413	1188.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21 0.21.0000 20.1527	Jul 75.6933 6.0462 0.3423 20.1526 20.9997 9 22 0.21.0000 20.1527	Aug 75.9168 6.0611 0.3844 20.1547 20.9995 22 0.21.0000 20.1550	Sep 75.2501 6.0167 0.6275 20.1367 20.989 8 22 0.21.0000 20.1481	Gact 74.5949 5.9730 0.9194 19.9082 20.8619 22 0.21.0000 20.1413	Nov 74.1645 5.9443 0.9915 19.3162 20.5881 22 0.21.0000 20.1367	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 9 22 0 21.0000 20.1321	(76) (78) (82) (83) (84) (85) (86)
6. Solar gain: [Jan] North East South Horizontal 7. Mean inter: Temperature d Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of 1	311.1237 829.5789 anal tempera 	547.6445 1063.8428 ture (heati ng periods sins for li Feb 73.1098 5.8740 0.9882 19.2067 20.5440 8 20 0 21.0000 20.1253 0.9847 19.2067	4.1. 18.8. 19.4 3.0. 787.5910 1286.6369 ing season) in the livitiving area, Mar 73.3183 5.8879 0.9554 19.6115 20.7280 21.0000 20.1276 0.9427 19.6115	nrea m2 200 800 500 000 1025.8198 1496.8754 ng area fere Apr 74.3791 5.9586 0.8497 19.9759 20.9020 21.0000 20.13900 0.8155 19.9759	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 m Table 9, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 9 22 0 21.0000 20.1413 0.6151 20.1137	Il88.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21.0000 20.1527 0.4135 20.1506	Jul 75.6933 6.0462 0.3423 20.1526 20.1526 0.2765 20.1526	Aug 75.9168 6.0611 0.3844 20.1547 20.995 0.3142 20.1547	Sep 75.2501 6.0167 0.6275 20.1367 20.1367 0.5570 20.1367	fact Table 0.77 0.77 0.77 1.00 616.4251 1062.6844 0ct 74.5949 5.9730 0.9194 19.9082 20.8612 0 21.0000 20.1413 0.8910 19.9082	Nov 74.1645 5.9443 0.9915 19.3162 0.21.0000 20.1367 0.9884 19.3162	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 9 22 0 021.0000 20.1321 0.9976 18.8258	(76) (78) (82) (83) (84) (85) (86)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter Temperature d' Utilisation f. tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of i	311.1237 829.5789 anal tempera 	547.6445 1063.8428 ture (heati 	4.1 18.8 19.4 3.0 787.5910 1286.6369 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.	ng area fr nil,m (see Apr 74.3791 5.9586 0.8497 19.9759 20.9020 8 22 0 21.0000 0.8155	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 Dom Table 9, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 9 22 0 21.0000 20.1413 0.6151	Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21 00 21.0000 20.1527 0.4135	Jul 75.6933 6.0462 0.3423 20.1526 20.9997 9 22 1.0000 20.1527 0.2765	Specific or Tab O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sep 75.2501 6.0167 0.6275 20.1367 20.1367 20.1367 20.1367 20.1367 20.1368	Gact Table 0.777 0.77 0.77 1.00 616.4251 1062.6844 Oct 74.5949 5.9730 0.9194 19.9082 20.8612 9 22 0 21.0000 20.1413 0.8910 19.9082 19.9082 20.1413 0.8910 19.9082 20.1413	Nov 74.1645 5.9443 0.9915 19.3162 20.1367 0.9884 19.3162 19.3162 20.1367	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 9 22 0 21.0000 21.0000 20.1321 0.9976 18.8258 18.8258 18.8258 18.8258	(86) (87) (88) (88) (85) (86) (87) (88) (89) (90)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter Temperature d Utilisation f. tau alpha util living a. Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekday Tweekday Tutil rest of :	311.1237 829.5789 	547.6445 1063.8428 ture (heati ng periods ains for li Feb 73.1098 5.8740 0.9882 19.2067 20.5440 20 0.21.0000 20.1253 0.9847 19.2067 19.2067	4.1 18.8 19.4 3.0 787.5910 1286.6369 19.6115 20.7280 9.22 0.00 21.0000 20.1276 0.9427 19.6115 19.6115	nrea m2 200 800 500 000 1025.8198 1496.8754 ng area fro nil,m (see Apr 74.3791 5.9586 0.8497 19.9759 20.9020 8 22 00 21.0000 20.1390 0.8155 19.9759 19.9759	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 Dom Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 22 0 0 21.0000 20.1413 0.6151 20.1137 20.1137	Il88.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21 000 20.1527 0.4135 20.1506 20.1506	Jul 75.6933 6.0462 0.3423 20.1526 20.1	Aug 75.9168 6.0611 0.3844 20.1547 20.1550 0.3142 20.1547 20.1547 20.1547	Sep 75.2501 6.0167 0.6275 20.1367 20.1367 20.1367 20.1367 20.1367 20.1368	Oct 74.5949 5.9730 0.9194 19.9082 20.8612	Nov 74.1645 5.9443 0.9915 19.3162 20.1367 0.9884 19.3162 20.1367 a / (4) =	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 922 021.0000 20.1321 0.9976 18.8258 20.3721 18.8258 20.3721 0.21.0000	(82) (83) (84) (85) (86) (87) (88) (89) (90) (91)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter: Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of : Tweekday Tweekend MIT 2 Living area f	311.1237 829.5789 anal tempera actor for g Jan 72.9024 5.8602 rea 0.9972 18.8761 20.3058 double constant of the cons	547.6445 1063.8428 ture (heating periods alins for life of the control of the co	4.1 18.8 19.4 3.0 787.5910 1286.6369 20 10.000 20.1276 0.9554 19.6115 20.1276	rea m2 200 800 500 000 1025.8198 1496.8754	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 m Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 9 22 0 21.0000 20.1413 0.6151 20.1137 20.1137	1188.5425 1603.0661 Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.9977 9 21 0.21.0000 20.1527	Jul 75.6933 6.0462 0.3423 20.1526 20.1526 20.1527	Aug 75.9168 6.0611 0.3844 20.1547 20.1550 0.3142 20.1547 20.1550	Sep 75.2501 6.0167 0.6275 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1481 flA =	Gact 74.5949 5.9730 0.9194 19.9082 20.1413 0.8910 19.9082 20.1413 1.5 cm. 20.1	Nov 74.1645 5.9443 0.9915 19.3162 20.1367 0.9884 19.3162 20.1367 a / (4) =	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 9 22 0 21.0000 20.1321 0.9976 18.8258 18.8258 18.8258 18.8258 20.1321 0.2084	(76) (78) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
6. Solar gain. [Jan] North East South Horizontal 7. Mean inter: Temperature of Utilisation for the solution of the solution	311.1237 829.5789	547.6445 1063.8428 ture (heati 	4.1 18.8 19.4 3.0 787.5910 1286.6369 10.0000 10.0000 20.1276 0.9427 19.6115 20.1276 0.9427 19.6115 19.6115 20.1276 20.3094 20.3094	rea m2 200 800 500 000 1025.8198 1496.8754 rg area fr. ng area fr. 174.3791 5.9586 0.8497 19.9759 20.9020 8 222 0 21.0000 20.1390 0.8155 19.9759 19.9759 19.9759 20.1390 20.3184 20.3184	Solar flux Table 6a W/m2 10.6334 19.6403 46.7521 26.0000 1184.3188 1626.3782 m Table 9, Table 9a) May 74.5949 5.9730 0.6686 20.1137 20.9794 22 0 21.0000 20.1413 0.6151 20.1137 20.1137 20.1137	Th1 (C) Jun 75.6933 6.0462 0.4751 20.1506 20.1527 0.4135 20.1506 20.1527 20.3293	Jul 75.6933 6.0462 0.3423 20.1526 20.1527 20.3293 20.3293	Aug 75.9168 6.0611 0.3844 20.1547 20.995 9 22 00 21.0000 20.1550 0.3142 20.1547 20.1555 20.3311 20.3311	Sep 75.2501 6.0167 20.1367 20.1367 20.1367 20.1367 20.1357 20.1367 20.1357 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1367 20.1357	Oct 74.5949 5.9730 0.9194 19.9082 20.1413 0.8910 19.9082 20.1413 Living are 20.3203	Nov 74.1645 5.9443 0.9915 19.3162 20.1367 0.9884 19.3162 19.3162 20.1367 4) (4) = 20.3166	9.5634 80.9456 198.5017 22.1130 263.9225 767.5851 21.0000 Dec 73.7390 5.9159 0.9982 18.8258 20.3721 0.21.0000 20.1321 0.9976 18.8258 1	(76) (78) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)





CALCULATION OF I	DWELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
Utilisation 0.9965 Useful gains 826.7001 Ext temp. 4.3000 Heat loss rate W	Feb 0.9855 1048.4133 4.9000	Mar 0.9456 1216.6713 6.5000	Apr 0.8232 1232.1690 8.9000	May 0.6266 1019.0578 11.7000	Jun 0.4265 683.6278 14.6000	Jul 0.2903 446.3171 16.6000	Aug 0.3289 468.8988 16.4000	Sep 0.5721 737.4589 14.1000	Oct 0.8976 953.8861 10.6000	Nov 0.9891 845.5510 7.1000	Dec 0.9977 765.8562 4.2000	(95)
1989.6854 Month fracti 1.0000	1909.8908 1.0000	1706.9133 1.0000	1391.2471 1.0000	1047.2702	685.9498 0.0000	446.4965 0.0000	469.2728 0.0000	749.7695 0.0000	1180.9087 1.0000	1615.0027 1.0000	1980.2881 1.0000	
Space heating kWh 865.2611 Space heating Space heating per m2	578.9129	364.7401	114.5362	20.9901	0.0000	0.0000	0.0000	0.0000	168.9048	554.0052) / (4) =	903.5373 3570.8877 27.3631	(98)
8c. Space cooling requir	ement											
Not applicable												
9a. Energy requirements												
Fraction of space heat f Fraction of space heat f Efficiency of main space Efficiency of secondary/ Space heating requiremen	rom seconda rom main sy heating sy supplementa	ry/suppleme stem(s) stem 1 (in	 ntary syste %)								0.0000 1.0000 286.7664 100.0000 1245.2252	(202) (206) (208)
Jan Space heating requiremen	Feb t	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
865.2611 Space heating efficiency	578.9129	364.7401 ing system		20.9901	0.0000	0.0000	0.0000	0.0000	168.9048	554.0052	903.5373	(98)
	286.7664	286.7664		286.7664	0.0000	0.0000	0.0000	0.0000	286.7664	286.7664	286.7664	(210)
Water heating requiremen			39.9406	7.3196	0.0000	0.0000	0.0000	0.0000	58.8998	193.1904	315.0778	
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 requiremen	t 190.6239	199.9938	178.9992	175.2091	156.2625	149.7943	164.7556	164.5851	185.6257	196.6347	211.0701	(64)
Efficiency of water heat (217)m 178.1250	er	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	(216)
Fuel for water heating,		112.2772	100.4908	98.3630	87.7263	84.0951	92.4944	92.3987	104.2109	110.3914		
Water heating fuel used Annual totals kWh/year Space heating fuel - mai											1229.4315	(211)
Space heating fuel - sec Electricity for pumps an											0.0000	(215)
(BalancedWithHeatRec mechanical ventilatio Total electricity for th Electricity for lighting Total delivered energy f	overy, Data n fans (SFP e above, kW (calculate	= 1. h/year d in Append	1000)	1.2500, SFP	= 1.1000)						449.8129 449.8129 469.6873 3394.1569	(231) (232)
12a. Carbon dioxide emis	sions - Ind 	ividual hea	ting system	s including	micro-CHP			n.i.			Postantana	
Space heating - main sys Space heating - secondar Water heating (other fue	У						Energy kWh/year 1245.2252 0.0000 1229.4315		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	1	Emissions kg CO2/year 646.2719 0.0000 638.0750	(263)
Space and water heating Pumps and fans	-,						449.8129		0.5190		1284.3469 233.4529	(265)
Energy for lighting Total CO2, kg/year Dwelling Carbon Dioxide	Emission Ra	te (DER)					469.6873		0.5190		243.7677 1761.5675 13.5000	(268) (272)
16 CO2 EMISSIONS ASSOCIA	TED WITH AP	PLIANCES AN	D COOKING A	ND SITE-WID	E ELECTRICI	TY GENERATI	ON TECHNOLO	GIES				
DER Total Floor Area										TFA	13.5000 130.5000	ZC1
Assumed number of occupa CO2 emission factor in T	able 12 for		y displaced	from grid						N EF	2.8963 0.5190	
CO2 emissions from appli CO2 emissions from cooki											13.5463	ZC3
Total CO2 emissions Residual CO2 emissions o			Wh /m² /**^ ~								28.4908	ZC5
Additional allowable ele Resulting CO2 emissions Net CO2 emissions				electricity	generation						0.0000 0.0000 28.4908	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) 125.3450 (1b) - (3b) (m2) 47.3000 (1b) (m) 2.6500 (2b) Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln) Dwelling volume 134.8050 (1c) - (3c) 75.0310 (1d) - (3d) 47.3000 (1c) 35.9000 (1d) 2.8500 2.8500 (2c) 2.0900 (2d) $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 2. Ventilation rate secondary total heating heating 0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = Number of chimneys 0.0000 (6a) Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0.0000 (6b) 40.0000 (7a) 0.0000 (7b) 0.0000 (7c) 40 = Air changes Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 40.0000 / (5) Pressure test Measured/design AP50 Yes 5.0000 Infiltration rate Number of sides sheltered 0.3693 (18) 2 (19) $(20) = 1 - [0.075 \times (19)]$ $(21) = (18) \times (20)$ Shelter factor 0.8500 (20) 0.3139 (21) Infiltration rate adjusted to include shelter factor Dec 4.7000 (22) 1.1750 (22a) Jan 5.1000 May 4.3000 Aug 3.7000 Sep 4.0000 Oct 4.3000 4.9000 4.5000 4.4000 Wind speed Wind factor 5.0000 3.8000 3.8000 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 Adj infilt rate 0.4003 0.3375 0.2982 0.3139 Effective ac 3. Heat losses and heat loss parameter A x U W/K 3.8600 A x K kJ/K Openings NetArea W/m2K 1.0000 kJ/m2K m2 3.8600 (26) TER Opaque door TER Opening Type (Uw = 1.40)
TER Room Window (Uw = 1.70)
Floor 1 26.8600 1.8900 47.3200 1.3258 1.5918 0.1300 35.6098 3.0084 6.1516 (27) (27a) (28a) 101.3000 30.7200 ext wall 70.5800 0.1800 12.7044 (29a) 36.9000 29.2000 10.2000 36.9000 27.3100 10.2000 10.7000 6.6420 3.5503 1.3260 1.3910 Dwarf wall flat roof 0.1800 (29a) 0.1300 0.1300 0.1300 0.1300 (30) (30) 1 8900 ff ceiling (30) 10.7000 Total net area of external elements Aum(A, m2) 235.6200 (31) Fabric heat loss, $W/K = Sum (A \times U)$ (26)...(30) + (32) = 74.2436 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) 250.0000 (35) 14.9800 (36) 89.2236 (37) (33) + (36) = Total fabric heat loss Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jun Jul Mar 63.4843 Aug Jan 64.1656 Feb 63.8215 Apr 61.9002 May 61.6038 Sep 60.7555 Oct 61.6038 59.9686 62.8302 (38) 60.2241 60.2241 62.2034 Heat transfer coeff 153.3892 Average = Sum(39)m / 12 153.0451 152.7079 151.1238 150.8274 149.4477 Feb 1.1728 Apr 1.1580 May 1.1558 Jul 1.1452 Aug 1.1432 Sep 1.1493 Dec 1.1652 (40) 1.1702 1.1452 1.1754 1.1558 1.1604 Days in month 31 28 31 30 31 30 31 30 31 (41) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 102.9865 (43) Feh Jun Jul Oct Daily hot water use
113.2852
Energy conte 167.9986 113.2852 (44) 162.6977 (45) 146.9327 151.6214 132.1872 126.8367 109.4505 101.4219 116.3832 117.7731 137.2533 149.8227 Energy content (annual) Distribution loss (46) Total = Sum(45)m = 1620.3789 (45)



 $(46) m = 0.15 \times (45) m$



CALCULAT	ION OF 1	TARGET I	EMISSION	NS 09 J	an 2014								
Water storage	25.1998 loss:	22.0399	22.7432	19.8281	19.0255	16.4176	15.2133	17.4575	17.6660	20.5880	22.4734	24.4047	(46)
Store volume a) If manufac Temperature Enter (49) or	factor from (54) in (5	m Table 2b		own (kWh/d	ay):							150.0000 1.3938 0.5400 0.7527	(48) (49)
Total storage If cylinder co	23.3325		23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325	21.0745	23.3325			22.5798 22.5120		23.3325 23.2624					
Total heat req	uired for	water heati		ed for each	month					183.8482			
Solar input Output from w/	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 out (sum of	0.0000 months) = S	0.0000 Sum(63)m =	0.0000	
-	214.5935			177.2790	173.4316	154.5423	148.0168			183.8482 Wh/year) = S			
Heat gains fro			87.6900	80.0257	79.4491	72.4658	70.9987	75.9733	75.2330	82.9126	85.8895	91.3729	(65)
5. Internal ga Metabolic gain													
(66) m	Jan 144.8137	Feb 144.8137		144.8137	May 144.8137			Aug 144.8137	Sep 144.8137	Oct 144.8137	Nov 144.8137	Dec 144.8137	(66)
Lighting gains	26.5949	23.6214	19.2102	14.5433	10.8713	9.1780	9.9172	12.8907	17.3019	21.9688	25.6408	27.3341	(67)
Appliances gai	298.3222	301.4178	293.6169	277.0096	256.0459	236.3430	223.1802	220.0845	227.8855	244.4928	265.4565	285.1594	(68)
Cooking gains Pumps, fans	37.4814		37.4814	37.4814	37.4814 3.0000	37.4814	37.4814	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	,
Losses e.g. ev	aporation	(negative v	ralues) (Tab	le 5)						-115.8510			
Water heating	gains (Tab	le 5)	117.8629			100.6469	95.4284	102.1147	104.4903	111.4417	119.2910	122.8130	
Total internal		517.2864	500.1341	472.1439	443.1478	415.6120	397.9699	404.5341	419.1219	447.3473	479.8323	504.7506	(73)
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci	g fic data	Specific	FF data	Acce fact		Gains W	
					W/m2	or	Table 6b	or Tab	le 6c	Table			
North East			2.6		10.6334 19.6403			0		Table 0.77 0.77	6d 00	8.4817 71.7877	
			2.6 11.9 12.2 1.8	100 600 900 900	10.6334 19.6403 46.7521 26.0000		0.6300 0.6300 0.6300 0.6300	0 0 0	.7000	0.77	6d 00 00		(76) (78)
East South Horizontal	275.3731	484.7362	2.6 11.9 12.2 1.8	908.0969	10.6334 19.6403 46.7521 26.0000	1052.2007	0.6300 0.6300 0.6300 0.6300	0 0 0 0 0	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037	(76) (78) (82)
East South Horizontal Solar gains Total gains	275.3731 794.9164	484.7362 1002.0226	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037	(76) (78) (82)
East South Horizontal Solar gains Total gains	275.3731 794.9164 all tempera	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9,	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 	905.0648	.7000 .7000 .7000 .7000 .7000 .71.0411 1190.1629	0.77 0.77 0.77 1.00 545.6286 992.9760	6d 00 00 00 00 00 332.8747 812.7070	71.7877 175.6000 19.5037 233.5931 738.3437	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha	275.3731 794.9164 	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037 233.5931 738.3437	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, May 60.0852	1052.2007 1467.8126 	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000 .7000 .701.0411 1190.1629	0.77 0.77 0.77 1.00 545.6286 992.9760	6d 00 00 00 00 00 332.8747 812.7070	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar	275.3731 794.9164 	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564	908.0969 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000 .701.0411 1190.1629 Sep 60.4251 5.0283	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602	00 00 00 00 00 00 332.8747 812.7070 Nov 59.8473 4.9898	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734	(76) (78) (78) (82) (83) (84) (85)
East South Horizontal	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472	2.6 11.9 12.2 1.8 697.1637 1197.2978 	100 600 900 900 900 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .7029 .7029 .7029 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709	0.77 0.77 0.77 1.00 545.6286 992.9760 Oet 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 08.2055	(85) (86) (87) (88) (89) (90)
East South Horizontal	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700	100 600 900 900 900 1380.2408 908.0969 1380.2408 on area fro nii,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641	905.0648 1309.5989 Aug 60.7438 5.0496 0.5143 20.9908 19.9657 0.4036	.7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .7029 .7029 .7029 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.9480 0.9980 18.2055 0.2084 18.5161	(85) (86) (87) (88) (89) (89) (89) (89) (90)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr	275.3731 794.9164 all tempera- ring heati ctor for gradient for gradie	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674	2.6 11.9 12.2 1.8 697.1637 1197.2978 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076	908.0969 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454	0.6300 0.6300 0.6300 1009.8956 1407.8655 311 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622	Aug 60.7438 5.0496 0.5143 20.9908 19.9657 0.4036 19.9621	.7000 .7000 .7000 .7000 .7000 .701.0411 1190.1629 	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 18.2055 0.2084	(85) (86) (88) (89) (90) (91) (92)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad	275.3731 794.9164 all tempera: all tempera: ctor for g. Jan 59.0817 4.9388 ea 0.9979 19.7332 19.9397 couse 0.9971 18.2544 action 18.5626 tjustment 18.5626	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669	100 600 900 900 900 1380.2408 ng area fro nii,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are	Nov 59.8473 4.9898 0.9947 20.0687 19.0528 19.0272	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 0.9980 18.2055 0.2084 18.5161 0.0000	(85) (86) (88) (89) (90) (91) (92)
East South Horizontal	275.3731 794.9164	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669	908.0969 1380.2408 900 900 900 900 1380.2408 908.0969 1380.2408 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347 19.7347	10.6334 19.6403 46.7521 26.0000	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845	Nov 59.8473 4.9898 0.9947 20.0687 19.0528 19.0272	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 0.9980 18.2055 0.2084 18.5161 0.0000	(85) (86) (87) (88) (89) (90) (91) (92) (93)
East South Horizontal	275.3731 794.9164 all tempera- all tempera- ining heating tor for gramma from the second sec	484.7362 1002.0226 ture (heati- map periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550 ment	2.6 11.9 12.2 1.8 697.1637 1197.2978 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669 Mar 0.9669	100 600 900 900 900 900 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .1029 .0015 .0015 .0010	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 19.0272 19.0272 Nov 0.9897 804.3231 7.1000	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 18.2055 0.2084 18.5161 Dec 0.9969 736.0858 4.2000	(85) (86) (87) (88) (89) (90) (91) (92) (93)
East South Horizontal	275.3731 794.9164 275.3731 794.9164 281 281 281 281 281 282 282 283 283 283 283 283 284 285 284 285 285 285 285 287 287 287 287 287 287 287 287 287 287	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550 18.8550 	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669 Mar 0.9636 1153.6814 6.5000 1949.5999	100 600 900 900 900 900 1380.2408 ng area fro nil,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347 Apr 0.8957 1236.2778 8.9000 1637.3755 1.0000	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590 Jun 0.5516 809.6606 14.6000 830.7795	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7000 .771.0411 1190.1629 Sep 60.4251 5.0283 0.7709 20.9155 19.9608 0.6884 19.8979 fLA: 20.1100 20.1100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845 Oct 0.9358 929.2142 10.6000 1370.1979 1.0000 328.0919	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 18.7530 19.0272 19.0272 Nov 0.9897 804.3231 7.1000 1806.1062 1.0000	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.9480 18.2055 0.2084 18.5161 0.0000 18.5161 Dec 0.9969 736.0858 4.2000 2176.8224	(85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement										
Not applicable										
9a. Energy requirements - Individual heat										
Fraction of space heat from secondary/sup Fraction of space heat from main system(s Efficiency of main space heating system 1 Efficiency of secondary/supplementary hear Space heating requirement	(in %)	m (Table 11)						0.0000 1.0000 93.5000 0.0000 5250.1739	(202) (206) (208)
Jan Feb Ma:	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 1038.7973 770.4105 592.		97.4674	0.0000	0.0000	0.0000	0.0000	328.0919	721.2838	1071.9080	(98)
Space heating efficiency (main heating system) 93.5000 93.5000 93.5000		93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system) 1111.0132 823.9684 633.	3298 308.8667	104.2432	0.0000	0.0000	0.0000	0.0000	350.9004	771.4265	1146.4257	(211)
Water heating requirement 0.0000 0.0000 0.0	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating										
Water heating requirement 214.5935 189.0184 198.	2163 177.2790	173.4316	154.5423	148.0168	162.9781	162.8650	183.8482	194.9145	209.2926	
	5558 86.1083	83.3454	79.8000	79.8000	79.8000	79.8000	86.3424	87.9900	79.8000 88.5602	
Fuel for water heating, kWh/month 242.5634 214.3774 226.	3885 205.8791	208.0878	193.6620	185.4848	204.2332	204.0915	212.9292	221.5189	236.3281	
Water heating fuel used Annual totals kWh/year									2555.5439	
Space heating fuel - main system Space heating fuel - secondary									5250.1739 0.0000	
Electricity for pumps and fans:									20.000	(000
central heating pump main heating flue fan									30.0000 45.0000	(230e)
Total electricity for the above, kWh/year Electricity for lighting (calculated in A	opendix L)								75.0000 469.6745	
Total delivered energy for all uses									8350.3923	(238)
12a. Carbon dioxide emissions - Individua	heating system	s including	micro-CHP							
					Energy		ion factor		Emissions	
Space heating - main system 1					kWh/year 5250.1739		kg CO2/kWh 0.2160	k	g CO2/year 1134.0376	
Space heating - secondary Water heating (other fuel)					0.0000 2555.5439		0.0000		0.0000 551.9975	
Space and water heating									1686.0350	(265)
Pumps and fans Energy for lighting					75.0000 469.6745		0.5190 0.5190		38.9250 243.7611	
Total CO2, kg/m2/year Emissions per m2 for space and water heat.	ing								1968.7211 12.9198	(272)
Fuel factor (electricity)	iiig								1.5500	
Emissions per m2 for lighting Emissions per m2 for pumps and fans									1.8679	
Target Carbon Dioxide Emission Rate (TER)	= (12.9198 * 1.	55) + 1.867	9 + 0.2983,	rounded to	2 d.p.				22.1900	





Property Reference	4 Bed End Terrace				Issued on Date	16/03/2021
Assessment	2			Prop Type Ref		
Reference						
Property	Type H, x, Mill Lane, Taplo	ow , Buckingh	mashire, SL6			
SAP Rating		84 B	DER	15.88	TER	22.19
Environmental		86 B	% DER <ter< th=""><th></th><th>28.44</th><th></th></ter<>		28.44	
CO ₂ Emissions (t/ye	ear)	1.74	DFEE	49.98	TFEE	50.49
General Requireme	ents Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>1.01</th><th></th></tfe<>	E	1.01	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult		036031622,		Assessor ID	T296-0001
Client						





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

	d Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
End-Terrace House, total floor area 131	m²	
This report covers items included withi It is not a complete report of regulati	ons compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (R) 22.19 kgCO□/m² DER) 15.88 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE)5 Dwelling Fabric Energy Efficiency (DFEE	0.5 kWh/m²/yr	
Party wall 0.00 (max. 0.20) Floor 0.16 (max. 0.25) Roof 0.12 (max. 0.20) Openings 1.38 (max. 2.00)	thermal transmittances for each junction	
3 Air permeability Air permeability at 50 pascals: Maximum	5.00 (design value) 10.0	ok
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	
	Yes	OK
Primary pipework insulated: 6 Controls	Yes	OK
Primary pipework insulated:	Yes Time and temperature zone control	OK
Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Time and temperature zone control Cylinderstat Independent timer for DHW	
Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100%	ok ok
Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable	Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75%	OK OK OK
Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature	Time and temperature zone control Cylinderstat Independent timer for DHW rgy fittings:100% 75%	OK OK OK OK





CALCULATION	OF D	WELLING	G EMISSI	IONS FOR	REGULAT	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKSHEET CALCULATION OF DWE					9.92, Janua NCE 09								
1. Overall dwellin								Area	Stor	ey height		Volume	
Ground floor First floor Second floor Total floor area T Dwelling volume	*FA = (1	a)+(1b)+(1c	c)+(1d)+(1e	e)(1n)	1	30.5000		(m2) 47.3000 47.3000 35.9000	(1b) x (1c) x	(m) 2.6500 2.8500 2.0900	(2c) = (2d) =	(m3) 125.3450 134.8050	(1b) - (3i (1c) - (3i (1d) - (3i (4) (5)
2. Ventilation rat													
					main heating		econdary heating		other	tot	al m	3 per hour	
Number of chimneys Number of open flu Number of intermit Number of passive Number of flueless	es tent fa vents				0	++	0	+ +	0 =		0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = 0 * 40 =	0.0000 0.0000 40.0000 0.0000	(6b) (7a) (7b)
Infiltration due t Pressure test Measured/design AP Infiltration rate Number of sides sh	50		and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				40.0000	Air change / (5) =	0.1193 Yes 5.0000 0.3693	
Shelter factor Infiltration rate	adjuste	ed to includ	de shelter	factor					(20) = 1 - (2	[0.075 x 1) = (18)		0.8500 0.3139	
Wind speed 5 Wind factor 1	an .1000 .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	
	.4003 .5801	0.3924 0.5770	0.3846 0.5739	0.3453 0.5596	0.3375 0.5569	0.2982 0.5445	0.2982 0.5445	0.2904 0.5422		0.3375 0.5569	0.3532 0.5624	0.3689 0.5680	
3. Heat losses and											_		
Element Opening Type 1 (Uw Opening Type 6 Opening Type 11 (U Floor 1 ext wall Dwarf wall flat roof skeiling ff ceiling Total net area of Fabric heat loss, Party Wall	w = 1.4	(1)		Gross m2 101.3000 36.9000 29.2000 10.2000 10.7000	Openings m2 46.3100 3.0000	42 3 3 47 54 36 26 10 10 235	tArea m2 .4500 .8600 .0000 .3200 .9900 .9000 .2000 .7000 .6200 (26)(U-value W/m2K 1.3258 1.2000 1.3258 0.1600 0.1800 0.1200 0.1100 0.1600 0.1200 30) + (32) 0.0000	A x W/ 56.278 4.632 3.977 7.571 9.898 4.428 2.882 1.632 1.284 = 92.583 0.000	K 4 0 0 3 2 2 0 0 0 0 1	-value kJ/m2K	A x K kJ/K	(27) (26) (27a) (28a) (29a) (29a) (30) (30) (30) (31) (33) (32)
Thermal mass param Thermal bridges (S Total fabric heat	um(L x)					(33)	+ (36) =	250.0000 15.3710 107.9541	(36)
	an	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coef	.1197	63.8215	63.4843 171.4383	61.9002 169.8542	61.6038 169.5579	60.2241 168.1782	60.2241 168.1782	59.9686 167.9227		61.6038 169.5579	62.2034 170.1574	62.8302 170.7843 169.8528	(39)
HLP (average)	an .3189	Feb 1.3163	Mar 1.3137	Apr 1.3016	May 1.2993	Jun 1.2887	Jul 1.2887	Aug 1.2868	Sep 1.2928	Oct 1.2993	Nov 1.3039	Dec 1.3087 1.3016	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4. Water heating e	nergy r	equirements	s (kWh/year	:)									
Assumed occupancy Average daily hot												2.8963 102.9865	
	an	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water us 113 Energy conte 167 Energy content (an	.2852	109.1657 146.9327	105.0462 151.6214	100.9268 132.1872	96.8073 126.8367	92.6879 109.4505	92.6879 101.4219	96.8073 116.3832			109.1657 149.8227 um(45)m =	162.6977	(45)





Primary Jose 23,224 21,0112 23,224 23,120 23,120 23,	25.1100 24.3000 25.1100 (57) 23.2624 22.5120 23.2624 (59)	
Matter storage loss: Store Volume Temperature factor from Table 26 Store Volume Temperature factor from Table 27 Store Volume Temperature factor from Table 28 Temperature factor from Table 28 Temperature factor from Table 28 Temperature factor fac	150.0000 (47) 1.5000 (48) 0.5400 (49) 0.8100 (55) 25.1100 24.3000 25.1100 (56) 25.1100 24.3000 25.1100 (57) 23.2624 22.5120 23.2624 (59)	
a) If menufacturer declared loss factor is known (MBM/day): Temperature factor from (MBM) Total darrage loss Total darrage loss If cylinder contains declared solar storage 25.1100 22.8800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 Total factoring loss are contained declared solar storage 26.2562 42.012 23.2624 22.5120 23.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 22.5120 23.2624 22.2624 2	1.5000 (48) 0.5400 (49) 0.8100 (55) 25.1100 24.3000 25.1100 (56) 25.1100 24.3000 25.1100 (57) 23.2624 22.5120 23.2624 (59)	
Trigonization 23,100 23,6800 23,100 24,3000 25,1100 24,3000 25,1100 24,3000 25,1100 24,3000 25,100 25,1000 2	25.1100 24.3000 25.1100 (57) 23.2624 22.5120 23.2624 (59)	
25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 24.3000 25.1100 24.3000 27.001 25.1002 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 22.5120 23.2642 23.2642 22.5120 23.2642 23.2642 22.5120 23.2642 23.2642 22.5120 23.2642 23.2642 22.5120 23.2642 23.26	23.2624 22.5120 23.2624 (59)	
216.3710 190.6239 199.938 178.9392 175.2391 156.2625 149.7943 164.7556 164.5851 216.3750 10.0000 0.0000		
Output from w/h	0.0000 0.0000 0.0000 (63)	
### Reat gains from water heating, kWhi/month 94.5575 83.8081 89.1120 81.4018 80.9711 73.8419 72.4207 77.3953 76.6092 5. Internal gains (see Table 5 and 5a) **Metabolic gains (Table 5), Watts Jan See Table 5 and 5a) **Metabolic gains (Table 5), Watts Jan See Table 5 and 5a) **Metabolic gains (Table 5), Watts Jan See Table 5 and 5a) **Metabolic gains (calculated in Appendix L, equation 19 or 12a), also see Table 5 and 5a) **Appliance gain (calculated in Appendix L, equation 19 or 12a), also see Table 5 and 5a) **Appliance gain (See Table 5) (14.9137) 144.8137 144.813	185.6257 196.6347 211.0701 (64)	
Metabolic gains (Table 5), Watts	84.3346 87.2656 92.7949 (65)	
Metabolic gains (Table 5), Watts		
Netabolic gains (Table 5), Watts Jan Feb Mar Apr 144.8137 144.8		
144,8137	Oct Nov Dec	
Appliances gains (calculated in Appendix L, equation L13 or L13h, also see Table 5 298.3022 301.4778 293.6169 277.096 256.0459 236.049 237.8302 220.0845 227.8855 Cooking gains (calculated in Appendix L, equation L15 or L15h), also see Table 5 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 Pumps, fans 0.0000 0.00		
Cooking gains (calculated in Appendix L. equation L15 or L15a), also see Table 5 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 37.4814 20.0000 0.00000 0.00000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000 0.000000 0.0000000 0.0000000 0.00000000	21.9693 25.6415 27.3348 (67)	
Pumps, fans 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000	244.4928 265.4565 285.1594 (68) 37.4814 37.4814 37.4814 (69)	
Nate Pating gains (Table 5) 127.0934 124,7144 119.7742 113.0581 108.6978 102.5582 97.3397 104.0260 106.4016	0.0000 0.0000 0.0000 (70)	
Total internal gains Si8.4553 Si6.1983 499.0459 471.0556 442.0594 414.5235 396.8814 403.4457 418.0336		
Area Solar gains Area Solar flux Table 6a Specific data Specific	113.3530 121.2023 124.7243 (72) 446.2592 478.7443 503.6627 (73)	
Area Solar flux Table 6a Specific data		
Area Solar flux Graph Area Table 6a Specific data Specific data Or Table 6c		
Mar Apr		
North	2	
Solar gains 311.1237 547.6445 787.5910 1025.8198 1184.3188 1188.5425 1140.7624 1022.3763 871.0278	Access Gains factor W Table 6d	
Solar gains 311.1237 547.6445 787.5910 1025.8198 1184.3188 1188.5425 1140.7624 1022.3763 871.0278 Total gains 829.5789 1063.8428 1286.6369 1496.8754 1626.3782 1603.0661 1537.6438 1425.8220 1289.0614 10000	factor W Table 6d 0.7700 9.5634 (74)	
Total gains 829.5789 1063.8428 1286.6369 1496.8754 1626.3782 1603.0661 1537.6438 1425.8220 1289.0614 1289.	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78)	
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep tau 52.6523 52.7578 52.8616 53.3546 53.4478 53.8863 53.8863 53.9683 53.7166 alpha 4.5102 4.5172 4.5241 4.5570 4.5632 4.5924 4.5924 4.5979 4.5811 util living area 0.9974 0.9917 0.9748 0.9226 0.8073 0.6317 0.4724 0.5264 0.7766 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 20.0761 20.2276 20.4436 20.6948 20.8805 20.9711 20.9938 20.9901 20.9261 24 / 16 9 8 9 8 9 9 9 9 9 8 24 / 9 22 20 22 22 22 22 22 22 22 16 / 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82)	
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (C) Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep tau 52.6523 52.7578 52.8616 53.3546 53.4478 53.8863 53.8863 53.9683 53.7166 alpha 4.5102 4.5172 4.5241 4.5570 4.5632 4.5924 4.5924 4.5979 4.5811 util living area 0.9974 0.9917 0.9748 0.9226 0.8073 0.6317 0.4724 0.5264 0.7766 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 20.0761 20.2276 20.4436 20.6948 20.8805 20.9711 20.9938 20.9901 20.9261 24 / 16 9 8 9 8 9 9 9 9 9 8 24 / 9 22 20 22 22 22 22 22 22 22 16 / 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82)	
Utilisation factor for gains for living area, nil,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep tau 52.6523 52.7578 52.8616 53.3546 53.4478 53.8863 53.8863 53.9683 53.7166 alpha 4.5102 4.5172 4.5241 4.5570 4.5632 4.5924 4.5924 4.5979 4.5811 util living area 0.9974 0.9917 0.9748 0.9926 0.8073 0.6317 0.4724 0.5264 0.7766 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 20.0761 20.2276 20.4436 20.6948 20.8805 20.9711 20.9938 20.9901 20.9261 24 / 16 9 8 9 8 9 9 9 9 9 9 8 24 / 9 22 20 22 22 22 22 22 22 16 / 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82)	
tau 52.6523 52.7578 52.8616 53.3546 53.4478 53.8863 53.8863 53.9683 53.7166 alpha 4.5102 4.5172 4.5241 4.5570 4.5632 4.5924 4.5924 4.5979 4.5811 util living area 0.9974 0.9917 0.9748 0.9926 0.8073 0.6317 0.4724 0.5264 0.7766 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 1.0000 21.0	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82)	
util living area 0.9974 0.9917 0.9748 0.9226 0.8073 0.6317 0.4724 0.5264 0.7766 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 20.761 20.2276 20.4436 20.6948 20.8805 20.9711 20.9938 20.9901 20.9261 24 / 16 9 8 9 8 9	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84)	
Tweekend 20.0761 20.2276 20.4436 20.6948 20.8805 20.9711 20.9938 20.9901 20.9261 24 / 16 9 8 9 8 9 9 9 9 9 9 8 8 24 / 9 22 20 22 22 22 22 16 / 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640	
24 / 16 9 8 9 8 9 9 9 9 9 9 9 9 8 24 / 9 22 20 22 22 22 22 22 21 22	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec	
16 / 9 0 <td>factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831</td> <td></td>	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831	
Th 2 19.8260 19.8281 19.8301 19.8396 19.8414 19.8497 19.8497 19.8512 19.8465 util rest of house 0.9965 0.9889 0.9661 0.8962 0.7473 0.5342 0.3534 0.4026 0.6886 Tweekday 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 17.9387 18.2810 18.7633 19.3096 19.6720 19.8224 19.8465 19.8455 19.7624 Tweekend 17.9387 19.8260 19.8281 19.8301 19.8396 19.8414 19.8497 19.8497 19.8512 19.8465	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 20.6625 20.3141 20.0491 9 8 9	
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MIT 20.0707 20.0724 20.0740 20.0815 20.0829 20.0894 20.0894 20.0907 20.0869	factor W Table 6d 0.7700 9.5634 (74) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 20.6625 20.3141 20.0491 9 8 9 22 22 22 22 00 0 0 0 00 21.0000 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2656 18.4842 17.8831 19.2665 18.4842 17.8831 19.2665 18.4842 17.8831 19.2665 18.4842 17.8831 19.2665 18.4842 17.8831 19.2665 18.4842 17.8831 19.2665 18.4842 17.8831 19.3430 (90)	
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	factor Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 20.6625 20.3141 20.0491 9 22 22 22 20 20 20 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 0.9382 0.901 20.0000 21.0000 (87) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831	
8. Space heating requirement	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 19.2662 20.3141 20.0491 9 8 9 22 22 22 22 22 21.0000 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 0.9382 0.9912 0.9975 (89) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.8414 19.8378 19.8340 (90) 50.0000	
Jan Feb Mar Apr May Jun Jul Aug Sep	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 19.2662 20.3141 20.0491 9 8 9 22 22 22 22 22 21.0000 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 0.9382 0.9912 0.9975 (89) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.8414 19.8378 19.8340 (90) 50.0000	
Utilisation 0.9967 0.9896 0.9682 0.9024 0.7610 0.5556 0.3788 0.4293 0.7090 Useful gains 826.8301 1052.7673 1245.6808 1350.7985 1237.6863 890.6588 582.4763 612.0733 913.8820 1 Ext temp. 4.3000 4.9000 6.5000 8.9000 11.7000 14.6000 16.6000 16.4000 14.1000	factor W Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 19.2662 20.3141 20.0491 9 8 9 22 22 22 22 22 21.0000 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 0.9382 0.9912 0.9975 (89) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.8414 19.8378 19.8340 (90) 50.0000	
Temperature adjustment adjusted MIT 20.0707 20.0724 20.0740 20.0815 20.0829 20.0894 20.0894 20.0907 20.0869	factor Table 6d 0.7700 9.5634 (74) 0.7700 80.9456 (76) 0.7700 198.5017 (78) 1.0000 22.1130 (82) 616.4251 376.0860 263.9225 (83) 1062.6844 854.8303 767.5851 (84) 21.0000 (85) Oct Nov Dec 53.4478 53.2595 53.0640 4.5632 4.5506 4.5376 0.9581 0.9938 0.9982 (86) 19.2565 18.4842 17.8831 20.6625 20.3141 20.0491 9 22 22 22 20 20 20 21.0000 21.0000 (87) 19.8414 19.8378 19.8340 (88) 0.9382 0.901 20.0000 21.0000 (87) 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831 19.2565 18.4842 17.8831	





CALCULATION OF I	OWELLIN	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
Heat loss rate W 2714.4523 Month fracti 1.0000 Space heating kWh 1404.3909 Space heating per m2	1.0000	2327.0959 1.0000 804.5728	1899.2195 1.0000 394.8631	1421.3823 1.0000 136.6699	923.2037 0.0000 0.0000	586.8474 0.0000 0.0000	619.7448 0.0000 0.0000	1010.0490 0.0000	1607.8960 1.0000 450.6438	2208.6481 1.0000 979.7943) / (4) =	2711.5507 1.0000 1447.6456 6662.5143 51.0537	(97a) (98) (98)
8c. Space cooling require	ement											
9a. Energy requirements Fraction of space heat f: Fraction of space heat f: Efficiency of main space Efficiency of secondary/: Space heating requirement	- Individua rom seconda rom main sy heating sy supplementa	l heating s 	ystems, inc ntary syste %)	luding micro	o-CHP						0.0000 1.0000 290.4247 100.0000 2294.0590	(202) (206) (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 1404.3909	1043.9339		394.8631	136.6699	0.0000	0.0000	0.0000	0.0000	450.6438	979.7943	1447.6456	(98)
	290.4247	290.4247		290.4247	0.0000	0.0000	0.0000	0.0000	290.4247	290.4247	290.4247	(210)
	359.4508	277.0332	135.9606	47.0586	0.0000	0.0000	0.0000	0.0000	155.1672	337.3660	498.4581	(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 requirement 216.3710 Efficiency of water heate (217)m 178.1250 Fuel for water heating, 121.4715 Water heating fuel used Annual totals kWh/year Space heating fuel - main Space heating fuel - second Electricity for pumps and Total electricity for the Electricity for lighting	190.6239 er 178.1250 kWh/month 107.0169 n system ondary d fans: e above, kW		178.9992 178.1250 100.4908	175.2091 178.1250 98.3630	156.2625 178.1250 87.7263	149.7943 178.1250 84.0951	164.7556 178.1250 92.4944	164.5851 178.1250 92.3987	185.6257 178.1250 104.2109	196.6347 178.1250 110.3914	211.0701 178.1250 178.1250 118.4955 1229.4315 2294.0590 0.0000 469.6873	(216) (217) (219) (219) (211) (215) (231)
Total delivered energy for the control of the contr	or all uses	lividual hea	ting system	s including	micro-CHP				ion factor kg CO2/kWh 0.5190 0.5190 0.5190 0.0000 0.5190	k	Emissions g CO2/year 1190.6166 0.0000 638.0750 1828.6916 0.0000 243.7677 2072.4593 15.8800	(261) (263) (264) (265) (267) (268) (272)
16 CO2 EMISSIONS ASSOCIANDER Total Floor Area Assumed number of occupat CO2 emission factor in Ti CO2 emissions from applia CO2 emissions from cookin Total CO2 emissions Residual CO2 emissions of Additional allowable ele	nts able 12 for ances, equa ng, equatio ffset from ctricity ge	electricit tion (L14) on (L16) biofuel CHP	y displaced Wh/m²/year	from grid			ON TECHNOLO	GIES		TFA N EF	15.8800 130.5000 2.8963 0.5190 13.5463 1.4445 30.8708 0.0000 0.0000 0.0000 30.8708	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) 125.3450 (1b) - (3b) (m2) 47.3000 (1b) (m) 2.6500 (2b) Ground floor First floor Second floor Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln) Dwelling volume 134.8050 (1c) - (3c) 75.0310 (1d) - (3d) 47.3000 (1c) 35.9000 (1d) 2.8500 2.8500 (2c) 2.0900 (2d) $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 2. Ventilation rate secondary total heating heating 0 * 40 = 0 * 20 = 4 * 10 = 0 * 10 = Number of chimneys 0.0000 (6a) Number of open flues Number of intermittent fans Number of passive vents Number of flueless gas fires 0.0000 (6b) 40.0000 (7a) 0.0000 (7b) 0.0000 (7c) 40 = Air changes Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 40.0000 / (5) Pressure test Measured/design AP50 Yes 5.0000 Infiltration rate Number of sides sheltered 0.3693 (18) 2 (19) $(20) = 1 - [0.075 \times (19)]$ $(21) = (18) \times (20)$ Shelter factor 0.8500 (20) 0.3139 (21) Infiltration rate adjusted to include shelter factor Dec 4.7000 (22) 1.1750 (22a) Jan 5.1000 May 4.3000 Aug 3.7000 Sep 4.0000 Oct 4.3000 4.9000 4.5000 4.4000 Wind speed Wind factor 5.0000 3.8000 3.8000 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 Adj infilt rate 0.4003 0.3375 0.2982 0.3139 Effective ac 3. Heat losses and heat loss parameter A x U W/K 3.8600 A x K kJ/K Openings NetArea W/m2K 1.0000 kJ/m2K m2 3.8600 (26) TER Opaque door TER Opening Type (Uw = 1.40)
TER Room Window (Uw = 1.70)
Floor 1 26.8600 1.8900 47.3200 1.3258 1.5918 0.1300 35.6098 3.0084 6.1516 (27) (27a) (28a) 101.3000 30.7200 ext wall 70.5800 0.1800 12.7044 (29a) 36.9000 29.2000 10.2000 36.9000 27.3100 10.2000 10.7000 6.6420 3.5503 1.3260 1.3910 Dwarf wall flat roof 0.1800 (29a) 0.1300 0.1300 0.1300 0.1300 (30) (30) 1 8900 ff ceiling (30) 10.7000 Total net area of external elements Aum(A, m2) 235.6200 (31) Fabric heat loss, $W/K = Sum (A \times U)$ (26)...(30) + (32) = 74.2436 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K Thermal bridges (Sum(L x Psi) calculated using Appendix K) 250.0000 (35) 14.9800 (36) 89.2236 (37) (33) + (36) = Total fabric heat loss Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jun Jul Mar 63.4843 Aug Jan 64.1656 Feb 63.8215 Apr 61.9002 May 61.6038 Sep 60.7555 Oct 61.6038 59.9686 62.8302 (38) 60.2241 60.2241 62.2034 Heat transfer coeff 153.3892 Average = Sum(39)m / 12 153.0451 152.7079 151.1238 150.8274 149.4477 Feb 1.1728 Apr 1.1580 May 1.1558 Jul 1.1452 Aug 1.1432 Sep 1.1493 Dec 1.1652 (40) 1.1702 1.1452 1.1754 1.1558 1.1604 Days in month 31 28 31 30 31 30 31 30 31 (41) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 102.9865 (43) Feh Jun Jul Oct Daily hot water use
113.2852
Energy conte 167.9986 113.2852 (44) 162.6977 (45) 146.9327 151.6214 132.1872 126.8367 109.4505 101.4219 116.3832 117.7731 137.2533 149.8227 Energy content (annual) Distribution loss (46) Total = Sum(45)m = 1620.3789 (45)



 $(46) m = 0.15 \times (45) m$



CALCULAT	ION OF 1	TARGET I	EMISSION	NS 09 J	an 2014								
Water storage	25.1998 loss:	22.0399	22.7432	19.8281	19.0255	16.4176	15.2133	17.4575	17.6660	20.5880	22.4734	24.4047	(46)
Store volume a) If manufac Temperature Enter (49) or	factor from (54) in (5	m Table 2b		own (kWh/d	ay):							150.0000 1.3938 0.5400 0.7527	(48) (49)
Total storage If cylinder co	23.3325		23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325	21.0745	23.3325			22.5798 22.5120		23.3325 23.2624					
Total heat req	uired for	water heati		ed for each	month					183.8482			
Solar input Output from w/	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 out (sum of	0.0000 months) = S	0.0000 Sum(63)m =	0.0000	
-	214.5935			177.2790	173.4316	154.5423	148.0168			183.8482 Wh/year) = S			
Heat gains fro			87.6900	80.0257	79.4491	72.4658	70.9987	75.9733	75.2330	82.9126	85.8895	91.3729	(65)
5. Internal ga Metabolic gain													
(66) m	Jan 144.8137	Feb 144.8137		144.8137	May 144.8137			Aug 144.8137	Sep 144.8137	Oct 144.8137	Nov 144.8137	Dec 144.8137	(66)
Lighting gains	26.5949	23.6214	19.2102	14.5433	10.8713	9.1780	9.9172	12.8907	17.3019	21.9688	25.6408	27.3341	(67)
Appliances gai	298.3222	301.4178	293.6169	277.0096	256.0459	236.3430	223.1802	220.0845	227.8855	244.4928	265.4565	285.1594	(68)
Cooking gains Pumps, fans	37.4814		37.4814	37.4814	37.4814 3.0000	37.4814	37.4814	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	37.4814 3.0000	,
Losses e.g. ev	aporation	(negative v	ralues) (Tab	le 5)						-115.8510			
Water heating	gains (Tab	le 5)	117.8629			100.6469	95.4284	102.1147	104.4903	111.4417	119.2910	122.8130	
Total internal		517.2864	500.1341	472.1439	443.1478	415.6120	397.9699	404.5341	419.1219	447.3473	479.8323	504.7506	(73)
6. Solar gains													
[Jan]				m2	Solar flux Table 6a W/m2	Speci	g fic data	Specific	FF data	Acce fact		Gains W	
					W/m2	or	Table 6b	or Tab	le 6c	Table			
North East			2.6		10.6334 19.6403			0		Table 0.77 0.77	6d 00	8.4817 71.7877	
			2.6 11.9 12.2 1.8	100 600 900 900	10.6334 19.6403 46.7521 26.0000		0.6300 0.6300 0.6300 0.6300	0 0 0	.7000	0.77	6d 00 00		(76) (78)
East South Horizontal	275.3731	484.7362	2.6 11.9 12.2 1.8	908.0969	10.6334 19.6403 46.7521 26.0000	1052.2007	0.6300 0.6300 0.6300 0.6300	0 0 0 0 0	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037	(76) (78) (82)
East South Horizontal Solar gains Total gains	275.3731 794.9164	484.7362 1002.0226	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037	(76) (78) (82)
East South Horizontal Solar gains Total gains	275.3731 794.9164 all tempera	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9,	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 	905.0648	.7000 .7000 .7000 .7000 .7000 .71.0411 1190.1629	0.77 0.77 0.77 1.00 545.6286 992.9760	6d 00 00 00 00 00 332.8747 812.7070	71.7877 175.6000 19.5037 233.5931 738.3437	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha	275.3731 794.9164 	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945	1052.2007 1467.8126	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000	0.77 0.77 0.77 1.00	6d 00 00 00 00 00 332.8747	71.7877 175.6000 19.5037 233.5931 738.3437	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453	908.0969 1380.2408	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, May 60.0852	1052.2007 1467.8126 	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000 .7000 .701.0411 1190.1629	0.77 0.77 0.77 1.00 545.6286 992.9760	6d 00 00 00 00 00 332.8747 812.7070	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006	(76) (78) (82) (83) (84)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar	275.3731 794.9164 	484.7362 1002.0226 ture (heati	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564	908.0969 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655	905.0648 1309.5989	.7000 .7000 .7000 .7000 .701.0411 1190.1629 Sep 60.4251 5.0283	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602	00 00 00 00 00 00 332.8747 812.7070 Nov 59.8473 4.9898	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734	(76) (78) (78) (82) (83) (84) (85)
East South Horizontal	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472	2.6 11.9 12.2 1.8 697.1637 1197.2978 	100 600 900 900 900 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .7029 .7029 .7029 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709	0.77 0.77 0.77 1.00 545.6286 992.9760 Oet 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 08.2055	(85) (86) (87) (88) (89) (90)
East South Horizontal	275.3731 794.9164 	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907	2.6 11.9 12.2 1.8 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700	100 600 900 900 900 1380.2408 908.0969 1380.2408 on area fro nii,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341	0.6300 0.63300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641	905.0648 1309.5989 Aug 60.7438 5.0496 0.5143 20.9908 19.9657 0.4036	.7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .7029 .7029 .7029 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709 .7709	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.9480 0.9980 18.2055 0.2084 18.5161	(85) (86) (87) (88) (89) (89) (89) (89) (90)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr	275.3731 794.9164 all tempera- ring heati ctor for gradient for gradie	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674	2.6 11.9 12.2 1.8 697.1637 1197.2978 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076	908.0969 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454	0.6300 0.6300 0.6300 1009.8956 1407.8655 311 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622	Aug 60.7438 5.0496 0.5143 20.9908 19.9657 0.4036 19.9621	.7000 .7000 .7000 .7000 .7000 .701.0411 1190.1629 	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 18.7530	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 18.2055 0.2084	(85) (86) (88) (89) (90) (91) (92)
East South Horizontal Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad	275.3731 794.9164 all tempera: all tempera: ctor for g. Jan 59.0817 4.9388 ea 0.9979 19.7332 19.9397 couse 0.9971 18.2544 action 18.5626 tjustment 18.5626	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669	100 600 900 900 900 1380.2408 ng area fro nii,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are	Nov 59.8473 4.9898 0.9947 20.0687 19.0528 19.0272	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 0.9980 18.2055 0.2084 18.5161 0.0000	(85) (86) (88) (89) (90) (91) (92)
East South Horizontal	275.3731 794.9164	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669	908.0969 1380.2408 900 900 900 900 1380.2408 908.0969 1380.2408 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347 19.7347	10.6334 19.6403 46.7521 26.0000	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100 .70100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845	Nov 59.8473 4.9898 0.9947 20.0687 19.0528 19.0272	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 0.9980 18.2055 0.2084 18.5161 0.0000	(85) (86) (87) (88) (89) (90) (91) (92) (93)
East South Horizontal	275.3731 794.9164 all tempera- all tempera- ining heating tor for gramma from the second sec	484.7362 1002.0226 ture (heati- map periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550 ment	2.6 11.9 12.2 1.8 697.1637 1197.2978 697.1637 1197.2978 in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669 Mar 0.9669	100 600 900 900 900 900 1380.2408 	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590	0.6300 0.6300 0.6300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7000 .7010 .7010 .7010 .7010 .7010 .1029 .0015 .0015 .0010	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 19.0272 19.0272 Nov 0.9897 804.3231 7.1000	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.6958 19.9480 0.9980 18.2055 0.2084 18.5161 Dec 0.9969 736.0858 4.2000	(85) (86) (87) (88) (89) (90) (91) (92) (93)
East South Horizontal	275.3731 794.9164 275.3731 794.9164 281 281 281 281 281 282 282 283 283 283 283 283 284 285 284 285 285 285 285 287 287 287 287 287 287 287 287 287 287	484.7362 1002.0226 ture (heati- ng periods ains for li Feb 59.2146 4.9476 0.9930 19.9472 19.9419 0.9907 18.5674 18.8550 18.8550 18.8550 	2.6 11.9 12.2 1.8 697.1637 1197.2978 ng season) in the livi ving area, Mar 59.3453 4.9564 0.9776 20.2516 19.9439 0.9700 19.0076 19.2669 Mar 0.9636 1153.6814 6.5000 1949.5999	100 600 900 900 900 900 1380.2408 ng area fro nil,m (see Apr 59.9674 4.9978 0.9262 20.6046 19.9537 0.9018 19.5056 19.7347 Apr 0.8957 1236.2778 8.9000 1637.3755 1.0000	10.6334 19.6403 46.7521 26.0000 1048.4467 1491.5945 m Table 9, Table 9a) May 60.0852 5.0057 0.8069 20.8568 19.9556 0.7504 19.8230 20.0385 20.0385	1052.2007 1467.8126 Th1 (C) Jun 60.6400 5.0427 0.6233 20.9701 19.9641 0.5341 19.9454 20.1590 20.1590 Jun 0.5516 809.6606 14.6000 830.7795	0.6300 0.63300 0.63300 0.6300 1009.8956 1407.8655 Jul 60.6400 5.0427 0.4617 20.9945 19.9641 0.3558 19.9622 20.1774 20.1774	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 .7000 .7000 .771.0411 1190.1629 Sep 60.4251 5.0283 0.7709 20.9155 19.9608 0.6884 19.8979 fLA: 20.1100 20.1100	0.77 0.77 0.77 1.00 545.6286 992.9760 Oct 60.0852 5.0057 0.9602 20.5578 19.9556 0.9419 19.4546 = Living are 19.6845 19.6845 Oct 0.9358 929.2142 10.6000 1370.1979 1.0000 328.0919	Nov 59.8473 4.9898 0.9947 20.0687 19.9518 0.9925 18.7530 18.7530 19.0272 19.0272 Nov 0.9897 804.3231 7.1000 1806.1062 1.0000	71.7877 175.6000 19.5037 233.5931 738.3437 21.0000 Dec 59.6006 4.9734 0.9985 19.9480 18.2055 0.2084 18.5161 0.0000 18.5161 Dec 0.9969 736.0858 4.2000 2176.8224	(85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement										
Not applicable										
9a. Energy requirements - Individual heat										
Fraction of space heat from secondary/sup Fraction of space heat from main system(s Efficiency of main space heating system 1 Efficiency of secondary/supplementary hear Space heating requirement	(in %)	m (Table 11)						0.0000 1.0000 93.5000 0.0000 5250.1739	(202) (206) (208)
Jan Feb Ma:	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 1038.7973 770.4105 592.		97.4674	0.0000	0.0000	0.0000	0.0000	328.0919	721.2838	1071.9080	(98)
Space heating efficiency (main heating system) 93.5000 93.5000 93.5000		93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system) 1111.0132 823.9684 633.	3298 308.8667	104.2432	0.0000	0.0000	0.0000	0.0000	350.9004	771.4265	1146.4257	(211)
Water heating requirement 0.0000 0.0000 0.0	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating										
Water heating requirement 214.5935 189.0184 198.	2163 177.2790	173.4316	154.5423	148.0168	162.9781	162.8650	183.8482	194.9145	209.2926	
	5558 86.1083	83.3454	79.8000	79.8000	79.8000	79.8000	86.3424	87.9900	79.8000 88.5602	
Fuel for water heating, kWh/month 242.5634 214.3774 226.	3885 205.8791	208.0878	193.6620	185.4848	204.2332	204.0915	212.9292	221.5189	236.3281	
Water heating fuel used Annual totals kWh/year									2555.5439	
Space heating fuel - main system Space heating fuel - secondary									5250.1739 0.0000	
Electricity for pumps and fans:									20.000	(000
central heating pump main heating flue fan									30.0000 45.0000	(230e)
Total electricity for the above, kWh/year Electricity for lighting (calculated in A	opendix L)								75.0000 469.6745	
Total delivered energy for all uses									8350.3923	(238)
12a. Carbon dioxide emissions - Individua	heating system	s including	micro-CHP							
					Energy		ion factor		Emissions	
Space heating - main system 1					kWh/year 5250.1739		kg CO2/kWh 0.2160	k	g CO2/year 1134.0376	
Space heating - secondary Water heating (other fuel)					0.0000 2555.5439		0.0000		0.0000 551.9975	
Space and water heating									1686.0350	(265)
Pumps and fans Energy for lighting					75.0000 469.6745		0.5190 0.5190		38.9250 243.7611	
Total CO2, kg/m2/year Emissions per m2 for space and water heat.	ing								1968.7211 12.9198	(272)
Fuel factor (electricity)	iiig								1.5500	
Emissions per m2 for lighting Emissions per m2 for pumps and fans									1.8679	
Target Carbon Dioxide Emission Rate (TER)	= (12.9198 * 1.	55) + 1.867	9 + 0.2983,	rounded to	2 d.p.				22.1900	





Property Reference	4 Bed Detached				Issued on Date	16/03/2021
Assessment	3			Prop Type Ref		
Reference						
Property	Type 9 Det, Stratford-upo	n-Avon, CV36	j			
SAP Rating		86 B	DER	14.23	TER	24.74
Environmental		87 B	% DER <ter< th=""><th></th><th>42.49</th><th></th></ter<>		42.49	
CO ₂ Emissions (t/yea	ar)	1.73	DFEE	45.63	TFEE	60.10
General Requiremen	nts Compliance	Pass	% DFEE <tfe< th=""><th>Έ</th><th>24.07</th><th></th></tfe<>	Έ	24.07	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve		
DWELLING AS DESIGNED		
Detached House, total floor area 140 $\ensuremath{\text{m}}^2$		
This report covers items included within It is not a complete report of regulation		
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE) Dwelling Carbon Dioxide Emission Rate (
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) 6 Dwelling Fabric Energy Efficiency (DFEE		
2 Fabric U-values		
External wall 0.15 (max. 0.30)	Highest 0.15 (max. 0.70) OK	
Floor 0.10 (max. 0.25)	0.10 (max. 0.70) OK	
	0.10 (max. 0.35) OK 1.20 (max. 3.30) OK	
2a Thermal bridging		
	thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89	Measured cylinder loss: 1.50 kWh/day	
Primary pipework insulated:	Yes	OK
6 Controls Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat Independent timer for DHW	OK
7 Low energy lights		
Percentage of fixed lights with low-ene	rgy fittings:100% 75%	OK
8 Mechanical ventilation		
Continuous supply and extract system Specific fan power:	0.88	
Maximum MVHR efficiency:	1.5 84%	OK
Minimum:	04% 70%	OK
9 Summertime temperature	Not significant	OK
Overshading:	Average	
Windows facing North: Windows facing East:	15.13 m², No overhang 4.96 m², No overhang	
Windows facing South:	10.50 m ² , No overhang	
Windows facing West: Air change rate:	0.75 m², No overhang 4.00 ach	
Blinds/curtains:	None	
10 Key features		
Roof U-value Roof U-value	0.10 W/m ² K 0.10 W/m ² K	
Floor U-value	0.10 W/m ² K	
Door U-value Thermal bridging y-value	1.00 W/m ² K 0.030 W/m ² K	
Air permeability	3.0 m³/m²h	





CALCULATI	ON OF D	OWELLING	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 0	9 Jan 2014				
SAP 2012 WORKS	HEET FOR Ne	ew Build (As	Designed)	(Version	9.92, Janua	ry 2014)							
CALCULATION OF	DWELLING E	EMISSIONS FO	OR REGULATI	ONS COMPLIA	NCE 09	Jan 2014							
1. Overall dwel	lling dimer	nsions											
Ground floor First floor Total floor are Dwelling volume		.a)+(1b)+(1c	c)+(1d)+(1e)(ln)	1	40.0000		Area (m2) 75.0000 65.0000	(1b) x	rey height (m) 2.3900 2.6100)+(3d)+(3e)	(2c) =		(1b) - (3 (1c) - (3 (4) (5)
2. Ventilation													
					main heating		econdary heating		other	tot	tal m3	B per hour	
Number of chimm Number of open Number of inter Number of pass Number of flue	flues rmittent fa ive vents				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)
Infiltration du Pressure test Measured/design Infiltration ra Number of sides	n AP50 ate		and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				0.0000	Air changes) / (5) =	0.0000 Yes 3.0000 0.1500	
Shelter factor Infiltration ra	ate adjuste	ed to includ	de shelter	factor					(20) = 1	- [0.075 2 21) = (18)		1.0000 0.1500	
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 mecha	0.1913 anical vent		0.1838 th heat rec	0.1650 overy	0.1613	0.1425	0.1425	0.1388	0.1500	0.1613	0.1688	0.1763	
If mechanical v If balanced wit			iciency in	% allowing	for in-use f	actor (fro	m Table 4h)	=				0.5000 71.4000	
Effective ac	0.3343	0.3305	0.3268	0.3080	0.3043	0.2855	0.2855	0.2818	0.2930	0.3043	0.3118	0.3193	(25)
3. Heat losses													
Dening Type 1 Opening Type 2 Opening Type 1: Ground Floor External Wall Main Roof GF Flat Roof	(Uw = 1.20))		Gross m2 181.0100 65.0000 10.0000	Openings m2 35.7700	Ne 2 31 2 75 145 65	tArea m2 .1200 .3400 .3100 .0000 .2400 .0000 .0000 .0000	U-value W/m2K 1.0000 1.1450 1.2000 0.1000 0.1500 0.1000 0.1000	A x W 2.12 35.88 2.77. 7.50 21.78 6.50	/K 00 55 20 00 60	K-value kJ/m2K	A x K kJ/K	(26) (27) (26a) (28a) (29a) (30) (30)
Total net area Fabric heat los			Aum(A, m2)			331	.0100	30) + (32)	= 77.56	35			(31)
Thermal mass pa Thermal bridges Total fabric he	s (Sum(L x)					(33)	+ (36) =	250.0000 9.8224 87.3859	(36)
Ventilation hea	at loss cal Jan 38.4845	culated mor Feb 38.0528	nthly (38)m Mar 37.6210	= 0.33 x (Apr 35.4622	25)m x (5) May 35.0304	Jun 32.8716	Jul 32.8716	Aug 32.4398	Sep 33.7351	Oct 35.0304	Nov 35.8940	Dec 36.7575	(38)
Heat transfer of Average = Sum (3	125.8704	125.4387	125.0069	122.8481	122.4163	120.2575	120.2575	119.8257	121.1210	122.4163	123.2798	124.1434 122.7401	
HLP (average)	Jan 0.8991	Feb 0.8960	Mar 0.8929	Apr 0.8775	May 0.8744	Jun 0.8590	Jul 0.8590	Aug 0.8559	Sep 0.8652	Oct 0.8744	Nov 0.8806	Dec 0.8867 0.8767	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)
4. Water heating	ng energy r	equirements	s (kWh/year)									
Assumed occupar Average daily h	ncy											2.9171 103.4808	
Daily hot water	Jan r use	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte Energy content	113.8288 168.8049	109.6896 147.6378	105.5504 152.3490	101.4111 132.8216	97.2719 127.4455	93.1327 109.9757	93.1327 101.9087	97.2719 116.9417			150.5417	113.8288 163.4785 1628.1554	(45)





CALCULATION OF DWELLING	EMISSIONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
Distribution loss $(46) m = 0.15 x (45)$										
25.3207 22.1457 Water storage loss: Store volume	22.8524 19.9232	19.1168	16.4964	15.2863	17.5413	17.7508	20.6868	22.5813	24.5218 150.0000	
a) If manufacturer declared loss fac Temperature factor from Table 2b Enter (49) or (54) in (55)	ctor is known (kWh/d	ay):							1.5000 0.5400 0.8100	(48) (49)
Total storage loss 25.1100 22.6800 If cylinder contains dedicated solar		25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
25.1100 22.6800 Primary loss 23.2624 21.0112	25.1100 24.3000 23.2624 22.5120			25.1100 23.2624	25.1100 23.2624		25.1100 23.2624	24.3000 22.5120		
Total heat required for water heating 217.1773 191.3290 Solar input 0.0000 0.0000	200.7214 179.6336	175.8179		150.2811		165.1504			211.8509	
Output from w/h					Solar inp	ut (sum of	months) = S	um (63) m =	0.0000	(63)
217.1773 191.3290		175.8179	156.7877	150.2811		165.1504 er year (kW				
Heat gains from water heating, kWh/mc 94.8255 84.0425		81.0735	74.0165	72.5826	77.5810	76.7971	84.5536	87.5047	93.0545	(65)
5. Internal gains (see Table 5 and 5a										
Metabolic gains (Table 5), Watts										
(66)m 145.8542 145.8542					Aug 145.8542	Sep 145.8542	Oct 145.8542	Nov 145.8542	Dec 145.8542	(66)
Lighting gains (calculated in Appendi 27.5823 24.4984 Appliances gains (calculated in Apper	19.9234 15.0833	11.2749	9.5188	10.2854	13.3693	17.9443	22.7844	26.5928	28.3489	(67)
309.4120 312.6228 Cooking gains (calculated in Appendix	304.5318 287.3072	265.5642	245.1288	231.4767	228.2660	236.3569	253.5816	275.3246	295.7600	(68)
	0.0000 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	
Losses e.g. evaporation (negative val -116.6834 -116.6834 - Water heating gains (Table 5)		-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	(71)
127.4537 125.0633 Total internal gains	120.0994 113.3511	108.9698	102.8007	97.5572	104.2756	106.6626	113.6474	121.5343	125.0733	(72)
531.2043 528.9407	511.3109 482.4978	452.5652	424.2046	406.0756	412.6672	427.7202	456.7696	490.2079	515.9384	(73)
6. Solar gains										
[Jan]						FF	Acce	ss	Gains	
	m2	Solar flux Table 6a W/m2	Speci or	fic data Table 6b	Specific or Tab	data le 6c	fact Table	or	W	
North East	15.1300 4.9600						0.77	00	35.1200 21.2654	
South West	0.7500	19.6403		0.4500	ō	.7000 .7000	0.77 0.77 0.77 0.77	00	107.1603 3.2155	(78)
Solar gains 166.7612 290.5069 Total gains 697.9655 819.4476	416.4715 550.8801	651.0331	661.8661	631.5990	554.1176					
7. Mean internal temperature (heating										(0.5)
Temperature during heating periods in Utilisation factor for gains for livi			Jun	Jul	Aug	Sep	Oct	Nov	21.0000 Dec	(85)
tau 77.2399 77.5058 alpha 6.1493 6.1671	77.7735 79.1402 6.1849 6.2760	79.4193 6.2946	80.8450 6.3897	80.8450 6.3897	81.1363 6.4091	80.2687 6.3512	79.4193 6.2946	78.8630 6.2575	78.3145 6.2210	
util living area 0.9992 0.9977	0.9922 0.9665	0.8760	0.6838	0.5065	0.5633	0.8353	0.9814	0.9980	0.9995	(86)
Tweekday 18.8297 19.0391 Tweekend 20.3617 20.4535	19.3579 19.7728 20.5941 20.7775	20.0683 20.9216	20.1896 20.9877	20.2015 20.9984	20.2031 20.9970	20.1439 20.9578	19.7625 20.7695	19.2295 20.5330	18.8102 20.3495	
24 / 16 9 8 24 / 9 22 20	9 8 22 22	9 22	9 21	9 22	9 22	8 22	9 22	8 22	9 22	
16 / 9 0 0 MIT 21.0000 21.0000 Th 2 20.1683 20.1709	0 0 21.0000 21.0000 20.1735 20.1867	0 21.0000 20.1893	0 21.0000 20.2025	0 21.0000 20.2025	0 21.0000 20.2051	0 21.0000 20.1972	0 21.0000 20.1893	0 21.0000 20.1840		
util rest of house 0.9990 0.9970	0.9894 0.9544	0.8357	0.6089	0.4166	0.4696	0.7719	0.9726	0.9972		
Tweekday 18.8297 19.0391 Tweekend 18.8297 19.0391	19.3579 19.7728 19.3579 19.7728	20.0683	20.1896	20.2015	20.2031	20.1439	19.7625 19.7625	19.2295 19.2295	18.8102	4001
MIT 2 20.1683 20.1709 Living area fraction MIT 20.3227 20.3249	20.1735 20.1867 20.3270 20.3377	20.1893	20.2025	20.2025	20.2051	20.1972 fLA = 20.3463	20.1893 Living are 20.3399	20.1840 a / (4) = 20.3356	20.1788 0.1857 20.3313	(91)
Temperature adjustment adjusted MIT 20.3227 20.3249	20.3270 20.3377	20.3399	20.3506	20.3506	20.3528	20.3463	20.3399	20.3356	0.0000	
8. Space heating requirement										
Utilisation Jan Feb Utilisation 0.9990 0.9971 Useful gains 697.2959 817.0811 Ext temp. 4.3000 4.9000	Mar Apr 0.9900 0.9569 918.5144 988.8788 6.5000 8.9000	May 0.8439 931.3260 11.7000	Jun 0.6233 676.9930 14.6000	Jul 0.4335 449.7936 16.6000	Aug 0.4873 471.1353 16.4000	Sep 0.7848 698.5850 14.1000	Oct 0.9745 762.8368 10.6000	Nov 0.9973 689.2325 7.1000	Dec 0.9993 657.5098 4.2000	(95)





CALCULATION OF	DWELLIN	G EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
Heat loss rate W	1934 9769	1728.4730	1405 1025	1057 6609	691.5542	451.0392	473.6428	756 5596	1192.3189	1631 6804	2002 5938	(97)
Month fracti 1.0000 Space heating kWh	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	
Space heating	751.1587	602.6091	299.6810	93.9932	0.0000	0.0000	0.0000	0.0000	319.5347		1000.7424 4727.9854	(98)
Space heating per m2									(98) / (4) =	33.7713	(99)
8c. Space cooling requir												
Not applicable												
9a. Energy requirements	- Individua	l heating s	ystems, inc	cluding micr	o-CHP							
Fraction of space heat f Fraction of space heat f	rom main sy	rstem(s)		em (Table 11)						0.0000	(202)
Efficiency of main space Efficiency of secondary/ Space heating requirement	supplementa										286.8678 100.0000 1648.1411	(208)
Jan Space heating requiremen	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	751.1587	602.6091		93.9932	0.0000	0.0000	0.0000	0.0000	319.5347	678.5625	1000.7424	(98)
	286.8678	286.8678		286.8678	0.0000	0.0000	0.0000	0.0000	286.8678	286.8678	286.8678	(210)
342.2147 Water heating requiremen	it	210.0651	104.4666	32.7653	0.0000	0.0000	0.0000	0.0000	111.3875	236.5419	348.8515	(211)
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 requiremen 217.1773	191.3290	200.7214	179.6336	175.8179	156.7877	150.2811	165.3141	165.1504	186.2843	197.3537	211.8509	(64)
Efficiency of water heat (217)m 178.1250	er 178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250 178.1250	
Fuel for water heating, 121.9241 Water heating fuel used	kWh/month 107.4128	112.6857	100.8469	98.7048	88.0212	84.3683	92.8079	92.7160	104.5807	110.7950	118.9338 1233.7973	
Annual totals kWh/year Space heating fuel - mai											1648.1411	(211)
Space heating fuel - sec Electricity for pumps an											0.0000	(213)
(BalancedWithHeatRec mechanical ventilation Total electricity for the	n fans (SFE	1.	e factor = 1000)	1.2500, SFP	= 1.1000)						468.2238 468.2238	
Electricity for lighting Total delivered energy f	(calculate	d in Append	lix L)								487.1124 3837.2746	(232)
12a. Carbon dioxide emis	sions - Inc	lividual hea	ting system	ns including	micro-CHP							
							Energy kWh/year		ion factor kg CO2/kWh	k	Emissions g CO2/year	
Space heating - main sys Space heating - secondar							1648.1411		0.5190 0.5190		855.3852 0.0000	(261)
Water heating (other fue Space and water heating	:1)						1233.7973		0.5190		640.3408 1495.7260	(265)
Pumps and fans Energy for lighting							468.2238 487.1124		0.5190 0.5190		243.0082 252.8113	(268)
Total CO2, kg/year Dwelling Carbon Dioxide	Emission Ra	ite (DER)									1991.5455 14.2300	
16 CO2 EMISSIONS ASSOCIA	TED WITH AF	PLIANCES AN	D COOKING #	AND SITE-WID	E ELECTRICI	TY GENERATI	ON TECHNOLO	GIES			14 0200	E01
DER Total Floor Area Assumed number of occupa	nte									TFA N	14.2300 140.0000 2.9171	
CO2 emission factor in T	able 12 for		y displaced	d from grid						EF		
CO2 emissions from cooki Total CO2 emissions											1.3501 28.6766	ZC3
Residual CO2 emissions o Additional allowable ele	ctricity ge	neration, k	Wh/m²/year								0.0000	ZC5 ZC6
Resulting CO2 emissions Net CO2 emissions	offset from	additional	allowable	electricity	generation						0.0000 28.6766	





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) 179.2500 (1b) - (3b) (m2) 75.0000 (1b) (m) 2.3900 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 2.6100 (2c) 65.0000 (1c) 169.6500 (1c) - (3c) 140.0000 2. Ventilation rate secondarv other total m3 per hour 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 0.0000 (6b) 40.0000 (7a) Air changes 40.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1146 (8) Pressure test Measured/design AP50 5.0000 0.3646 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] (21) = (18) x (20) 1.0000 (20) 0.3646 (21) (20) = 1 -Infiltration rate adjusted to include shelter factor Feb 5.0000 1.2500 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 0 4649 0.3920 3. Heat losses and heat loss parameter U-value W/m2K 1.0000 A x U W/K 2.1200 2.7720 TER Opaque door TER Semi-glazed door 2.3100 1.2000 (26a) TER Opening Type (Uw = 1.40) Ground Floor External Wall 30.5700 75.0000 146.0100 40.5284 9.7500 26.2818 1.3258 (27) 181.0100 Main Roof 65.0000 0.1300 8.4500 (30)GF Flat Roof 10.0000 10.0000 0.1300 1.3000 (30) Total net area of external elements Aum(A, m2) Fabric heat loss, $W/K = Sum (A \times U)$ 331.0100 (31) (26)...(30) + (32) = 91.2022 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35) Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss (33) + (36) =Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan Jun Jul 70.0122 66.8307 69.5290 69.0553 66.4145 64.4769 64 4769 64 1180 66 4145 67.2565 68.1368 (38) Heat transfer coeff 176.9409 171.0468 175.0655 (39) 173.7574 (39) 175.9840 173.7594 173.3432 171.4056 171.4056 173.3432 174.1852 Average = Sum(39)m / 12 = Jan 1.2639 Apr 1.2411 May 1.2382 1.2505 (40) 1.2411 (40) HLP (average) Days in month 31 28 31 30 31 31 31 31 3.0 31 (41) 4. Water heating energy requirements (kWh/year) 2.9171 (42) Assumed occupancy Average daily hot water use (litres/day) 103.4808 (43) Feb Apr May Jun Jul Aug Sep Daily hot water use
113.8288
Energy conte 168.8049 105.5504 109.6896 101.4111 93.1327 93.1327 101.4111 105.5504 109.6896 113.8288 (44) Energy content (annual)
Distribution loss (46)m
25.3207 147.6378 152.3490 132.8216 109.9757 101.9087 118.3384 150.5417 (46) m = 0.15 x (45) m .3207 22.1457 22 24.5218 (46) 22.8524 19.9232 19.1168 16.4964 15.2863 17.5413 17.7508 20.6868 22.5813 Water storage loss: Store volume 150.0000 (47)



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



CALCULAT	ION OF	TARGET I	EMISSION	NS 09.	Jan 2014								
a) If manufac Temperature Enter (49) or	factor fro	m Table 2b	actor is kn	own (kWh/	day):							1.3938 0.5400 0.7527	(49)
Total storage	23.3325		23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	23.3325	21.0745	23.3325 23.2624	22.5798 22.5120		22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat req	uired for	water heati	ng calculat	ed for each						184.5069			
Solar input	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 um(63)m =	0.0000	(63)
Output from w/		189.7235	198.9439	177.9134	174.0404	155.0676	148.5036			184.5069 h/year) = S			
Heat gains fro		ating, kWh/ 82.7582		80.2366	79.6515	72.6404	71.1606	76.1590	75.4210	83.1316	86.1286	91.6325	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gain), Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	145.8542	145.8542	145.8542 dix L, equa	145.8542 tion L9 or	145.8542 L9a), also	145.8542	145.8542		145.8542			145.8542	(66)
Appliances gai	ns (calcul		endix L, eq	uation L13			le 5	13.3784	17.9565	22.7999	26.6108	28.3682	(67)
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or		see Table	5		236.3569	253.5816	275.3246		
	3.0000	3.0000	37.5854 3.0000	3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	
Losses e.g. ev Water heating	-116.6834	-116.6834			-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	(71)
Total internal	125.5424		118.1881	111.4398	107.0585	100.8895	95.6459	102.3643	104.7514	111.7361	119.6230	123.1620	(72)
		530.0461	512.4132	483.5968	453.6616	425.2998	407.1713	413.7650	428.8211	457.8738	491.3147	517.0464	(73)
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data	Acce fact Table	or	Gains W	
North East				500	10.6334					0.77	00	47.9331	
			4.8	400	19.6403		0.6300		.7000	0.77	00	29.0512	(76)
South West			10.2	300	19.6403 46.7521 19.6403		0.6300 0.6300 0.6300	0 0 0	.7000 .7000 .7000	0.77 0.77 0.77	00	29.0512 146.4524 4.3817	(78)
West	227.8184	396.8558	10.2 0.7 568.8909	752.4204	46.7521 19.6403 	903.9241	0.6300 0.6300 0.6300 	0 0 0 756.8191	.7000 .7000	0.77 0.77 445.3480	00 00 274.4146	146.4524 4.3817 194.0014	(78) (80)
West 	227.8184 760.1302	396.8558 926.9019	10.2 0.7 568.8909 1081.3041	500 300 752.4204 1236.0172	46.7521 19.6403 	903.9241 1329.2239	0.6300 0.6300 0.6300 862.5980 1269.7693	756.8191 1170.5841	.7000 .7000	0.77 0.77 445.3480	00 00 274.4146	146.4524 4.3817 194.0014	(78) (80)
Solar gains Total gains 7. Mean intern Temperature du	227.8184 760.1302	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 	752.4204 1236.0172	46.7521 19.6403 889.1541 1342.8157	903.9241	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000	0.77 0.77 445.3480	00 00 274.4146	146.4524 4.3817 194.0014	(78) (80) (83) (84)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	227.8184 760.1302 all tempera ring heati ctor for g Jan	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar	752.4204 1236.0172 	46.7521 19.6403 889.1541 1342.8157 mm Table 9, Table 9a) May	903.9241 1329.2239 Th1 (C) Jun	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218	00 00 274.4146 765.7294	146.4524 4.3817 194.0014 711.0478	(78) (80) (83) (84)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha	227.8184 760.1302 all tempera uring heati ctor for g Jan 54.9462 4.6631	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar	752.4204 1236.0172	46.7521 19.6403 889.1541 1342.8157 om Table 9, Table 9a) May 56.0866	903.9241 1329.2239 Th1 (C) Jun	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218	00 00 274.4146 765.7294	146.4524 4.3817 194.0014 711.0478	(78) (80) (83) (84)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	227.8184 760.1302 all tempera uring heati ctor for g Jan 54.9462 4.6631	396.8558 926.9019 ture (heati 	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830	752.4204 1236.0172 ng area fr nii,m (see Apr 55.9522 4.7301	46.7521 19.6403 889.1541 1342.8157 om Table 9, Table 9a) May 56.0866 4.7391	903.9241 1329.2239 Th1 (C) Jun 56.7206	0.6300 0.6300 0.6300 1269.7693 Jul 56.7206 4.7814	756.8191 1170.5841 	.7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391	00 00 274.4146 765.7294 Nov 55.8154 4.7210	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348	(78) (80) (83) (84)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar	227.8184 760.1302 all tempera arring heati cctor for g Jan 54.9462 4.6631 ea 0.9987 19.5569 19.8692	396.8558 926.9019 ture (heati 	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830 0.9896	752.4204 1236.0172 ng area fro nii,m (see Apr 55.9522 4.7301 0.9649	889.1541 1342.8157 m Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814	0.6300 0.6300 0.6300 1269.7693 Jul 56.7206 4.7814	756.8191 1170.5841 Aug 56.8396 4.7893 0.6356	Sep 56.4747 4.7650 0.8699 20.8245	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808	274.4146 765.7294 Nov 55.8154 4.7210 0.9970	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305	(78) (80) (83) (84) (85)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h	227.8184 760.1302 all tempera all tempera ctor for g Jan 54.9462 4.6631 ea 0.9987 19.5569 19.8692 couse 0.9982	396.8558 926.9019 ture (heati- 	10.2 0.7 568.8909 1081.3041 ing season) in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746	752.4204 1236.0172 ng area fr. nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508	889.1541 1342.8157 mm Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441	0.6300 0.6300 0.6300 	756.8191 1170.5841 Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706	274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987	(78) (80) (83) (84) (85) (86) (87) (88) (89)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr	227.8184 760.1302 	396.8558 926.9019 ture (heati- 	10.2 0.7 568.8909 1081.3041 ing season) in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334	752.4204 1236.0172 ng area fr. ni, m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779	889.1541 1342.8157 om Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498	Jul 56.7206 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942	756.8191 1170.5841 	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA =	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802	274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) =	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9887 17.9165 0.1857	(78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91)
Solar gains Total gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad	227.8184 760.1302 all tempera	396.8558 926.9019 ture (heati ng periods ains for li Feb 55.0966 4.6731 0.9964 19.7391 19.8720 0.9951 18.2158 18.4987	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919	752.4204 1236.0172 ng area fronii,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	889.1541 1342.8157 om Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493	0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA = 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 5.Living are	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(86) (87) (88) (89) (89) (90) (91) (92)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT	227.8184 760.1302 all tempera	396.8558 926.9019 ture (heati ng periods ains for li Feb 55.0966 4.6731 0.9964 19.7391 19.8720 0.9951 18.2158 18.4987	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919	752.4204 1236.0172 ng area fronii,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	889.1541 1342.8157 om Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498	Jul 56.7206 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942	756.8191 1170.5841 	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA = 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(86) (87) (88) (89) (89) (90) (91) (92)
Solar gains Total gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad	227.8184 760.1302 all tempera all tempera correction for g Jan 54.9462 4.6631 rea 0.9987 19.5569 19.8692 rouse 0.9982 17.9479 raction 18.2467 ljustment 18.2467	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 ing season) in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919	752.4204 1236.0172 ng area fr. ni, m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493	0.6300 0.6300 0.6300 1.6300 1.6300 1.6300 1.69.7693 1.69.7693 1.60.7206 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942 20.0962	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA = 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 5.Living are	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(86) (87) (88) (89) (89) (90) (91) (92)
West	227.8184 760.1302 all tempera all tempera ining heati 54.9462 4.6631 ea 0.9987 19.5569 19.8692 couse 0.9982 17.9479 faction 18.2467 Jan 0.9971	396.8558 926.9019 ture (heati- ng periods a sins for li Feb 55.0966 4.6731 0.9964 19.7391 19.8720 0.9951 18.2158 18.4987 18.4987	10.2 0.7 568.8909 1081.3041 	752.4204 1236.0172 ng area froil, m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	46.7521 19.6403 889.1541 1342.8157 0m Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493	0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 20.0916 20.0916	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA = 19.9512 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 Living are 19.4057	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162	(78) (80) (83) (84) (85) (86) (87) (88) (90) (91) (92) (93)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad adjusted MIT 8. Space heati	227.8184 760.1302 all tempera all tempera ictor for g Jan 54.9462 4.6631 tea 0.9987 19.5569 19.8692 touse 0.9982 17.9479 taction 18.2467 Jan 0.9971 757.9587 4.3000	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 ing season) in the liviving area, Mar 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919 18.8919	752.4204 1236.0172 ng area fr. ni, m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048 19.4048	May 0.8448 1134.3952	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493	0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 40.5261 615.8769	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 fLA = 19.9512 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 19.4057 19.4057	274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370 Nov 0.9937 760.9016	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000 18.2162	(78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93)
West	227.8184 760.1302 all tempera all tempera inctor for g Jan 54.9462 4.6631 tea 0.9987 19.5569 19.8692 touse 0.9982 17.9479 faction 18.2467 Jan 0.9971 757.9587 4.3000 tw 2467.7459 1.0000	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919 18.8919	752.4204 1236.0172 752.4204 1236.0172 ng area fron nl, m German 20.3996 19.8872 0.9508 19.1779 19.4048 19.4048 Apr 0.9428 1165.3290 8.9000 1825.3118	#6.7521 19.6403 #89.1541 1342.8157 m Table 9, Table 9, May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 May 0.8488 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493	0.6300 0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 20.5261 615.8769 16.4000 631.4411	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 f.Na 19.9512 19.9512 Sep 0.8046 853.2456 14.1000 1007.2968	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 1.1ving are 19.4057 19.4057	274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370 Nov 0.9937 760.9916 7.1000 2026.9916	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9997 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000 18.2162	(78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (93)
West	227.8184 760.1302	396.8558 926.9019 ture (heati	10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919 18.8919	752.4204 1236.0172 ng area froil, m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048 19.4048 19.4048 19.4048 19.4048 19.4048	#6.7521 19.6403 #89.1541 1342.8157 m Table 9, Table 9, May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 May 0.8488 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493 Jun 0.6583 874.9706 14.6000 934.0488	0.6300 0.6300 0.6300 1.269.7693 3.1269.7693 3.1269.7693 3.1269.7693 3.1269.7693 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942 20.0962 20.0962 3.1269.7650 5.1269.7650 5.1269.7650 5.1269.7660 0.0000	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 20.5261 615.8769 16.4000 631.4411 0.0000	Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 fl.A = 19.9512 19.9512 Sep 0.8046 853.2456 14.1000 1007.2968 0.0000	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 Living are- 19.4057 19.4057	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.7370 18.7370 18.7370 18.7370 20.9937 760.9016 7.1000 2026.9916 1.0000 911.5848	146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000 18.2162	(85) (86) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (97a) (98) (98)





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement 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) 93.5000 (206) 0.0000 (208) 6925.6992 (211) Mar Apr Feb May Jun Jul Aug Sep Oct Nov Dec Space heating requirement 1272.0817 994.1558 833.4742 475.1876 203.7045 0.0000 487.6571 911.5848 1297.6828 (98) Space heating efficiency (main neucons) 2 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 Space heating fuel (main heating system) 1360.5152 1063.2683 891.4163 508.2221 217.8658 Water heating requirement 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Space heating efficiency (main heating system 1) 93.5000 93.5000 93.5000 0 0000 0 0000 0 0000 0 0000 93 5000 93 5000 93.5000 (210) 0.0000 0.0000 0.0000 0.0000 521.5584 974.9570 1387.8961 (211) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215) Water heating Water heating requirement

215.3998 189.7235 198.9439 177.9134 174.0404 155.0676 148.5036 163.5366 163.4302 184.5069 195.6335 210.0734 (64)

79.8000 (216 Water heating requirement 215.3998 189.7235 198.9439 177.9134 174.0404 155.0676 148.5036 163.5366 163.4302 184.5069 195.6335 Efficiency of water heater (217)m 88.7763 88.5962 88.2206 87.3108 85.2344 79.8000 79.8000 79.8000 79.8000 87.2873 88.4055 Fuel for water heating, kWh/month 242.6322 214.1440 225.5074 203.7701 204.1903 194.3203 186.0947 204.9331 204.7998 211.3788 221.2910 Water heating fuel used Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary 88.8403 (217) 2549.5234 (219) 6925.6992 (211) 0.0000 (215) 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 (230c) 45.0000 (230e) 75.0000 (231) 487.4436 (232) 10037.6663 (238) 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Emissions Energy Emissions kg CO2/year 1495.9510 (261) 0.0000 (263) 550.6971 (264) 2046.6481 (265) kWh/year 6925.6992 0.0000 kg CO2/kWh Space heating - main system 1 Space heating - secondary Water heating (other fuel) 0.2160 0.2160 Space and water heating Pumps and fans 2046.6481 (265) 38.9250 (267) 252.9832 (268) 2338.5563 (272) 14.6189 (272a) 1.5500 75.0000 0.5190 Emergy for lighting Total CO2, kg/m2/year Emissions per m2 for space and water heating Fuel factor (electricity) 1.8070 (272b) 0.2780 (272c) 24.7400 (273) Emissions per m2 for lighting
Emissions per m2 for pumps and fans
Target Carbon Dioxide Emission Rate (TER) = (14.6189 * 1.55) + 1.8070 + 0.2780, rounded to 2 d.p.





Property Referenc	e 4 Bed Detached				Issued on Date	16/03/2021
Assessment Reference	2			Prop Type Ref		
Property	Type 9 Det, Stratford-upo	n-Avon, CV36	j			
SAP Rating		82 B	DER	17.09	TER	24.74
Environmental		84 B	% DER <ter< th=""><th></th><th>30.93</th><th></th></ter<>		30.93	
CO ₂ Emissions (t/y	ear)	2.09	DFEE	56.40	TFEE	60.10
General Requirem	ents Compliance	Pass	% DFEE <tfe< th=""><th></th><th>6.16</th><th></th></tfe<>		6.16	
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID	T296-0001
Client						





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

REGULATIONS COMPLIANCE REPORT - Approve	d Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Detached House, total floor area 140 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:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (TE Dwelling Carbon Dioxide Emission Rate (IR) 24.74 kgCO□/m²	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) 6 Dwelling Fabric Energy Efficiency (DFEE	C)56.4 kWh/m²/yrOK	
2 Fabric U-values		
Element Average External wall 0.18 (max. 0.30) Floor 0.16 (max. 0.25) Roof 0.12 (max. 0.20)	Highest 0.18 (max. 0.70) OK 0.16 (max. 0.70) OK	
Floor 0.16 (max. 0.25)	0.16 (max. 0.70) OK 0.16 (max. 0.35) OK	
Openings 1.37 (max. 2.00)	1.40 (max. 3.30) OK	
2a Thermal bridging	thermal transmittances for each junction	
3 Air permeability Air permeability at 50 pascals: Maximum	5.00 (design value) 10.0	OK
maximum	10.0	
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:		
	None	
	None	
5 Cylinder insulation	Measured cylinder loss: 1.50 kWh/day	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated:	Measured cylinder loss: 1.50 kWh/day OK Yes	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls	Measured cylinder loss: 1.50 kWh/day OK Yes	
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control	OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	ok ok
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands):	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW	OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average	OK OK OK OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang	OK OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing East:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang	OK OK OK OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing East: Windows facing South: Windows facing South: Windows facing South: Windows facing Mest:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 0.75 m², No overhang	OK OK OK OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overshading: Windows facing in North: Windows facing South: Windows facing South: Windows facing West: Air change rate:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 0.75 m², No overhang	OK OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing Fast: Windows facing South: Windows facing South: Windows facing West: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 10.55 m², No overhang 4.00 ach None	OK OK OK OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing West: Air change rate: Blinds/curtains: 10 Key features	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW Progry fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 0.75 m², No overhang 4.00 ach None	OK OK OK OK
5 Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: 6 Controls Space heating controls: Hot water controls: 7 Low energy lights Percentage of fixed lights with low-ene Minimum 8 Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing North: Windows facing Fast: Windows facing South: Windows facing South: Windows facing West: Air change rate: Blinds/curtains:	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 10.55 m², No overhang 4.00 ach None	OK OK OK OK
S Cylinder insulation Hot water storage Permitted by DBSCG 1.89 Primary pipework insulated: Controls Space heating controls: Hot water controls: T Low energy lights Percentage of fixed lights with low-ene Minimum Mechanical ventilation Not applicable 9 Summertime temperature Overheating risk (Midlands): Based on: Overshading: Windows facing East: Windows facing East: Windows facing South: Windows facing West: Air change rate: Blinds/curtains: 10 Key features Roof U-value	Measured cylinder loss: 1.50 kWh/day OK Yes Time and temperature zone control Cylinderstat Independent timer for DHW ergy fittings:100% 75% Not significant Average 15.13 m², No overhang 4.96 m², No overhang 10.50 m², No overhang 4.00 ach None 0.11 W/m²K	OK OK OK OK





CALCULATIO	ON OF E	OWELLING	G EMISS	IONS FOR	REGULA1	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
SAP 2012 WORKSHE						ry 2014) Jan 2014							
l. Overall dwell	ling dimer	nsions											
								Area (m2)		rey height (m)		Volume (m3)	
Ground floor First floor Potal floor area	a TFA = (1	la)+(1b)+(1c	c) + (1d) + (1e	e)(1n)	1	40.0000		75.0000 65.0000		2.3900			(1b) - (3 (1c) - (3 (4)
Owelling volume								(3	3a) + (3b) + (3c)	+(3d)+(3e)	(3n) =	348.9000	
	rate												
					main		econdary		other	tot	al m	3 per hour	
Number of chimne Number of open f					heating 0 0	+ +	heating 0 0	++	0 =		0 * 40 = 0 * 20 =	0.0000	
umber of internumber of passivumber of fluele	mittent fa ve vents										4 * 10 = 0 * 10 = 0 * 40 =	40.0000 0.0000 0.0000	(7a) (7b)
nfiltration due	e to chimr	neys, flues	and fans	= (6a)+(6b)+(7a)+(7b)+	(7c) =				40.0000	Air change / (5) =	s per hour 0.1146	
ressure test easured/design nfiltration rat umber of sides	te	1										Yes 5.0000 0.3646	
helter factor nfiltration rat			de shelter	factor					(20) = 1	- [0.075 x		1.0000	(20)
ind oncod	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(22)
ind speed ind factor dj infilt rate	5.1000 1.2750 0.4649	5.0000 1.2500 0.4558	4.9000 1.2250 0.4467	4.4000 1.1000 0.4011	4.3000 1.0750 0.3920	3.8000 0.9500 0.3464	3.8000 0.9500 0.3464	3.7000 0.9250 0.3373	4.0000 1.0000 0.3646	4.3000 1.0750 0.3920	4.5000 1.1250 0.4102	4.7000 1.1750 0.4285	(22a)
Effective ac	0.6081	0.6039	0.5998	0.5804	0.5768	0.5600	0.5600	0.5569	0.5665	0.5768	0.5841	0.5918	
. Heat losses a													
lement				Gross	Openings	Ne	tArea	U-value	Ах		-value	Α×Κ	
pening Type 1 pening Type 2	(Uw = 1.40))		m2	m2	2	m2 .1200 .3400	W/m2K 1.0000 1.3258	2.120 41.549	00	kJ/m2K	kJ/K	(26) (27)
pening Type 11 round Floor						2 75	.3100	1.3000 0.1600	3.003 12.000	30 00			(26a) (28a)
xternal Wall Main Roof FF Flat Roof				181.0100 65.0000 10.0000	35.7700	65	.2400 .0000 .0000	0.1800 0.1100 0.1600	26.143 7.150 1.600	00			(29a) (30) (30)
otal net area o abric heat loss			Aum (A, m2)				.0100	30) + (32)					(31) (33)
hermal mass par hermal bridges otal fabric hea	(Sum(L x)					(33)	+ (36) =	250.0000 15.2712 108.8366	(36)
entilation heat	t loss cal Jan 70.0122	Iculated mor Feb 69.5290	nthly (38)m Mar 69.0553	n = 0.33 x (Apr 66.8307	25)m x (5) May 66.4145	Jun 64.4769	Jul 64.4769	Aug 64.1180	Sep	Oct 66.4145	Nov 67.2565	Dec	(20)
38)m eat transfer co verage = Sum(39	peff 178.8488	178.3656			175.2511	173.3135	173.3135	172.9547	65.2232 174.0598	175.2511	176.0931	68.1368 176.9734 175.6653	(39)
LP	Jan 1.2775	Feb 1.2740	Mar 1.2707	Apr 1.2548	May 1.2518	Jun 1.2380	Jul 1.2380	Aug 1.2354	Sep 1.2433	Oct 1.2518	Nov 1.2578	Dec 1.2641	(40)
MLP (average) Days in month	31	28	31	30	31	30	31	31	30	31	30	1.2548	(41)
. Water heating	g energy :	requirements	kWh/year	î)									
ssumed occupand verage daily ho		ise (litres/	'day)									2.9171 103.4808	
aily hot water		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
nergy conte 1 nergy content of istribution los	(annual)	109.6896 147.6378 = 0.15 x (4	105.5504 152.3490	101.4111 132.8216	97.2719 127.4455	93.1327 109.9757	93.1327 101.9087	97.2719 116.9417	101.4111 118.3384	137.9119	109.6896 150.5417 um(45)m =	113.8288 163.4785 1628.1554	(45)
ater storage lo	25.3207	22.1457	22.8524	19.9232	19.1168	16.4964	15.2863	17.5413	17.7508	20.6868	22.5813	24.5218	
tore volume												150.0000	(47)





CALCULAT	TION OF I	OWELLIN	IG EMISSI	IONS FOR	R REGULA	TIONS C	OMPLIAN	ICE 09	Jan 2014	ı			
a) If manufa Temperature Enter (49) or	factor from	m Table 2b	actor is kn	own (kWh/c	day):							1.5000 0.5400 0.8100	(49)
Total storage			25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	
If cylinder c	25.1100		25.1100 23.2624			24.3000 22.5120	25.1100 23.2624	25.1100 23.2624		25.1100 23.2624	24.3000 22.5120		
Total heat re Solar input		191.3290			n month 175.8179 0.0000	156.7877 0.0000	150.2811	0.0000	0.0000	186.2843 0.0000 months) = S	0.0000	211.8509 0.0000 0.0000	(63)
Output from w		191.3290	200.7214	179.6336	175.8179	156.7877	150.2811	165.3141	165.1504		197.3537	211.8509	(64)
Heat gains fr		ating, kWh/ 84.0425		81.6128	81.0735	74.0165	72.5826	77.5810	76.7971	84.5536	87.5047	93.0545	
5. Internal g													
Metabolic gai	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gain	s (calculat	ed in Appen	ndix L, equa	tion L9 or		see Table 5			145.8542		145.8542	145.8542	
Appliances ga		ated in App		uation L13		lso see Tab	le 5	13.3693	17.9443	22.7844	26.5928	28.3489	
Cooking gains	(calculate	d in Append	dix L, equat	ion L15 or		see Table	5		236.3569	253.5816	275.3246	295.7600	
	37.5854 0.0000	0.0000	37.5854 0.0000	0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	37.5854 0.0000	
Losses e.g. e	-116.6834	-116.6834			-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	(71)
Water heating	127.4537		120.0994	113.3511	108.9698	102.8007	97.5572	104.2756	106.6626	113.6474	121.5343	125.0733	(72)
Total interna		528.9407	511.3109	482.4978	452.5652	424.2046	406.0756	412.6672	427.7202	456.7696	490.2079	515.9384	(73)
6. Solar gain	s												
[Jan]				m2	W/m2	Speci or	Table 6b	Specific or Tab	FF data le 6c	Acce fact Table	or	Gains W	
North								0	7000	0.77	00	35.1200	(74)
East South West			4.9 10.5 0.7	600 6000 500	19.6403 46.7521 19.6403		0.4500 0.4500 0.4500	0 0 0	.7000 .7000 .7000	0.77 0.77 0.77	00 00	21.2654 107.1603 3.2155	(76) (78)
East South	166.7612	290.5069	4.9 10.5 0.7 416.4715	9600 5000 7500 550.8801	19.6403 46.7521 19.6403 	661.8661	0.4500 0.4500 0.4500 	0 0 0 554.1176	.7000 .7000 .7000	0.77 0.77 0.77	00 00 00 200.8713	21.2654 107.1603 3.2155 142.0060	(76) (78) (80)
East South West Solar gains Total gains	166.7612 697.9655	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824	550.8801 1033.3780	19.6403 46.7521 19.6403 651.0331 1103.5983	661.8661 1086.0708	0.4500 0.4500 0.4500 	554.1176 966.7848	.7000 .7000 .7000	0.77 0.77 0.77	00 00 00 200.8713	21.2654 107.1603 3.2155 142.0060	(76) (78) (80)
East South West Solar gains Total gains 7. Mean inter Temperature d	166.7612 697.9655 nal tempera	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824	550.8801 1033.3780	19.6403 46.7521 19.6403 651.0331 1103.5983	661.8661 1086.0708	0.4500 0.4500 0.4500 	554.1176 966.7848	.7000 .7000 .7000	0.77 0.77 0.77	00 00 00 200.8713	21.2654 107.1603 3.2155 142.0060	(76) (78) (80) (83) (84)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f	166.7612 697.9655 nal tempera uring heati actor for g	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 om Table 9, Table 9a)	661.8661 1086.0708 Th1 (C)	0.4500 0.4500 0.4500 	554.1176 966.7848	.7000 .7000 .7000 462.3792 890.0994	0.77 0.77 0.77 326.0125 782.7821	00 00 00 200.8713 691.0793	21.2654 107.1603 3.2155 142.0060 657.9445	(76) (78) (80) (83) (84)
East South West	166.7612 697.9655 	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824 ng season) in the livi	550.8801 1033.3780	19.6403 46.7521 19.6403 651.0331 1103.5983 0m Table 9, Table 9a May 55.4760	661.8661 1086.0708 Th1 (C)	0.4500 0.4500 0.4500 	554.1176 966.7848	.7000 .7000 .7000 462.3792 890.0994	0.77 0.77 0.77 326.0125 782.7821	00 00 00 200.8713 691.0793	21.2654 107.1603 3.2155 142.0060 657.9445	(76) (78) (80) (83) (84)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a	166.7612 697.9655 nal tempera 	290.5069 819.4476 ture (heati ong periods ains for li Feb 54.5073	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 om Table 9, Table 9a) May 55.4760 4.6984	661.8661 1086.0708 Thi (C) Jun 56.0962	0.4500 0.4500 0.4500 	554.1176 966.7848	.7000 .7000 .7000 462.3792 890.0994 Sep 55.8556 4.7237	0.77 0.77 0.77 326.0125 782.7821	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624	(76) (78) (80) (83) (84)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a	166.7612 697.9655 nal tempera viring heati actor for g Jan 54.3600 4.6240 rea 0.9991	290.5069 819.4476 ture (heati- ng periods ains for li Feb 54.5073 4.6338 0.9979	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 0m Table 9, Table 9a) May 55.4760 4.6984 0.9420	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902	Jul 56.0962 4.7397 0.6803 19.8747	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.7000 .7000 .7000 462.3792 890.0994 Sep 55.8556 4.7237 0.9233 19.6625	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327	(76) (78) (80) (83) (84)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16	166.7612 697.9655 	290.5069 819.4476 ture (heati 	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 550 area from fine (see Apr 55.3445 4.6896 0.9823 18.9882 20.5274	19.6403 46.7521 19.6403 651.0331 1103.5983 0m Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9	Jul 56.0962 4.7397 0.6803 19.8747 20.9758	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 9	.7000 .7000 .7000 .7000 462.3792 890.0994 Sep 55.8556 4.7237 0.9233 19.6625 20.8383 8	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9	(76) (78) (80) (83) (84) (85)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9	166.7612 697.9655 	290.5069 819.4476 ture (heati 	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 120.7487 120.7487 120.7487 120.7487	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 0	0.4500 0.4500 0.4500 	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9646 0.00	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .890.0994 .700 .9933 .900 .9233 .900 .9233 .900 .9233 .900 .900 .900 .900 .900 .900 .900 .9	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8 22 0	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9	(76) (78) (80) (83) (84) (85)
East South West	166.7612 697.9655 	290.5069 819.4476 ture (heati- ng periods ains for li Feb 54.5073 4.6338 0.9979 18.0823 20.1289 8 20 21.000	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 550 area fro nil,m (see Apr 55.3445 4.6896 0.9823 18.9882 20.5274 8 22 0.1.0000	19.6403 46.7521 19.6403 651.0331 1103.5983 0m Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 021.0000	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 0	0.4500 0.4500 0.4500 	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9666 20.9646 20.9666 20.9	.7000 .7000	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8 22 0	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9 22 0.21.0000	(76) (78) (80) (83) (84) (85) (86)
East South West Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	166.7612 697.9655 	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824 416.4715 927.7824 in the livi ving area, Mar 54.6524 4.6435 0.9944 18.4634 20.2969 9 22 0 0 12.1000 19.8639 0.9922	550.8801 1033.3780 550.8801 1033.3780 550.8801 1033.3780 50.9823 18.982 20.5274 8 22 0 21.0000 19.8764	19.6403 46.7521 19.6403 651.0331 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.5983 1103.6984 110	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21.000 19.8898 0.7494	Jul 56.0962 4.7397 0.6803 19.8747 20.9758 9 22 00 19.8898 0.5345	354.1176 966.7848 366.7848 366.2125 4.7475 0.7372 19.8666 20.9646 9 22 0 0 21.0000 19.8918 0.5978	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8ep .55.8556 4.7237 0.9233 .19.6625 .20.8383 .8 .22 .0 .0 .21.000 .19.8855 0.8721	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0 0 21.0000 19.8788 0.9830	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8 222 0 0 21.0000 19.8740	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9 22.0000 19.8691 0.9991	(76) (78) (80) (83) (84) (85) (86)
East South West	166.7612 697.9655 	290.5069 819.4476 ture (heati 	4.9 10.5 0.7 416.4715 927.7824 ng season) in the livi ving area, Mar 54.6524 4.6435 0.9944 18.4634 20.2969 22 0.21.0000 19.8639 0.9922 18.4634 18.4634	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 0m Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 0 21.0000 19.8788 0.9130 19.4681 19.4681	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 021.0000 19.8898 0.7494 19.7902 19.7902	Jul 56.0962 4.7397 0.6803 19.8747 20.9758 22 0.21.0000 19.8898 0.5345 19.8747 19.8747	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9646 20.9648 19.8666 19.8666 19.8666 19.8666 19.8666 19.8666	.7000 .7000	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0.21.0000 19.8788 0.9830 19.0525 19.0525	00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8 22 0 21.0000 19.8740 0.9972 18.3706 18.3706	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9 22 0 21.0000 19.8691 0.9991 17.8327 17.8327	(76) (78) (80) (83) (84) (85) (86) (87) (88) (89)
East South West	166.7612 697.9655	290.5069 819.4476 ture (heati- ng periods ains for li Feb 54.5073 4.6338 0.9979 18.0823 20.1289 0 21.0000 19.8612 0.9971 18.0823 18.0823 19.8612	4.9 10.5 0.7 416.4715 927.7824	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 m Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 0 21.0000 19.8788 0.9130 19.4681 19.4681 19.8788	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 0 21.0000 19.8898 0.7494 19.7902 19.7902 19.8898	0.4500 0.4500 0.4500 	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9646 19.8918	.7000 .7000 .7000 .7000 462.3792 890.0994 Sep 55.8556 4.7237 0.9233 19.6625 20.8383 8 22 0 21.0000 19.8855 0.8721 19.6625 19.6625 19.6625 19.8855 fLA =	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0 21.0000 19.8788 0.9830 19.0525 19.0525 19.0525 19.8788	00 00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 8 22 0 21.0000 19.8740 0.9972 18.3706 18.3706 19.8740 a/(4) =	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 9 21.0000 19.8691 17.8327 17.8327 17.8327 17.8327 19.8691 0.1857	(76) (78) (80) (83) (84) (85) (86) (87) (88) (89)
East South West	166.7612 697.9655	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824 	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 0 19.8788 0.9130 19.4681 19.8788 20.0870	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 0 21.0000 19.8898 0.7494 19.7902 19.7902	Jul 56.0962 4.7397 0.6803 19.8747 20.9758 22 0.21.0000 19.8898 0.5345 19.8747 19.8747	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9646 20.9648 19.8666 19.8666 19.8666 19.8666 19.8666 19.8666	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .462.3792 .890.0994 .890.0994 .9233 .922.0923 .9233 .922.0923 .923	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0.21.0000 19.8788 0.9830 19.0525 19.0525 19.8788 2.19.0525 19.8788	00 00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 0 21.0000 19.8740 0.9972 18.3706 19.8740 a / (4) = 20.0831	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 0.21.0000 19.8691 17.8327 17.8327 17.8327 17.8327 17.8327 17.8327 19.8691 0.1857 20.0791 0.1857 20.0791 0.1857	(76) (78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
East South West	166.7612 697.9655 all tempera uring heati actor for g Jan 54.3600 4.6240 rea 0.9991 17.8559 20.0297 9 22 00 21.000 19.8585 house 0.9987 17.8559 19.8585 rection 20.0705 djustment 20.0705	290.5069 819.4476 ture (heati	4.9 10.5 0.7 416.4715 927.7824 ang season) in the livi ving area, Mar 54.6524 4.6435 0.9944 18.4634 20.2969 9 22 0 21.0000 19.8639 0.9922 18.4634 19.8639 20.0749 20.0749	550.8801 1033.3780 550.8801 1033.3780 550.8801 1033.3780 5.0000 101,m (see Apr 55.3445 4.6896 0.9823 18.9882 20.5274 8 22.000 19.8764 0.9744 18.9882 18.9882 19.8764 20.0851	19.6403 46.7521 19.6403 651.0331 1103.5983 Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 0 21.0000 19.8788 0.9130 19.4681 19.4681 19.4681 19.8788 20.0870	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21.000 21.0000 19.8898 0.7494 19.7902 19.7902 19.7902 19.7902 19.8898 20.0959	Jul 56.0962 4.7397 0.6803 19.8747 20.9758 0.5345 19.8747 19.8747 19.8747 19.8747 19.8747 19.8747 19.8747	Aug 554.1176 966.7848 	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .462.3792 .890.0994 .890.0994 .9233 .922.0923 .9233 .922.0923 .923	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0.21.0000 19.8788 0.9830 19.0525 19.0525 19.8788 2.19.0525 19.8788	00 00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 0 21.0000 19.8740 0.9972 18.3706 19.8740 a / (4) = 20.0831	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 0.21.0000 19.8691 17.8327 17.8327 17.8327 17.8327 17.8327 17.8327 19.8691 0.1857 20.0791 0.1857 20.0791 0.1857	(76) (78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
East South West	166.7612 697.9655	290.5069 819.4476 ture (heati- ner periods ains for li Feb 54.5073 4.6338 0.9979 18.0823 20.1289 8 20 0.000 19.8612 0.9971 18.0823 19.8612 20.0727 20.0727	4.9 10.5 0.7 416.4715 927.7824 416.4715 927.7824	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 Dom Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 00 21.0000 19.8788 0.9130 19.4681 19.4681 19.4681 19.4681 20.0870	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 00 21.0000 19.8898 0.7494 19.7902 19.7902 19.7902 19.8898 20.0959	Jul 56.0962 4.7397 0.6803 19.8747 20.9758 9 22 00 21.0000 19.8898 0.5345 19.8747 19.8747 19.8747 19.8747 19.8747	Aug 554.1176 966.7848 Aug 56.2125 4.7475 0.7372 19.8666 20.9646 9 22 0 021.0000 19.8918 0.5978 19.8666 19.8666 19.8666 19.8666 19.8918 20.0976	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .462.3792 .890.0994 .890.0994 .9233 .922.0923 .9233 .922.0923 .923	0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0.21.0000 19.8788 0.9830 19.0525 19.0525 19.8788 2.19.0525 19.8788	00 00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 0 21.0000 19.8740 0.9972 18.3706 19.8740 a / (4) = 20.0831	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 0.21.0000 19.8691 17.8327 17.8327 17.8327 17.8327 17.8327 17.8327 19.8691 0.1857 20.0791 0.1857 20.0791 0.1857	(76) (78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92)
East South West	166.7612 697.9655	290.5069 819.4476 ture (heati- 	4.9 10.5 0.7 416.4715 927.7824 416.4715 927.7824	550.8801 1033.3780 550.8801 1033.3780 	19.6403 46.7521 19.6403 651.0331 1103.5983 Table 9, Table 9a) May 55.4760 4.6984 0.9420 19.4681 20.7487 9 22 01.0000 19.8788 0.9130 19.4681 19.4681 19.8788 20.0870 20.0870	661.8661 1086.0708 Th1 (C) Jun 56.0962 4.7397 0.8344 19.7902 20.9133 9 21 00 21.0000 19.8898 0.7494 19.7902 19.7902 19.8998 20.0959 20.0959	0.4500 0.4500 0.4500 0.4500 	Aug 56.2125 4.7475 0.7372 19.8666 20.9646 20.9976 20.0976 20.0976	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .855 .8556 4.7237 0.9233 .8 22 .0 0 .21.0000 .19.8855 .0.8721 .19.6625 .10.6625 .10.	0.77 0.77 0.77 0.77 326.0125 782.7821 Oct 55.4760 4.6984 0.9892 19.0525 20.5537 9 22 0 021.0000 19.8788 0.9830 19.0525 19.0525 19.0525 19.0525 19.0525 19.0525 19.0525 19.0525 19.0525 19.0525	00 00 00 00 200.8713 691.0793 Nov 55.2107 4.6807 0.9981 18.3706 20.2523 0 21.0000 19.8740 0.9972 18.3706 19.8740 a / (4) = 20.0831 20.0831	21.2654 107.1603 3.2155 142.0060 657.9445 21.0000 Dec 54.9361 4.6624 0.9993 17.8327 20.0162 92 21.0000 19.8691 0.9991 17.8327 17.8327 17.8327 17.8327 20.0791 0.0000 20.0791	(76) (78) (80) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92) (93)





CALCULATIO	N OF D	WELLIN	G EIVIISSI	ONS FOR	REGULA	TIONS CO	JIVIPLIAN	ICE U9	Jan 2014	,			
pace heating		269.4732	1111.4145	688.4495	338.6266	0.0000	0.0000	0.0000	0.0000		1149.8020	8402.9267	(98)
pace heating per	IIIZ									(30) / (4) =	60.0209	(33)
c. Space cooling	requirem	nent											
ot applicable													
a. Energy requir	ements -	Individua	l heating s	ystems, inc	luding micro	o-CHP							
raction of space raction of space fficiency of mai fficiency of sec pace heating req	heat from heat f	om seconda om main sy leating sy	ry/supplements stem(s) stem 1 (in	ntary system								0.0000 1.0000 290.7417 100.0000 2890.1686	(202 (206 (208
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
pace heating req 157 pace heating eff	9.8048 1		1111.4145		338.6266	0.0000	0.0000	0.0000	0.0000	663.6639	1149.8020	1601.6922	(98)
	0.7417	290.7417	290.7417		290.7417	0.0000	0.0000	0.0000	0.0000	290.7417	290.7417	290.7417	(210
	3.3705		382.2686	236.7907	116.4699	0.0000	0.0000	0.0000	0.0000	228.2658	395.4719	550.8986	(211
	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
ater heating ater heating req			000 7014	170 6006	175 0170	456 8088	150 0011			105 0040	107 0507	011 0500	
fficiency of wat	er heater	191.3290 178.1250	200.7214 178.1250	179.6336 178.1250	175.8179 178.1250	156.7877 178.1250	150.2811 178.1250	165.3141 178.1250	165.1504 178.1250	186.2843 178.1250	197.3537 178.1250	211.8509 178.1250 178.1250	(216
uel for water he	ating, kV	h/month	112.6857	100.8469	98.7048	88.0212	84.3683	92.8079	92.7160	104.5807	110.7950	118.9338	
ater heating fue nnual totals kWh pace heating fue	l used /year l - main	system	112.0007	100.0103	30.7010	00.0212	01.000	32.0073	3217100	10110007	110.7300	1233.7973 2890.1686	(219
pace heating fue												0.0000	(215
lectricity for p otal electricity lectricity for l otal delivered e	for the ighting	above, kW		ix L)								0.0000 487.1124 4611.0782	(232
2a. Carbon dioxi	de emissi	ons - Ind	ividual hea	ting system:	s including	micro-CHP							
pace heating - m pace heating - s ater heating (ot	econdary	m 1						Energy kWh/year 2890.1686 0.0000 1233.7973		ion factor kg CO2/kWh 0.5190 0.5190 0.5190	k	Emissions g CO2/year 1499.9975 0.0000 640.3408	(261 (263
pace and water h numps and fans nergy for lighti otal CO2, kg/yea welling Carbon D	ng r	nission Ra	te (DER)					0.0000 487.1124		0.0000 0.5190		2140.3383 0.0000 252.8113 2393.1496 17.0900	(267 (268 (272
6 CO2 EMISSIONS ER otal Floor Area	ASSOCIATE	D WITH AP	PLIANCES AN	O COOKING A	ND SITE-WID	E ELECTRICI	TY GENERATI	ON TECHNOLO	GIES		TFA	17.0900 140.0000	
ssumed number of 02 emission fact 02 emissions fro 02 emissions fro otal CO2 emissio	or in Tak m appliar m cooking ns	ole 12 for ices, equa , equatio	tion (L14) n (L16)	y displaced	from grid						N EF	2.9171 0.5190 13.0965 1.3501 31.5366	ZC2 ZC3 ZC4
esidual CO2 emis dditional allowa esulting CO2 emi et CO2 emissions	ble elect ssions of	ricity ge	neration, k		electricity	generation						0.0000 0.0000 0.0000 31.5366	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) 179.2500 (1b) - (3b) (m2) 75.0000 (1b) (m) 2.3900 (2b) First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume 2.6100 (2c) 65.0000 (1c) 169.6500 (1c) - (3c) 140.0000 2. Ventilation rate secondarv other total m3 per hour 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 0.0000 (6b) 40.0000 (7a) Air changes 40.0000 / (5) = Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.1146 (8) Pressure test Measured/design AP50 5.0000 0.3646 (18) Infiltration rate Number of sides sheltered - [0.075 x (19)] (21) = (18) x (20) 1.0000 (20) 0.3646 (21) (20) = 1 -Infiltration rate adjusted to include shelter factor Feb 5.0000 1.2500 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 0 4649 0.3920 3. Heat losses and heat loss parameter U-value W/m2K 1.0000 A x U W/K 2.1200 2.7720 TER Opaque door TER Semi-glazed door 2.3100 1.2000 (26a) TER Opening Type (Uw = 1.40) Ground Floor External Wall 30.5700 75.0000 146.0100 40.5284 9.7500 26.2818 1.3258 (27) 181.0100 Main Roof 65.0000 0.1300 8.4500 (30)GF Flat Roof 10.0000 10.0000 0.1300 1.3000 (30) Total net area of external elements Aum(A, m2) Fabric heat loss, $W/K = Sum (A \times U)$ 331.0100 (31) (26)...(30) + (32) = 91.2022 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35) Thermal bridges (Sum(L x Psi) calculated using Appendix K) Total fabric heat loss (33) + (36) =Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Jan Jun Jul 70.0122 66.8307 69.5290 69.0553 66.4145 64.4769 64 4769 64 1180 66 4145 67.2565 68.1368 (38) Heat transfer coeff 176.9409 171.0468 175.0655 (39) 173.7574 (39) 175.9840 173.7594 173.3432 171.4056 171.4056 173.3432 174.1852 Average = Sum(39)m / 12 = Jan 1.2639 Apr 1.2411 May 1.2382 1.2505 (40) 1.2411 (40) HLP (average) Days in month 31 28 31 30 31 31 31 31 3.0 31 (41) 4. Water heating energy requirements (kWh/year) 2.9171 (42) Assumed occupancy Average daily hot water use (litres/day) 103.4808 (43) Feb Apr May Jun Jul Aug Sep Daily hot water use
113.8288
Energy conte 168.8049 105.5504 109.6896 101.4111 93.1327 93.1327 101.4111 105.5504 109.6896 113.8288 (44) Energy content (annual)
Distribution loss (46)m
25.3207 147.6378 152.3490 132.8216 109.9757 101.9087 118.3384 150.5417 (46) m = 0.15 x (45) m .3207 22.1457 22 24.5218 (46) 22.8524 19.9232 19.1168 16.4964 15.2863 17.5413 17.7508 20.6868 22.5813 Water storage loss: Store volume 150.0000 (47)



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



CALCULAT	ION OF	TARGET I	EMISSION	NS 09.	Jan 2014								
a) If manufac Temperature Enter (49) or	factor fro	m Table 2b	actor is kn	own (kWh/	day):							1.3938 0.5400 0.7527	(49)
Total storage	23.3325		23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	23.3325	21.0745	23.3325 23.2624	22.5798 22.5120		22.5798 22.5120	23.3325 23.2624	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	22.5798 22.5120	23.3325 23.2624	
Total heat req	uired for	water heati	ng calculat	ed for each						184.5069			
Solar input	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 um(63)m =	0.0000	(63)
Output from w/		189.7235	198.9439	177.9134	174.0404	155.0676	148.5036			184.5069 h/year) = S			
Heat gains fro		ating, kWh/ 82.7582		80.2366	79.6515	72.6404	71.1606	76.1590	75.4210	83.1316	86.1286	91.6325	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gain), Watts Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m Lighting gains	145.8542	145.8542	145.8542 dix L, equa	145.8542 tion L9 or	145.8542 L9a), also	145.8542	145.8542		145.8542			145.8542	(66)
Appliances gai	ns (calcul		endix L, eq	uation L13			le 5	13.3784	17.9565	22.7999	26.6108	28.3682	(67)
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or		see Table	5		236.3569	253.5816	275.3246		
	3.0000	3.0000	37.5854 3.0000	3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	37.5854 3.0000	
Losses e.g. ev Water heating	-116.6834	-116.6834			-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	-116.6834	(71)
Total internal	125.5424		118.1881	111.4398	107.0585	100.8895	95.6459	102.3643	104.7514	111.7361	119.6230	123.1620	(72)
		530.0461	512.4132	483.5968	453.6616	425.2998	407.1713	413.7650	428.8211	457.8738	491.3147	517.0464	(73)
6. Solar gains	5												
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	Specific or Tab	FF data	Acce fact Table	or	Gains W	
North East					10.6334					0.77	nn	47.9331	(74)
Luo C				400	19.6403		0.6300		.7000	0.77		29.0512	(76)
South West			4.8 10.2 0.7	400 500 300	19.6403 46.7521 19.6403		0.6300 0.6300 0.6300	0 0 0		0.77 0.77 0.77	00 00		(78)
South West	227.8184	396.8558	4.8 10.2 0.7 568.8909	400 500 300 	19.6403 46.7521 19.6403	903.9241	0.6300 0.6300 0.6300 	0 0 0 756.8191	.7000 .7000 .7000	0.77 0.77 445.3480	00 00 00 274.4146	29.0512 146.4524 4.3817	(78) (80)
South West 	227.8184 760.1302	396.8558 926.9019	4.8 10.2 0.7 568.8909 1081.3041	400 500 300 752.4204 1236.0172	19.6403 46.7521 19.6403 889.1541 1342.8157	903.9241 1329.2239	0.6300 0.6300 0.6300 862.5980 1269.7693	756.8191 1170.5841	.7000 .7000 .7000	0.77 0.77 445.3480	00 00 00 274.4146	29.0512 146.4524 4.3817	(78) (80)
Solar gains Total gains 7. Mean intern Temperature du	227.8184 760.1302	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041	400 500 300 	19.6403 46.7521 19.6403 889.1541 1342.8157	903.9241	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000 .7000	0.77 0.77 445.3480	00 00 00 274.4146	29.0512 146.4524 4.3817	(78) (80) (83) (84)
Solar gains Total gains 7. Mean intern Temperature du Utilisation fa	227.8184 760.1302 Lal tempera Liring heati Lictor for g Jan	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 	19.6403 46.7521 19.6403 889.1541 1342.8157 om Table 9, Table 9a) May	903.9241 1329.2239 Th1 (C) Jun	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000 .7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218	00 00 00 274,4146 765,7294	29.0512 146.4524 4.3817 194.0014 711.0478	(78) (80) (83) (84)
Solar gains Total gains Total gains Total gains Temperature du Utilisation fatau alpha	227.8184 760.1302 all tempera uring heati ctor for g Jan 54.9462 4.6631	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 	19.6403 46.7521 19.6403 889.1541 1342.8157 0m Table 9, Table 9a) May 56.0866	903.9241 1329.2239 Th1 (C) Jun	0.6300 0.6300 0.6300 	756.8191 1170.5841	.7000 .7000 .7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218	00 00 00 274,4146 765,7294	29.0512 146.4524 4.3817 194.0014 711.0478	(78) (80) (83) (84)
Solar gains Total gains Total gains Total gains Themperature du Utilisation fatau	227.8184 760.1302 all tempera uring heati ctor for g Jan 54.9462 4.6631	396.8558 926.9019 ture (heati 	4.8 10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830	400 500 300 	19.6403 46.7521 19.6403 889.1541 1342.8157 om Table 9, Table 9a) May 56.0866 4.7391	903.9241 1329.2239 Th1 (C) Jun 56.7206	0.6300 0.6300 0.6300 1269.7693 Jul 56.7206 4.7814	756.8191 1170.5841 	.7000 .7000 .7000 631.5765 1060.3976	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391	00 00 00 274.4146 765.7294 Nov 55.8154 4.7210	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023	(78) (80) (83) (84)
South West	227.8184 760.1302 and tempera arring heati totor for g Jan 54.9462 4.6631 tea 0.9987 19.5569 19.8692	396.8558 926.9019 ture (heati 	4.8 10.2 0.7 568.8909 1081.3041 in the livi ving area, Mar 55.2449 4.6830 0.9896	400 500 300 	19.6403 46.7521 19.6403 889.1541 1342.8157 0m Table 9, Table 9a) May 56.0866 4.7391 0.8919	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814	0.6300 0.6300 0.6300 1269.7693 Jul 56.7206 4.7814	756.8191 1170.5841 Aug 56.8396 4.7893 0.6356	.7000 .7000 .7000 631.5765 1060.3976 Sep 56.4747 4.7650 0.8699 20.8245	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808	00 00 00 274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305	(78) (80) (83) (84) (85)
South West	227.8184 760.1302 all tempera arring heati actor for g Jan 54.9462 4.6631 rea 0.9987 19.5569 19.8692 souse 0.9982	396.8558 926.9019 ture (heati- 	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 752.4204 1236.0172 ng area frc nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508	19.6403 46.7521 19.6403 889.1541 1342.8157 Dom Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441	0.6300 0.6300 0.6300 	756.8191 1170.5841 Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .3976 .3976 .3976 .3976 .3976 .3976 .3976 .3976 .3976 .3976 .3976 .3976	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706	00 00 00 274.4146 765.7294 Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987	(78) (80) (83) (84) (85) (86) (87) (88) (89)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr	227.8184 760.1302 all tempera all tempera corrector for g Jan 54.9462 4.6631 ea 0.9987 19.5569 19.8692 19.8692 19.9479 19.79479 19.79479	396.8558 926.9019 ture (heati- 	4.8 10.2 0.7 568.8909 1081.3041 ing season) in the livi ving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334	400 500 300	19.6403 46.7521 19.6403 889.1541 1342.8157 0m Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498	Jul 56.7206 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942	756.8191 1170.5841 	.7000 .7000 .7000 .631.5765 1060.3976 Sep 56.4747 4.7650 0.8699 20.8245 19.8963 0.8005 19.7520 flA =	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) =	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857	(78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h	227.8184 760.1302 anal tempera aniring heati guan 54.9462 4.6631 an 0.9987 19.5569 19.8692 an 19.79479 an aniring heati	396.8558 926.9019 ture (heati ng periods ains for li Feb 55.0966 4.6731 0.9964 19.7391 19.8720 0.9951 18.2158 18.4987	4.8 10.2 0.7 568.8909 1081.3041 ng season) in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919	752.4204 1236.0172 752.4204 1236.0172 ng area fr. nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	19.6403 46.7521 19.6403 889.1541 1342.8157 m Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441	0.6300 0.6300 0.6300 	756.8191 1170.5841 Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015	Sep 56.4747 4.7650 0.8699 20.8245 19.9512 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad Temperature ad	227.8184 760.1302 anal tempera aniring heati guan 54.9462 4.6631 an 0.9987 19.5569 19.8692 an 19.79479 an aniring heati	396.8558 926.9019 ture (heati ng periods ains for li Feb 55.0966 4.6731 0.9964 19.7391 19.8720 0.9951 18.2158 18.4987	4.8 10.2 0.7 568.8909 1081.3041 ng season) in the liviving area, Mar 55.2449 4.6830 0.9896 20.0250 19.8746 0.9857 18.6334 18.8919	752.4204 1236.0172 752.4204 1236.0172 ng area fr. nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	19.6403 46.7521 19.6403 889.1541 1342.8157 m Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493	0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916	Sep 56.4747 4.7650 0.8699 20.8245 19.9512 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 5.Living are	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad Temperature ad	227.8184 760.1302 all tempera all tempera inctor for g Jan 54.9462 4.6631 rea 0.9987 19.5569 19.8692 rouse 0.9982 17.9479 raction 18.2467 rigustment 18.2467	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 752.4204 1236.0172 ng area frc nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048	19.6403 46.7521 19.6403 889.1541 1342.8157 DOM Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493	0.6300 0.6300 0.6300 1.6300 1.6300 1.6300 1.69.7693 1.69.7693 1.60.7206 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942 20.0962	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916	Sep 56.4747 4.7650 0.8699 20.8245 19.9512 19.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 5.Living are	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000	(85) (86) (87) (88) (89) (90) (91) (92)
South West	227.8184 760.1302 all tempera all tempera aring heati actor for g Jan 54.9462 4.6631 acea 0.9987 19.5569 19.8692 acuse 0.9982 17.9479 action 18.2467 Jan 0.9971 757.9587 4.3000	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 752.4204 1236.0172 ng area frr nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048 19.4048	19.6403 46.7521 19.6403 889.1541 1342.8157 Dom Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493	0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 40.5261 615.8769	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8005 .9.7520 .8005 .9.7520 .9.9512 .9.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 19.4057 19.4057	Nov 55,8154 4,7210 0,9970 19,9067 19,8848 0,9957 18,4702 a / (4) = 18,7370	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000 18.2162 Dec 0.9979 709.5545	(78) (80) (83) (84) (85) (85) (86) (87) (88) (89) (90) (91) (92) (93)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad adjusted MIT 8. Space heati	227.8184 760.1302 all tempera all tempera all tempera ictor for g Jan 54.9462 4.6631 rea 0.9987 19.5569 19.8692 rouse 0.9982 17.9479 raction 18.2467 Jan 0.9971 757.9587 4.3000 rea 2467.7459	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041 	400 500 300 752.4204 1236.0172 ng area frr. nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048 Apr 0.9428 1165.3290 8.9000 1825.3118	19.6403 46.7521 19.6403 889.1541 1342.8157 Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493	0.6300 0.6300 0.6300 0.6300 	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 20.5261 615.8769 16.4000 631.4411	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .801 .900 .8045 .900 .8005 .900 .8005 .900 .8005 .900 .8005 .900 .8005 .900 .8005 .900 .8005 .900 .8005 .800	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 1.1ving are 19.4057 19.4057	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370 Nov 0.9937 760.9016 7.1000	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 Dec 0.9979 709.5545 4.2000	(78) (80) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (93)
South West Solar gains Total gains 7. Mean intern Temperature du Utilisation fa tau alpha util living ar MIT Th 2 util rest of h MIT 2 Living area fr MIT Temperature ad adjusted MIT 8. Space heati Utilisation Useful gains Ext temp. Heat loss rate Month fracti Space heating	227.8184 760.1302 all tempera all tempera ictor for g Jan 54.9462 4.6631 rea 0.9987 19.5569 19.8692 rouse 0.9982 17.9479 raction 18.2467 18.2467 all tempera 18.2467 rea 0.9982 17.9479 raction 18.2467	396.8558 926.9019 ture (heati	4.8 10.2 0.7 568.8909 1081.3041	400 500 300 752.4204 1236.0172 ng area frr nil,m (see Apr 55.9522 4.7301 0.9649 20.3996 19.8872 0.9508 19.1779 19.4048 19.4048 Apr 0.9428 1165.3290 8.9000 1825.3118 1.0000	19.6403 46.7521 19.6403 889.1541 1342.8157 Table 9, Table 9a) May 56.0866 4.7391 0.8919 20.7264 19.8896 0.8479 19.6178 19.8237 19.8237	903.9241 1329.2239 Th1 (C) Jun 56.7206 4.7814 0.7394 20.9245 19.9006 0.6441 19.8498 20.0493 20.0493 Jun 0.6583 874.9706 14.6000 934.0488	0.6300 0.6300 0.6300 1.269.7693 3.1269.7693 3.1269.7693 3.1269.7693 3.1269.7693 4.7814 0.5729 20.9823 19.9006 0.4403 19.8942 20.0962 20.0962 3.1269.7650 5.1269.7650 5.1269.7650 5.1269.7660 0.0000	Aug 56.8396 4.7893 0.6356 20.9717 19.9026 0.5015 19.8909 20.0916 20.0916 20.5261 615.8769 16.4000 631.4411 0.0000	.7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .7000 .8005 .9.7520 .8005 .9.7520 .9.9512 .9.9512 .9.9512	0.77 0.77 445.3480 903.2218 Oct 56.0866 4.7391 0.9808 20.3946 19.8896 0.9706 19.1802 Living are- 19.4057 19.4057	Nov 55.8154 4.7210 0.9970 19.9067 19.8848 0.9957 18.4702 a / (4) = 18.7370 18.7370 Nov 0.9937 760.9016 7.1000 911.5848	29.0512 146.4524 4.3817 194.0014 711.0478 21.0000 Dec 55.5348 4.7023 0.9990 19.5305 19.8798 0.9987 17.9165 0.1857 18.2162 0.0000 18.2162 Dec 0.9979 709.5545 4.2000 2453.7519 1.0000	(78) (80) (83) (84) (85) (85) (86) (87) (88) (90) (91) (92) (93) (93) (94) (95) (96) (97) (97a) (98) (98)





CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement 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) 93.5000 (206) 0.0000 (208) 6925.6992 (211) Mar Apr Feb May Jun Jul Aug Sep Oct Nov Dec Space heating requirement 1272.0817 994.1558 833.4742 475.1876 203.7045 0.0000 487.6571 911.5848 1297.6828 (98) Space heating efficiency (main neucons) 2 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 93.5000 Space heating fuel (main heating system) 1360.5152 1063.2683 891.4163 508.2221 217.8658 Water heating requirement 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Space heating efficiency (main heating system 1) 93.5000 93.5000 93.5000 0 0000 0 0000 0 0000 0 0000 93 5000 93 5000 93.5000 (210) 0.0000 0.0000 0.0000 0.0000 521.5584 974.9570 1387.8961 (211) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215) Water heating Water heating requirement

215.3998 189.7235 198.9439 177.9134 174.0404 155.0676 148.5036 163.5366 163.4302 184.5069 195.6335 210.0734 (64)

79.8000 (216 Water heating requirement 215.3998 189.7235 198.9439 177.9134 174.0404 155.0676 148.5036 163.5366 163.4302 184.5069 195.6335 Efficiency of water heater (217)m 88.7763 88.5962 88.2206 87.3108 85.2344 79.8000 79.8000 79.8000 79.8000 87.2873 88.4055 Fuel for water heating, kWh/month 242.6322 214.1440 225.5074 203.7701 204.1903 194.3203 186.0947 204.9331 204.7998 211.3788 221.2910 Water heating fuel used Annual totals kWh/year Space heating fuel - main system Space heating fuel - secondary 88.8403 (217) 2549.5234 (219) 6925.6992 (211) 0.0000 (215) 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 (230c) 45.0000 (230e) 75.0000 (231) 487.4436 (232) 10037.6663 (238) 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP Emissions Energy Emissions kg CO2/year 1495.9510 (261) 0.0000 (263) 550.6971 (264) 2046.6481 (265) kWh/year 6925.6992 0.0000 kg CO2/kWh Space heating - main system 1 Space heating - secondary Water heating (other fuel) 0.2160 0.2160 Space and water heating Pumps and fans 2046.6481 (265) 38.9250 (267) 252.9832 (268) 2338.5563 (272) 14.6189 (272a) 1.5500 75.0000 0.5190 Emergy for lighting Total CO2, kg/m2/year Emissions per m2 for space and water heating Fuel factor (electricity) 1.8070 (272b) 0.2780 (272c) 24.7400 (273) Emissions per m2 for lighting
Emissions per m2 for pumps and fans
Target Carbon Dioxide Emission Rate (TER) = (14.6189 * 1.55) + 1.8070 + 0.2780, rounded to 2 d.p.





Property Reference	3B5P GF End				Issued on Date	16/03/2021			
Assessment	3			Prop Type Ref					
Reference Property	x, Balham, SW12 OJH								
гторенту	x, baillaill, 3VV12 OJII								
SAP Rating		85 B	DER	17.00	TER	28.53			
Environmental		87 B	% DER <ter< th=""><th></th><th>40.41</th><th></th></ter<>		40.41				
CO ₂ Emissions (t/ye	ear)	1.18	DFEE	46.81	TFEE	61.90			
General Requireme	nts Compliance	Pass	% DFEE <tfe< th=""><th>E</th><th>24.39</th><th></th></tfe<>	E	24.39				
Assessor Details	Mr. Jonathan Peck, Jonathan Jonathan@hodkinsonconsult	,)36031622,		Assessor ID T296-00				
Client									





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

	ed Document L1A, 2013 Edition, England	
DWELLING AS DESIGNED		
Ground-floor flat, total floor area 87	m^2	
This report covers items included with It is not a complete report of regulat	ions compliance.	
la TER and DER Fuel for main heating:Electricity Fuel factor:1.55 (electricity) Target Carbon Dioxide Emission Rate (T Dwelling Carbon Dioxide Emission Rate	ER) 28.53 kgCO□/m² (DER) 17.00 kgCO□/m²OK	
1b TFEE and DFEE Target Fabric Energy Efficiency (TFEE) Dwelling Fabric Energy Efficiency (DFE		
2 Fabric U-values		
Element Average External wall 0 15 (max 0 30)	Highest 0.15 (max. 0.70) OK	
External wall 0.15 (max. 0.30) Party wall 0.00 (max. 0.20) Floor 0.10 (max. 0.25) Paof (no roof)	- OK	
Floor 0.10 (max. 0.25)	0.10 (max. 0.70) OK	
Roof (no roof) Openings 1.18 (max. 2.00)		
	r thermal transmittances for each junction	
3 Air permeability		
Air permeability at 50 pascals: Maximum	3.00 (design value) 10.0	OK
PICKLINGH		
4 Heating efficiency Main heating system: Mitsubishi ECODAN 5kW PUHZ-W50VHA-BS	Heat pump with radiators or underfloor - Electric	
Secondary heating system:	None	
5 Cylinder insulation Hot water storage	Measured cylinder loss: 1.50 kWh/day	
Permitted by DBSCG 1.89 Primary pipework insulated:	OK Yes	OK
6 Controls Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
7 Low energy lights	angu Fittinga 100%	
Percentage of fixed lights with low-en Minimum		OK
8 Mechanical ventilation Continuous supply and extract system		
Specific fan power:	0.60	
Maximum	1.5	OK
MVHR efficiency: Minimum:	88% 70%	OK
9 Summertime temperature		07
Overheating risk (Thames Valley): Based on:	Slight	OK
Overshading:	Average	
Windows facing North Fact:	6.48 m², No overhang	
Windows facing North East: Windows facing North West:	5.51 m², No overhang 7.42 m², No overhang	
Air change rate:	3.00 ach	
Blinds/curtains:	Light-coloured curtain or roller blind, closed 10	
10 Key features		
Party wall U-value	0.00 W/m²K	
Floor U-value Door U-value	0.10 W/m ² K 1.00 W/m ² K	
Air permeability	3.0 m ³ /m ² h	





CALCULATION	ON OF D	WELLIN	G EMISSI	ONS FOR	REGULAT	TIONS CO	OMPLIAN	CE 09	9 Jan 2014	l .			
SAP 2012 WORKSH	EET FOR New	Build (A	s Designed)	(Version		ry 2014)							
CALCULATION OF						Jan 2014							
Overall dwel													
								Area (m2)		rey height (m)		Volume (m3)	
Ground floor Total floor are Owelling volume		a) + (1b) + (1	c)+(1d)+(1e)(ln)	:	86.7000		86.7000	(1b) x 3a)+(3b)+(3c)	2.5000)+(3d)+(3e)		216.7500 216.7500	(4)
	rate												
					main heating	se	econdary heating		other	tot	al m	3 per hour	
Number of chimn Number of open Number of inter Number of passi Number of fluel	flues mittent far ve vents				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 du	e to chimne	eys, flues	and fans	= (6a)+(6b))+(7a)+(7b)+	(7c) =				0.0000	Air change: / (5) =	per hour 0.0000 Yes	(8)
Measured/design Infiltration ra Mumber of sides	te											3.0000 0.1500 2	(18) (19)
Shelter factor Infiltration ra	te adjusted	l to inclu	de shelter	factor					(20) = 1	- [0.075 x 21) = (18)		0.8500 0.1275	
ind speed ind factor dj infilt rate	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 mecha f mechanical v	0.1626 nical venti		0.1562 th heat rec	0.1403 overy	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	
f balanced wit			iciency in	% allowing :	for in-use f	actor (from	m Table 4h)	=				74.8000	
. Heat losses				Gross					2		. nolue	Α×Κ	
pening Type 1 pening Type 2 loor 1 xternal heltered otal net area			Aum(A, m2)	65.7000 50.5000	Openings m2 21.6100	2 19 86 44 50	m2 .2000 .4100 .7000 .5000	U-value W/m2K 1.0000 1.1450 0.1000 0.1500 0.1500	A x W 2.20 22.22 8.67 6.61 7.57	/K 00 52 00 35	-value kJ/m2K	A X K kJ/K	
Pabric heat los Party Party Ceiling 1		ım (A x U)					(26)(.7000 .7000	0.0000	47.28				(33) (32) (32b)
Thermal mass pa Thermal bridges Total fabric he	(Sum(L x E				1					(33)	+ (36) =	250.0000 10.1320 57.4157	(36)
entilation hea	Jan 20.6402	rulated mo Feb 20.4122	nthly (38)m Mar 20.1842	= 0.33 x (2 Apr 19.0442	25)m x (5) May 18.8162	Jun 17.6762	Jul 17.6762	Aug 17.4482	Sep 18.1322	Oct 18.8162	Nov 19.2722	Dec 19.7282	(38)
eat transfer c verage = Sum(3	78.0558	77.8279	77.5999	76.4599	76.2319	75.0919	75.0919	74.8639	75.5479	76.2319	76.6879	77.1439 76.4029	
LP LP (average) ays in month	Jan 0.9003	Feb 0.8977	Mar 0.8950	Apr 0.8819	May 0.8793	Jun 0.8661	Jul 0.8661	Aug 0.8635	Sep 0.8714	Oct 0.8793	Nov 0.8845	Dec 0.8898 0.8812	
-10 TH MOHOH	31	28	31	30	31	30	31	31	30	31	30	31	(41)
. Water heatin	g energy re	equirement	s (kWh/year)									
ssumed occupan verage daily h	су											2.5778 95.4228	
aily hot water		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(44)
Energy conte Energy content Distribution lo	155.6603 (annual)	101.1482 136.1415 = 0.15 x (97.3313 140.4858 45)m	93.5144 122.4789	89.6975 117.5214	85.8806 101.4121	85.8806 93.9732	89.6975 107.8356		97.3313 127.1729 Total = S	101.1482 138.8192 um(45)m =	104.9651 150.7486 1501.3730	(45)





CALCOLA	TION OF E	OWELLIN	IG EMISSI	ONS FOR	R REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014	ļ			
	23.3490	20.4212	21.0729	18.3718	17.6282	15.2118	14.0960	16.1753	16.3685	19.0759	20.8229	22.6123	(46)
Water storage Store volume												150.0000	
a) If manufa Temperature Enter (49) or	factor from	m Table 2b	factor is kn	own (kWh/c	lay):							1.5000 0.5400 0.8100	(49)
Total storage	loss 25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder c			r storage 25.1100	24.3000		24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(57)
Primary loss Total heat re					n month	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	
Solar input	0.0000	179.8327	188.8582	169.2909	165.8938	148.2241	142.3456	0.0000	155.9355 0.0000 ut (sum of	175.5453 0.0000 months) = S	185.6312 0.0000 Sum(63)m =	199.1210 0.0000 0.0000	(63)
Output from w		179.8327	188.8582	169.2909	165.8938	148.2241	142.3456	156.2080 Total p			185.6312 Sum(64)m =	199.1210 2070.9190	
Heat gains fr	om water hea	ating, kWh/ 80.2200	month 85.4094	78.1738	77.7738	71.1691	69.9440	74.5533	73.7332	80.9829	83.6070	88.8218	(65)
5. Internal g	ains (see Ta	able 5 and	5a)										
Metabolic gai (66)m	Jan	Feb	Mar 128.8902	Apr 128.8902	May 128.8902	Jun 128.8902	Jul 128.8902	Aug 128.8902	Sep 128.8902	Oct 128.8902	Nov 128.8902	Dec 128.8902	(66)
Lighting gain	20.7609	18.4396	14.9961	11.3530	8.4865	7.1647	7.7417	10.0629	13.5065	17.1495	20.0160	21.3379	(67)
Appliances ga	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	
Pumps, fans Losses e.g. e					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water heating	gains (Tab			108.5748	-103.1122 104.5347	98.8460	94.0108	100.2060	102.4072	108.8480	-103.1122 116.1208	-103.1122 119.3842	
Total interna	l gains		420.6617	397.8319	374.5608	352.1699	337.6367	343.7367	355.4709	378.5187	405.0225	424.9881	
	130.0011	101.7721	120.0017	337.0323	3,11,0000	302.2033	337.0307	31317307	300.1703	370.0107	100.0220	121.3001	(,3)
6. Solar gain													
[Jan]			A	rea m2	Solar flux Table 6a		g fic data	Specific	FF	Acce fact		Gains W	
					W/m2			or Tab		Table			
North			6.4	800	10.6334	or	Table 6b 0.4500	or Tab	le 6c	Table	6d 700	17.1903	
North Northeast Northwest			6.4 5.5 7.4	800 100 200	10.6334 11.2829 11.2829	or	Table 6b 0.4500 0.4500 0.4500	or Tab 0 0 0	le 6c	Table	6d 700 700	17.1903 15.5099 20.8863	(75)
Northeast Northwest	53.5865	106.9371	6.4 5.5 7.4 	800 100 200 	10.6334 11.2829 11.2829	or 443.4474	Table 6b 0.4500 0.4500 0.4500 414.5966	or Tab	.8000 .8000 .8000	Table 0.77 0.77 0.77	6d 700 700 700 67.0023	15.5099	(75) (81)
Northeast Northwest	53.5865	106.9371	6.4 5.5 7.4 	800 100 200 	10.6334 11.2829 11.2829	or 443.4474	Table 6b 0.4500 0.4500 0.4500 414.5966	or Tab 0 0 0 0 0 330.0577	.8000 .8000 .8000	Table 0.77 0.77 0.77	6d 700 700 700 67.0023	15.5099 20.8863 44.0537	(75) (81)
Northeast Northwest Solar gains Total gains	53.5865 490.4676 nal tempera	106.9371 541.7092 ture (heati	6.4 5.5 7.4 189.3014 609.9631	800 100 200 308.8759 706.7079	10.6334 11.2829 11.2829 415.4495 790.0103	443.4474 795.6174	0.4500 0.4500 0.4500 0.4500 	330.0577 673.7944	.8000 .8000 .8000	Table 0.77 0.77 0.77	6d 700 700 700 67.0023	15.5099 20.8863 44.0537	(75) (81)
Northeast Northwest 	53.5865 490.4676 	106.9371 541.7092 ture (heati	6.4 5.5 7.4 189.3014 609.9631 in the livi	800 100 200 308.8759 706.7079	10.6334 11.2829 11.2829 415.4495 790.0103	443.4474 795.6174	0.4500 0.4500 0.4500 0.4500 	330.0577 673.7944	.8000 .8000 .8000	Table 0.77 0.77 0.77	6d 700 700 700 67.0023	15.5099 20.8863 44.0537	(75) (81) (83) (84)
Northeast Northwest Solar gains Total gains 7. Mean inter Temperature d	53.5865 490.4676 	106.9371 541.7092 ture (heati	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar	308.8759 706.7079	10.6334 11.2829 11.2829 415.4495 790.0103	443.4474 795.6174 Phl (C) Jun	Table 6b 0.4500 0.4500 0.4500 0.4500 414.5966 752.2333	330.0577 673.7944	.le 6c .8000 .8000 .8000 229.7629 585.2337	Table 0.77 0.77 0.77 129.6439 508.1625	6d 000 000 000 67.0023 472.0248	15.5099 20.8863 44.0537 469.0417	(75) (81) (83) (84)
Northeast Northwest Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha	53.5865 490.4676 nal temperal curing heating actor for g Jan 77.1349 6.1423	106.9371 541.7092 ture (heati- ng periods ains for li Feb 77.3609	6.4 5.5 7.4 189.3014 609.9631 in the liviving area,	308.8759 706.7079	10.6334 11.2829 11.2829 415.4495 790.0103	443.4474 795.6174 Th1 (C) Jun 80.1795	Jul 80.1795	330.0577 673.7944	.le 6c .8000 .8000 .8000 229.7629 585.2337	Table 0.77 0.77 0.77 129.6439 508.1625	6d 700 700 67.0023 472.0248 Nov 78.5109	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468	(75) (81) (83) (84)
Northeast Northwest 	53.5865 490.4676 	106.9371 541.7092 ture (heati ang periods ains for li Feb 77.3609 6.1574	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882	308.8759 706.7079 area fro nil,m (see Apr 78.7450 6.2497	10.6334 11.2829 11.2829 415.4495 790.0103 mm Table 9, 7 Table 9a) May 78.9805	443.4474 795.6174 Fh1 (C) Jun 80.1795 6.3453	Jul 80.1795 6.3453	0r Tab 0 0 0 0 330.0577 673.7944 Aug 80.4237 6.3616	.le 6c .8000 .8000 .8000 229.7629 585.2337	Table 0.77 0.77 0.77 129.6439 508.1625	000 000 67.0023 472.0248 Nov 78.5109 6.2341	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468	(75) (81) (83) (84)
Northeast Northwest 	53.5865 490.4676 	106.9371 541.7092 ture (heati ng periods ains for li Feb 77.3609 6.1574 0.9967	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894	308.8759 706.7079 ng area fro nil,m (see Apr 78.7450 6.2497	10.6334 11.2829 11.2829 415.4495 790.0103 mm Table 9, 7 Table 9a) May 78.9805 6.2654 0.8116	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940	Jul 80.1795 6.3453 0.4379 20.1960	330.0577 673.7944 Aug 80.4237 6.3616 0.5076 20.1975	Sep 79.6956 6.3130 0.8086 20.1483	Table 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852	000 000 67.0023 472.0248 Nov 78.5109 6.2341	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035	(75) (81) (83) (84)
Northeast Northwest Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha	53.5865 490.4676 	106.9371 541.7092 ture (heati- ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169	308.8759 706.7079 308.8759 706.7079 area fer nil,m (see Apr 78.7450 6.2497 0.9489 19.8426 20.8126	10.6334 11.2829 11.2829 415.4495 790.0103 0m Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9	Jul 80.1795 6.3453 0.4379 20.1960 20.9993 9 22	Aug 80.4237 6.3616 0.5076 20.1975 20.9982 9	Sep 79.6956 6.3130 0.8086 20.1483 20.9646 82	Table 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9	Nov 78.5109 6.2341 0.9965	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9	(75) (81) (83) (84)
Northeast Northwest Northwest Solar gains Total gains Total gains Total gains Total gains Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT	53.5865 490.4676 	106.9371 541.7092 ture (heati- ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169	308.8759 706.7079 308.8759 706.7079 area frc nil,m (see Apr 78.7450 6.2497 0.9489 19.8426 20.8126 8	10.6334 11.2829 11.2829 415.4495 790.0103 mm Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 021.0000	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21	Jul 80.1795 6.3453 0.4379 20.1960 20.9993 9 22 0.21.0000 0.4500 0.4500	Aug 80.4237 6.3616 0.5076 20.1975 20.9982 9 22 0 0 21.0000	Sep 79.6956 6.3130 0.8086 20.1483 20.9646 8 22 00 21.0000	Table 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0 21.0000	Nov 78.5109 6.2341 0.9965 19.2914 20.5617 8 22 0 21.0000	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 00 21.0000	(85) (87)
Northeast Northwest Solar gains Total gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9	53.5865 490.4676 	106.9371 541.7092 ture (heati ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717	308.8759 706.7079 308.8759 706.7079 308.8759 706.7079 308.8759 309.87450 6.2497 0.9489 19.8426 20.8126 8 22 0.21.0000 20.1829	10.6334 11.2829 11.2829 415.4495 790.0103 mm Table 9, 7 Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0 21.0000 20.1852	Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21 0 21.0000 20.1964	Jul 80.1795 6.3453 0.4379 20.1960 20.1964	Aug 80.4237 6.3616 0.5076 20.1975 20.9982 9 22 0 21.0000 20.1987	Sep 79.6956 6.3130 0.8086 20.1483 20.9646 8 22 20 21.0000 20.1919	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.21.0000 20.1852	Nov 78.5109 6.2341 0.9965 19.2914 20.5617 8 22 0.21.0000 20.1807	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0.21.0000 20.1762	(85) (87) (88)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati 	189.3014 609.9631 in the liviving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717 0.9858 19.4070	308.8759 706.7079 308.8759 706.7079 308.8759 706.7079 308.8759 409	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 m Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0.21.0000 20.1852	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21	Jul 80.1795 6.3453 0.4379 20.1960 20.9993 22 0 0.21.0000 20.3587 20.1960 6.3587 20.1960	Aug 80.4237 6.3616 0.5076 20.1975 20.1987 0.4210 20.1987 0.4210 20.1975 20.1975	Sep 79.6956 6.3130 0.8086 20.1483 20.9646 8 22 0.1000 20.1919 0.7419 20.1483 20.1483 20.1483	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.21.0000 20.1852 0.9663 19.7852	Nov 78.5109 6.2341 0.9965 19.2914 20.1807 0.9952 19.2914	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 00 21.0000 20.1762	(85) (87) (88)
Northeast Northwest Northwest Solar gains Total gains 7. Mean inter Temperature d Utilisation f tau alpha util living a Tweekday Tweekend 24 / 16 24 / 9 16 / 9 MIT Th 2 util rest of	53.5865 490.4676	106.9371 541.7092 ture (heati 	189.3014 609.9631 in the liviving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717 0.9858 19.4070	308.8759 706.7079 308.8759 706.7079 308.8759 706.7079 308.8759 409	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 mm Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 22 0.000 20.1852 0.7634 20.1122 20.1122	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21 0 21.0000 20.1964 0.5238 20.1906	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 0.3587 20.1960 20.1964 20.1956	Aug 80.4237 6.3616 0.5076 20.1975 20.9982 0.21.0000 20.1987 0.4210 20.1975 20.1975	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1919	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.0000 21.0000 20.1852 0.9663 19.7852 19.7852 20.1852	Nov 78.5109 6.2341 20.1807 0.9965 19.2914 19.2914 19.2914 19.2914 19.2914 19.2914	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 18.9035 20.1762	(85) (87) (88) (89) (90)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati ang periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695 0.9957 19.0902 20.1695 20.3382	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717	308.8759 706.7079 308.8759 706.7079 308.8759 706.7079 308.8759 409	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 m Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0 21.0000 20.1852 0.7634 20.1122 20.1122 20.1122 20.1122	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.1900 20.1964 0.5238 20.1906 20.1906 20.1964	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 20.1964 20.1964	Aug 80.4237 6.3616 0.5076 20.1975 20.1975 20.1975 20.1987	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1919	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.21.0000 20.1852 19.7852 19.7852 20.1852	Nov 78.5109 67.02341 0.9965 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 18.9035 20.1762	(85) (87) (88) (89)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695 0.9957 19.0902 20.1695 20.3382	6.4 5.5 7.4 189.3014 609.9631 in the liviving area Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717 0.9858 19.4070 19.4070 20.1717	308.8759 706.7079 308.8759 706.7079 area frc nil,m (see Apr 78.7450 6.2497 0.9489 19.8426 20.8126 8 22 0 0.21.0000 20.1829 0.9320 19.8426 20.1829 20.3489	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0 21.0000 20.1852 0.7634 20.1122 20.1852 20.3507	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.1906 20.1964 0.5238 20.1906 20.1964 20.1966 20.1964	Jul 80.1795 6.3453 0.4379 20.1964 20.1964 20.3596	Aug 80.4237 6.3616 0.5076 20.1975 20.1987 20.1987 20.1987 20.1987 20.1987 20.1987 20.1987 20.3614	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1918 £LA = 20.3560	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.1.0000 20.1852 0.9663 19.7852 19.7852 20.1852 Living are 20.3507	Nov 78.5109 6.2341 0.9965 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 20.1762 0.2031 20.2031 20.3435	(85) (87) (88) (89) (90) (91) (92)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695 0.9957 19.0902 19.0902 20.1695 20.3382 20.3382	6.4 5.5 7.4 189.3014 609.9631 in the liviting area, wing area, 17.5882 6.1725 0.9894 19.4070 20.6169 0 21.0000 20.1717 0.9858 19.4070 19.4070 20.1717 20.3400 20.3400	308.8759 706.7079 308.8759 706.7079 308.8759 706.7079 308.8759 308.8759 308.7450 6.2497 0.9489 19.8426 20.8126 8 21.0000 20.1829 0.9320 19.8426 19.8426 20.1829 20.3489	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 mm Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0.00 20.1852 0.7634 20.1122 20.1852 20.3507	443.4474 795.6174 795.6174 795.6174 791.000 20.1906 20.1906 20.1906 20.1964 0.5238 20.1906 20.1906 20.1964 20.1964 20.3596	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 20.3596 20.3596	Aug 80.4237 6.3616 0.5076 20.1975 20.1987 20.1987 20.1987 20.3614 20.3614	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1918 £LA = 20.3560	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.1.0000 20.1852 0.9663 19.7852 19.7852 20.1852 Living are 20.3507	Nov 78.5109 6.2341 0.9965 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 18.9035 20.1762 0.2031 20.3435 0.0000	(85) (87) (88) (89) (90) (91) (92)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati- ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695 19.0902 20.1695 20.3382 20.3382	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 21.0000 20.1717 0.9858 19.4070 19.4070 20.1717 20.3400 20.3400	308.8759 706.7079 308.8759 706.7079 ang area from from from from from from from from	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 mm Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 22 0.000 20.1852 0.7634 20.1122 20.1852 20.3507 20.3507	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21 0 21.0000 20.1964 0.5238 20.1906 20.1964 20.1964 20.3596	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 20.3596 20.3596	Aug 80. 4237 6.3616 0.5076 20.1975 20.1987 20.1975 20.1987 20.1987 20.3614 20.3614	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1918 £LA = 20.3560	Table 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.1.0000 20.1852 0.9663 19.7852 19.7852 20.1852 Living are 20.3507	Nov 78.5109 6.2341 0.9965 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2914 20.1807 0.9952 19.2914 19.2914 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0.9952 19.2014 20.1807 0	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 18.9035 20.1762 0.2031 20.3435 0.0000	(85) (87) (88) (89) (90) (91) (92)
Northeast Northwest Northw	53.5865 490.4676 anal temperal control for grant gran	106.9371 541.7092 ture (heati	6.4 5.5 7.4 189.3014 609.9631 in the livit ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 2 0 21.0000 20.1717 0.9858 19.4070 19.4070 20.1717 20.3400 20.3400	308.8759 706.7079 308.8759 706.7079 area fro nil,m (see Apr 78.7450 6.2497 0.9489 19.8426 20.8126 21.0000 20.1829 0.9320 19.8426 19.8426 20.1829 20.3489 20.3489	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 mm Table 9, Table 9a) May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0.00 20.1852 0.7634 20.1122 20.1852 20.3507	443.4474 795.6174 Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.1906 20.1964 0.5238 20.1906 20.1906 20.1964 20.1964 20.3596	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 20.3596 20.3596	Aug 80.4237 6.3616 0.5076 20.1975 20.1987 20.1987 20.3614 20.3614	Sep 79.6956 6.3130 0.8086 20.1483 20.9646 8 2 2.000 20.1919 0.7419 20.1483 20.1483 20.1919 f.LA = 20.3560 20.3560	Table 0.77 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 21.0000 20.1852 0.9663 19.7852 19.7852 20.1852 Living are 20.3507	Nov 78.5109 6.2341 20.5617 8 2 2 2 2 0 21.0000 20.1807 0.9952 19.2914 20.1807 20.3471 20.3471	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 20.1762 0.2031 20.2031 20.3435 0.0000 20.3435	(85) (87) (88) (89) (90) (91) (92) (93)
Northeast Northwest Northw	53.5865 490.4676	106.9371 541.7092 ture (heati- ng periods ains for li Feb 77.3609 6.1574 0.9967 19.0902 20.4766 8 20 0 21.0000 20.1695 19.0902 20.1695 20.3382 20.3382	6.4 5.5 7.4 189.3014 609.9631 in the livi ving area, Mar 77.5882 6.1725 0.9894 19.4070 20.6169 9 22 0 0 21.0000 20.1717 0.9858 19.4070 20.1717 20.3400 20.3400	308.8759 706.7079 308.8759 706.7079 ang area from from from from from from from from	10.6334 11.2829 11.2829 11.2829 415.4495 790.0103 m Table 9a, May 78.9805 6.2654 0.8116 20.1122 20.9501 9 22 0.7634 40.1122 20.1852 20.1852 20.3507 20.3507	Th1 (C) Jun 80.1795 6.3453 0.5940 20.1906 20.9941 9 21 0 21.0000 20.1964 0.5238 20.1906 20.1964 20.3596 Jun 3596 Jun 443.4474 795.6174	Jul 80.1795 6.3453 0.4379 20.1960 20.1964 20.3596 20.3596 20.3596 21.0000 20.1964 20.3596 20.3596 20.3596	Aug 80. 4237 6. 3616 0. 5076 20. 1975 20. 1987 20. 1987 20. 1987 20. 3614 20. 3614 20. 3614	Sep 79.6956 6.3130 0.8086 20.1483 20.1919 0.7419 20.1483 20.1483 20.1919 £LA = 20.3560 20.7566	Table 0.77 0.77 0.77 0.77 0.77 129.6439 508.1625 Oct 78.9805 6.2654 0.9770 19.7852 20.7817 9 22 0.21.0000 20.1852 0.9663 19.7852 19.7852 20.1852 Living are 20.3507 Oct 0.9688 492.3268	Nov 78.5109 62.241 0.9965 19.2914 20.5617 8 22 0.21.0000 20.1807 0.9952 19.2914 20.3471 20.3471 20.3471	15.5099 20.8863 44.0537 469.0417 21.0000 Dec 78.0468 6.2031 0.9988 18.9035 20.3917 9 22 0 21.0000 20.1762 0.9985 18.9035 18.9035 20.1762 0.2031 20.3435	(85) (87) (88) (88) (89) (90) (91) (92) (93)





CALCULAT	ION OF D	WELLING	G EMISSI	ONS FOR	REGULA	TIONS CO	OMPLIAN	ICE 09	Jan 2014				
Month fracti Space heating Space heating Space heating	567.0860	1.0000 444.8788	1.0000 351.3010	1.0000 154.0938	1.0000 35.7779	0.0000	0.0000	0.0000	0.0000	1.0000 186.7330 (98)	1.0000 393.1202 / (4) =	1.0000 578.1007 2711.0912 31.2698	(98) (98)
8c. Space cool	ling requirem	ment											
9a. Energy rec Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	quirements - pace heat fro pace heat fro main space h secondary/su	Individual om secondar om main sys neating sys	heating sy cy/supplement stem(s) stem 1 (in %	stems, incident	luding micro	O-CHP						0.0000 1.0000 243.7071 100.0000 1112.4382	(202) (206) (208)
Space heating	Jan requirement	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating	567.0860	444.8788			35.7779	0.0000	0.0000	0.0000	0.0000	186.7330	393.1202	578.1007	(98)
Space heating	243.7071	243.7071	243.7071		243.7071	0.0000	0.0000	0.0000	0.0000	243.7071	243.7071	243.7071	(210)
	232.6916	182.5465		63.2291	14.6807	0.0000	0.0000	0.0000	0.0000	76.6219	161.3085	237.2112	(211)
Water heating	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)
Fuel for water Water heating Annual totals Space heating	requirement 204.0327 water heater 178.1250 r heating, kV 114.5447 fuel used kWh/year fuel - main	178.1250 Wh/month 100.9587	188.8582 178.1250 106.0256	169.2909 178.1250 95.0405	165.8938 178.1250 93.1334	148.2241 178.1250 83.2135	142.3456 178.1250 79.9133	156.2080 178.1250 87.6957	155.9355 178.1250 87.5427	175.5453 178.1250 98.5518	185.6312 178.1250 104.2140	178.1250 178.1250 111.7873 1162.6212 1112.4382	(216) (217) (219) (219) (211)
	or pumps and WithHeatRecov ventilation city for the or lighting	fans: very, Datak fans (SFP above, kWh (calculated	= 0.7 n/year	500)	1.2500, SFP	= 0.7500)						198.3263 198.3263 366.6436 2840.0293	(230a (231) (232)
12a. Carbon d	ioxide emissi	ions - Indi	vidual heat	ing systems	s including	micro-CHP							
Space heating Space heating Water heating Space and wate Pumps and fans Energy for lit Total CO2, kg, Dwelling Carbo	- main syste - secondary (other fuel) er heating s ghting /year	em 1						Energy kWh/year 1112.4382 0.0000 1162.6212 198.3263 366.6436		on factor g CO2/kWh 0.5190 0.5190 0.5190 0.5190 0.5190		Emissions kg CO2/year 577.3554 0.0000 603.4004 1180.7558 102.9313 190.2881 1473.9752 17.0000	(263) (264) (265) (267) (268) (272)
Dwelling Carbon Dioxide Emission Rate (DER) 16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES DER Total Floor 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 Net CO2 emissions											TFA N EF	17.0000 86.7000 2.5778 0.5190 15.9165 2.0861 35.0026 0.0000 0.0000 0.0000 35.0026	ZC2 ZC3 ZC4 ZC5 ZC6 ZC7



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



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) 216.7500 (1b) - (3b) (m) x 2.5000 (2b) 86.7000 (1b) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)Dwelling volume 86.7000 $(3a) + (3b) + (3c) + (3d) + (3e) \dots (3n) =$ 216.7500 (5) main secondary total m3 per hour heating 0 0 Number of chimneys Number of open flues 0 * 40 = 0 * 20 = 3 * 10 = 0.0000 (6a) 0.0000 (6b) Number of intermittent fans Number of passive vents Number of flueless gas fires 30.0000 (7a) 0.0000 0 * 40 = Air changes per hour Infiltration due to chimneys, flues and fans = (6a) + (6b) + (7a) + (7b) + (7c) =30.0000 / (5) = 0.1384 (8) Pressure test Measured/design AP50 0.3884 (18) Infiltration rate Number of sides sheltered 2 (19) - [0.075 x (19)] (21) = (18) x (20) 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 0.4209 0.4127 0.4044 0.3632 0.3549 0.3136 0.3136 0.3054 0.3301 0.3549 0.3714 0.3879 (22b) Effective ac 3. Heat losses and heat loss parameter Openings A x U W/K 2.2000 Element Gross NetArea U-value K-value W/m2K 1.0000 1.3258 2.2000 (26) TER Opaque door TER Opening Type (Uw = 1.40) 19.4100 25.7330 11.2710 (27) (28a) Floor 1 0.1300 44.0900 50.5000 202.9000 External 21.6100 0.1800 (29a) External Sheltered Total net area of external elements Aum(A, m2) Fabric heat loss, W/K = Sum (A x U) (26) . . . (30) + (32) = 56.2302 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) 11.6609 (36) 67.8911 (37) (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May (38)m 42.1007 41.8546 41.6134 40.4805 40.2685 Jul 39.2818 Aug 39.0991 Dec 41.1456 (38) Heat transfer coeff 109.9917 Average = Sum(39)m / 12 = 109.7457 109.5045 108.3716 108.1596 107.1729 107.1729 106.9902 107.5529 108.1596 108.5884 109.0367 (39) May 1.2475 Aug 1.2340 1.2475 1.2361 1.2405 1.2576 (40) 1.2499 (40) 1.2686 1.2630 1.2500 1.2361 1.2658 1.2525 HLP (average) 4. Water heating energy requirements (kWh/year) Assumed occupancy Average daily hot water use (litres/day) 2.5778 (42) 95.4228 (43) Feb Apr May Jun Jul Aug Sep Oct Nov Daily hot water use
104.9651
Energy conte 155.6603 101.1482 97.3313 136.1415 140.4858 Energy content (annual)
Distribution loss (46)
23.3490 Total = Sum(45)m = 1501.3730 (45) $(46)m = 0.15 \times (45)m$ 20.4212 21.0729 18.3718 17.6282 15 2118 14.0960 16.1753 16 3685 19.0759 20.8229 22.6123 (46) Store volume a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48) Temperature factor from Table 2b Enter (49) or (54) in (55)



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



CALCULAT	ION OF	TARGET E	EMISSION	IS 09.	Jan 2014								
Total storage	loss 23.3325	21 0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder co	ntains ded		r storage	22.5798		22.5798	23.3325	23.3325	22.5798	23.3325	22.5798		
Primary loss Total heat req		water heati			n month		23.2624	23.2624		23.2624	22.5120		
Solar input	0.0000	178.2272	187.0807 0.0000	0.0000	164.1163 0.0000	146.5039 0.0000	140.5681	0.0000	154.2153 0.0000	173.7678 0.0000 months) = Si	0.0000	197.3436 0.0000 0.0000	(63)
Output from w/		178.2272	187.0807	167.5708	164.1163	146.5039	140.5681	154.4305	154.2153	173.7678	183.9110	197.3436	(64)
Heat gains fro	m water he 89.0330	ating, kWh/ 78.9356	month 83.9874	76.7977	76.3518	69.7930	68.5220	73.1313	72.3570	h/year) = Si 79.5609	am (64)m = 82.2309	87.3998	
5. Internal ga	ins (see T	able 5 and	5a)										
Metabolic gain	s (Table 5		Mar				Jul		0	Oct	Nov	Dec	
(66)m Lighting gains	128.8902	128.8902	128.8902		May 128.8902 L9a), also s		128.8902	Aug 128.8902	Sep 128.8902	128.8902	128.8902	128.8902	(66)
Appliances gai	20.7594 ns (calcul	18.4383 ated in App	14.9950 endix L, eq	11.3522 uation L13	8.4859 or L13a), a	7.1642 Lso see Tab	7.7411 le 5	10.0622	13.5055	17.1483	20.0146	21.3363	(67)
Cooking gains	(calculate	d in Append	lix L, equat	ion L15 or		see Table	5	171.8007	177.8902	190.8540	207.2186	222.5989	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	35.8890 3.0000	
Losses e.g. ev Water heating	-103.1122	-103.1122			-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Total internal	119.6680	117.4637	112.8864	106.6635	102.6234	96.9347	92.0995	98.2947	100.4959	106.9367	114.2095	117.4729	(72)
	437.9683	435.8595	421.7494	398.9198	375.6489	353.2581	338.7248	344.8247	356.5586	379.6061	406.1097	426.0752	(73)
6. Solar gains													
[Jan]				rea m2	Solar flux Table 6a W/m2	Speci or	g fic data Table 6b	or Tab		Acce: factor Table	or	Gains W	
North Northeast Northwest			6.4 5.5 7.4	800 100 200	10.6334 11.2829 11.2829		0.6300 0.6300 0.6300	0 0 0	.7000 .7000 .7000	0.77 0.77 0.77	0.0	21.0581 18.9997 25.5857	(75)
Solar gains Total gains			231.8942 653.6436		508.9256 884.5745					158.8138 538.4199	82.0778 488.1876	53.9657 480.0410	,
7. Mean intern													
Temperature du												21.0000	(85)
Utilisation fa	ctor for g Jan	ains for li Feb	ving area, Mar	nil,m (see Apr	Table 9a) May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau alpha util living ar	54.7390 4.6493			55.5573 4.7038		56.1787 4.7452	56.1787 4.7452	56.2746 4.7516	55.9802 4.7320	55.6662 4.7111	55.4464 4.6964	55.2184 4.6812	
util living ar	0.9982	0.9966	0.9906	0.9633	0.8734	0.7009	0.5411	0.6233	0.8816	0.9835	0.9966	0.9986	(86)
MIT Th 2	19.5854 19.8655	19.7249 19.8677	20.0020 19.8699	20.4016 19.8802	20.7517 19.8822	20.9386 19.8912	20.9856 19.8912	20.9731 19.8929	20.8086 19.8877	20.3664 19.8822	19.9123 19.8783	19.5632 19.8742	
util rest of h	0.9976 17.9869	0.9954 18.1921	0.9870 18.5969	0.9487 19.1751	0.8251 19.6404	0.6041 19.8513	0.4128 19.8861	0.4895 19.8819	0.8152 19.7279	0.9746 19.1352	0.9952 18.4738		
	action 18.3116			19.4242		20.0721	20.1095	20.1036	fLA =	Living area	a / (4) =	0.2031 18.2859	(91) (92)
Temperature ad adjusted MIT		18.5034	18.8823	19.4242	19.8661	20.0721	20.1095	20.1036	19.9474	19.3853	18.7660	0.0000 18.2859	
8. Space heati	ng require	ment											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation Useful gains Ext temp.	501.7383	562.9746		731.3633	0.8243 729.1360 11.7000							478.6130	(95)
Heat loss rate	W 1541.1556	1492.9184	1355.9129	1140.5266	883.2406	586.4640	376.1180	396.2455	628.9094	950.2112	1266.7931	1535.8806	(97)
Space heating	kWh		1.0000		1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000		(98)
Space heating Space heating	per m2									(98)) / (4) =	4006.9682 46.2165	
8c. Space cool													
Not applicable													



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

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



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy red													
Fraction of sp Fraction of sp Efficiency of Efficiency of Space heating	pace heat fr pace heat fr main space secondary/s	om seconda om main sy heating sy supplementa	ry/suppleme stem(s) stem 1 (in	ntary system								0.0000 1.0000 93.5000 0.0000 4285.5275	(202) (206) (208)
Space heating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	773.3265	624.9222	530.9948	294.5976	114.6538	0.0000	0.0000	0.0000	0.0000	318.8067	563.0595	786.6071	(98)
Space heating	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating	fuel (main 827.0871	heating sy 668.3660	stem) 567.9088	315.0776	122.6244	0.0000	0.0000	0.0000	0.0000	340.9697	602.2027	841.2910	(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		178.2272	187.0807	167.5708	164.1163	146.5039	140.5681	154.4305	154.2153	173.7678	183.9110	197.3436	(64)
Efficiency of			87.4452	86.3042	83.8788	79.8000	79.8000	79.8000	79.8000	86.4125	87.6078	79.8000	(216)
(217) m Fuel for wate:	r heating, k	:Wh/month										88.1300	
Water heating	229.6989 fuel used	202.7959	213.9404	194.1628	195.6590	183.5889	176.1505	193.5219	193.2523	201.0910	209.9254	223.9233 2417.7103	
Annual totals Space heating		system										4285.5275	(211)
Space heating	fuel - seco	ondary										0.0000	(215)
Electricity for central her main heating Total electricity for Total delivered	ating pump ng flue fan city for the or lighting	above, kW	d in Append	ix L)								30.0000 45.0000 75.0000 366.6167 7144.8546	(230e) (231) (232)
12a. Carbon d													
Space heating Space heating Water heating	- main syst - secondary (other fuel	em 1						Energy kWh/year 4285.5275 0.0000 2417.7103		ion factor kg CO2/kWh 0.2160 0.0000 0.2160	k	Emissions cg CO2/year 925.6739 0.0000 522.2254	(261) (263) (264)
Space and water Pumps and fans the pumps and fans the pumps and fans total CO2, kg. Emissions per Fuel factor (emissions per Emissions per Emissions per Target Carbon	s ghting /m2/year m2 for spacelectricity) m2 for ligh m2 for pump	ting s and fans		5.7001 * 1.	55) + 2.194	6 + 0.4490,	rounded to	75.0000 366.6167 2 d.p.		0.5190 0.5190		1447.8994 38.9250 190.2741 1677.0985 16.7001 1.5500 2.1946 0.4490 28.5300	(267) (268) (272) (272a) (272b) (272c)



Appendix C SBEM BRUKL Outputs



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

Gym As designed

Date: Thu Mar 04 10:28:34 2021

Administrative information

Building Details

Address: .

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	30.2
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	30.2
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	29.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"First Floor 1 - Unit 6 Mezzanine_W_5"
Floor	0.25	0.13	0.13	"000 Ground Floor - Unit 6_S_3"
Roof	0.25	0.16	0.16	"First Floor 1 - Unit 6 Mezzanine_R_4"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"First Floor 1 - Unit 6 Mezzanine_G_7"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Ua-Limit = Limiting area-weighted average U-values [W			Hion - C	alculated maximum individual element LL-values [W//m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building			
m³/(h.m²) at 50 Pa	10	5			

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency					
This system	rem 4.25 4									
Standard value	2.5*	N/A	N/A	N/A	N/A					
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO										
* Standard shown is t	for all types >12 kW output	except absorption and gas	engine heat pumps. For t	ypes <=12 kW outpu	ut, refer to EN 14825					

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1483 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]						
This building	4.25	-						
Standard value 2* N/A								
* Standard shown is for all types except absorption and gas engine heat pumps.								

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name ID of system type		SFP [W/(I/s)]								HR efficiency	
		В	С	D	E	F	G	Н	I	пке	inclency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
First Floor 1 - Unit 6 Mezzanine	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 Ground Floor - Unit 6	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
First Floor 1 - Unit 6 Mezzanine	NO
000 Ground Floor - Unit 6	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
First Floor 1 - Unit 6 Mezzanine	-	100	-	306
000 Ground Floor - Unit 6	-	100	-	642

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
First Floor 1 - Unit 6 Mezzanine	NO (-83.7%)	NO
000 Ground Floor - Unit 6	NO (-84.6%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

Building Use

	Actual	Notional
Area [m²]	407.4	407.4
External area [m²]	995.6	995.6
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	274.56	497.53
Average U-value [W/m²K]	0.28	0.5
Alpha value* [%]	23.36	16.34

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

% Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.5	10.48
Cooling	12.64	20.54
Auxiliary	34.7	22.31
Lighting	8.3	6.36
Hot water	0	0
Equipment*	84.6	84.6
TOTAL**	57.14	59.69

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	182.93	357.92
Primary energy* [kWh/m²]	175.42	178.68
Total emissions [kg/m²]	29.7	30.2

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

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^{**} Total is net of any electrical energy displaced by CHP generators, if applicable

H	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	21.4	161.5	1.5	12.6	34.7	3.96	3.55	4.25	5
	Notional	91.7	266.2	10.5	20.5	22.3	2.43	3.6		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*	
Wall	0.23	0.18	"First Floor 1 - Unit 6 Mezzanine_W_5"	
Floor	0.2	0.13	"000 Ground Floor - Unit 6_S_3"	
Roof	0.15	0.16	"First Floor 1 - Unit 6 Mezzanine_R_4"	
Windows, roof windows, and rooflights	1.5	1.4	"First Floor 1 - Unit 6 Mezzanine_G_7"	
Personnel doors	1.5	-	"No external personnel doors"	
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"	
High usage entrance doors	1.5	-	"No external high usage entrance doors"	
U _{I-Typ} = Typical individual element U-values [W/(m²K	.)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.				

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

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Compliance with England Building Regulations Part L 2013

Project name Shell and Core

Health Centre

As designed

Date: Thu Mar 04 11:27:20 2021

Administrative information

Building Details

Address: Park View Road, Tottenham Hale, Haringey, ,

N17 9EX

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name: Nimco Ali

Telephone number: 02036031613

Address: Trinity Court Batchworth Island Church Street

Rickmansworth, London, WD3 1RT

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	19.3
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	12.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"000 GF Block B and C - Health Centre P 4"
Floor	0.25	0.13	0.2	"001 First Floor Block B and C - Health Centre
Roof	0.25	0.16	0.16	"001 First Floor Block B and C - Health Centre
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"000 GF Block B and C - Health Centre_G_7"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [V			Ulcaic = C	alculated maximum individual element LI-values [W/(m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- heat pump heating and cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	4.25	4	-	-	-	
Standard value	2.5*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO						
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825						

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1483 for limiting standards.

1- DHW integrated ASHP

	Water heating efficiency	Storage loss factor [kWh/litre per day]				
This building	4.25	-				
Standard value	2*	N/A				
* Standard shown is for all types except absorption and gas engine heat pumps.						

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide					
Α	Local supply or extract ventilation units serving a single area					
В	Zonal supply system where the fan is remote from the zone					
С	Zonal extract system where the fan is remote from the zone					
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery					
E	Local supply and extract ventilation system serving a single area with heating and heat recovery					
F	Other local ventilation units					
G	Fan-assisted terminal VAV unit					
Н	Fan coil units					
1	Zonal extract system where the fan is remote from the zone with grease filter					

Zone name		SFP [W/(I/s)]						UD officionay			
ID of system type	Α	В	С	D	E	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
000 GF Block B and C - Health Centre	e -	-	-	1.4	-	-	-	-	-	0.85	0.5
001 First Floor Block B and C - Health	Cent	е	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
000 GF Block B and C - Health Centre	NO
001 First Floor Block B and C - Health Centre	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 GF Block B and C - Health Centre	100	-	-	5434
001 First Floor Block B and C - Health Centre	100	-	-	5993

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
000 GF Block B and C - Health Centre	NO (-72.4%)	NO
001 First Floor Block B and C - Health Centre	NO (-72.4%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1711.9	1711.9
External area [m²]	2724.4	2724.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	894.46	1400.96
Average U-value [W/m²K]	0.33	0.51
Alpha value* [%]	15.96	18.4

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

Building Use

6 A	\rea	Build	ing 🛚	Гуре		
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A1/A2 Retail/Financial and Professional services

B1 Offices and Workshop businesses

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.32	7.11
Cooling	3.98	9.68
Auxiliary	3.74	2.4
Lighting	14.25	17.64
Hot water	0.82	1.36
Equipment*	36.09	36.09
TOTAL**	24.11	38.19

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

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	69.7	156.28
Primary energy* [kWh/m²]	74.02	114.3
Total emissions [kg/m²]	12.5	19.3

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

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H	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	18.8	50.9	1.3	4	3.7	3.96	3.55	4.25	5
	Notional	62.2	94.1	7.1	9.7	2.4	2.43	2.7		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency ratio Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"000 GF Block B and C - Health Centre_P_4"
Floor	0.2	0.13	"000 GF Block B and C - Health Centre_S_2"
Roof	0.15	0.16	"001 First Floor Block B and C - Health Centre_R_7"
Windows, roof windows, and rooflights	1.5	1.4	"000 GF Block B and C - Health Centre_G_7"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K	[)]		U _{I-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the	minimum U	l-value oc	curs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

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Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Retail Unit As designed

Date: Thu Mar 04 12:04:05 2021

Administrative information

Building Details

Address: Kennington, London, SE11

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7 BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Nimco Ali

Telephone number: 02036031613

Address: The Heights 59-65 Lowlands Road Harrow, London, HA1 3AW

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	37.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	37.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	29
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.28	1.5	"000 GF Block G - Commercial Unit 1_W_13"
Floor	0.25	0.13	0.13	"000 GF Block G - Commercial Unit 1_S_3"
Roof	0.25	0.16	0.16	"000 GF Block G - Commercial Unit 1_R_5"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"000 GF Block G - Commercial Unit 1_G_12"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [W U _{a-Calc} = Calculated area-weighted average U-values			Ui-Calc = C	alculated maximum individual element U-values [W/(m²K)]

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

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

ĺ	Air Permeability	Worst acceptable standard	This building
	m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- VRF Heating and Cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficienc		
This system	4.25	4	-	-	-		
Standard value	2.5*	N/A	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO							
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.							

1- Oval DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]			
This building	4.25	-			
Standard value 2* N/A					
* Standard shown is for all types except absorption and gas engine heat pumps.					

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]							HR efficiency		
ID of system type		В	С	D	E	F	G	Н	I	пке	inclency
Standard value		1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
000 GF Block G - Commercial Unit 1	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 GF Block G - Commercial Unit 2	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 GF Block G - Commercial Unit 3	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 GF Block G - Commercial Unit 4	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
000 GF Block G - Commercial Unit 1	NO
000 GF Block G - Commercial Unit 2	NO
000 GF Block G - Commercial Unit 3	NO
000 GF Block G - Commercial Unit 4	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 GF Block G - Commercial Unit 1	-	100	75	2578

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

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

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 GF Block G - Commercial Unit 2	-	100	75	2614
000 GF Block G - Commercial Unit 3	-	100	75	1011
000 GF Block G - Commercial Unit 4	-	100	75	940

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
000 GF Block G - Commercial Unit 1	NO (-54.3%)	NO
000 GF Block G - Commercial Unit 2	NO (-57.1%)	NO
000 GF Block G - Commercial Unit 3	NO (-84%)	NO
000 GF Block G - Commercial Unit 4	NO (-70.6%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

Actual Notional 780 780 Area [m²] External area [m2] 1550.2 1550.2 LON LON Weather Infiltration [m³/hm²@ 50Pa] 5 3 Average conductance [W/K] 490.82 714.88 Average U-value [W/m²K] 0.46 Alpha value* [%] 109.87 15.23

Building Use

% Area	Building Type
100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional	
Heating	6.06	3.47	
Cooling	6.8	17.31	
Auxiliary	6.57	3.78	
Lighting	36.02	48.02	
Hot water	0.4	0.66	
Equipment*	20.26	20.26	
TOTAL**	55.85	73.23	

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	173.25	254.62
Primary energy* [kWh/m²]	171.46	219.19
Total emissions [kg/m²]	29	37.1

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

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

H	HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	86.4	86.9	6.1	6.8	6.6	3.96	3.55	4.25	5	
	Notional	30.3	224.3	3.5	17.3	3.8	2.43	3.6			

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal effici

= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element	U i-Typ	U _{i-Min}	Surface where the minimum value occurs*				
Wall	0.23	0.18	"000 GF Block G - Commercial Unit 1_W_8"				
Floor	0.2	0.13	"000 GF Block G - Commercial Unit 1_S_3"				
Roof	0.15	0.16	"000 GF Block G - Commercial Unit 1_R_5"				
Windows, roof windows, and rooflights	1.5	1.4	"000 GF Block G - Commercial Unit 1_G_12"				
Personnel doors	1.5	-	"No external personnel doors"				
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"				
High usage entrance doors	1.5	-	"No external high usage entrance doors"				
U _{I-Typ} = Typical individual element U-values [W/(m²K	()		U _{i-Min} = Minimum individual element U-values [W/(m²K)]				
* There might be more than one surface where the minimum U-value occurs.							

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

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Compliance with England Building Regulations Part L 2013

Project name Shell and Core

Nursery As designed

Date: Thu Mar 04 12:20:59 2021

Administrative information

Building Details

Address: Leven Rd, Poplar, London, E14 0LL

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM Interface to calculation engine version: v6.1.7

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

Certifier details

Name: Nimco Ali

Telephone number: 02036031613

Address: Trinity Court Batchworth Island Church Street

Rickmansworth, London, WD3 1RT

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	13.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	13.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	12.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	Ua-Limit	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"000 Nursery - Creche - Unit 0_P_6"
Floor	0.25	0.13	0.13	"000 Nursery - Creche - Unit 0_S_3"
Roof	0.25	-	-	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"000 Nursery - Creche - Unit 0_G_9"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Ua-Limit = Limiting area-weighted average U-values [W			Hion - C	Palculated maximum individual element Livalues (IWI/m²K)

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	4.25	4	-	-	-				
Standard value	2.5*	N/A	N/A	N/A	N/A				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO									
* Standard shown is f	* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825								

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1483 for limiting standards.

1- ASHP DHW

Water heating efficiency		Storage loss factor [kWh/litre per day]					
This building	4.25	-					
Standard value 2* N/A							
* Standard shown is for all types except absorption and gas engine heat pumps.							

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
T	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(I/s)]						UD officionay				
ID of system type	Α	В	С	D	E	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
000 Nursery - Creche - Unit 0	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
000 Nursery - Creche - Unit 0	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 Nursery - Creche - Unit 0	100	-	-	1562

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

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

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
000 Nursery - Creche - Unit 0	NO (-73.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

% Area Building Type Notional

Area [m²]	375.7	375.7
External area [m²]	561.4	561.4
Weather	LON	LON
nfiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	126.07	230.47
Average U-value [W/m²K]	0.22	0.41
Alpha value* [%]	15.8	13.5

Actual

Building Use

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.04	0.98
Cooling	5.26	6.61
Auxiliary	6.93	4.45
Lighting	9.09	10.23
Hot water	3.09	5.13
Equipment*	13.87	13.87
TOTAL**	24.41	27.4

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

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	67.73	94.28
Primary energy* [kWh/m²]	74.95	82.02
Total emissions [kg/m²]	12.7	13.9

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

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

ŀ	HVAC Systems Performance									
Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[S]	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	0.6	67.2	0	5.3	6.9	3.96	3.55	4.25	5
	Notional	8.6	85.7	1	6.6	4.5	2.43	3.6		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency ratio Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element	U i-Тур	U _{i-Min}	Surface where the minimum value occurs*	
Wall	0.23	0.18	"000 Nursery - Creche - Unit 0_P_6"	
Floor	0.2	0.13	"000 Nursery - Creche - Unit 0_S_3"	
Roof	0.15	-	"No heat loss roofs"	
Windows, roof windows, and rooflights	1.5	1.4	"000 Nursery - Creche - Unit 0_G_9"	
Personnel doors	1.5	-	"No external personnel doors"	
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"	
High usage entrance doors	1.5	-	"No external high usage entrance doors"	
U _{I-Typ} = Typical individual element U-values [W/(m²K)]			U _{I-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.				

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

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Compliance with England Building Regulations Part L 2013

Project name Shell and Core

Office As designed

Date: Thu Mar 04 12:51:22 2021

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO2 emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	19
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	14.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"First Floor 1 - Unit 6 Mezzanine_W_5"
Floor	0.25	0.13	0.13	"000 Ground Floor - Unit 7_S_3"
Roof	0.25	0.16	0.16	"First Floor 1 - Unit 6 Mezzanine_R_4"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"First Floor 1 - Unit 6 Mezzanine_G_7"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [W U _{a-Calc} = Calculated area-weighted average U-values			Ui-Calc = C	alculated maximum individual element U-values [W/(m²K)]

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	4.25	4	-	-	-	
Standard value	2.5*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO						
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825						

for limiting standards. 1- Project DHW

Water heating efficiency		Storage loss factor [kWh/litre per day]		
This building	4.25	-		
Standard value	2*	N/A		
* Standard shown is for all types except absorption and gas engine heat pumps.				

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
T	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]						UD officioness			
ID of system type	Α	В	С	D	E	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
First Floor 1 - Unit 6 Mezzanine	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 Ground Floor - Unit 7	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 Ground Floor - Unit 6	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 Ground Floor - Unit 8	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
First Floor 1 - Unit 6 Mezzanine	NO
000 Ground Floor - Unit 7	NO
000 Ground Floor - Unit 6	NO
000 Ground Floor - Unit 8	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
First Floor 1 - Unit 6 Mezzanine	100	-	-	815

Page 1 of 6 Page 2 of 6

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

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

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 Ground Floor - Unit 7	100	-	-	995
000 Ground Floor - Unit 6	100	-	-	1711
000 Ground Floor - Unit 8	100	-	-	703

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
First Floor 1 - Unit 6 Mezzanine	NO (-83.7%)	NO
000 Ground Floor - Unit 7	NO (-67.6%)	NO
000 Ground Floor - Unit 6	NO (-84.6%)	NO
000 Ground Floor - Unit 8	NO (-84.2%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Actual Notional 662.8 662.8 Area [m²] External area [m2] 1706.7 1706.7 LON LON Weather Infiltration [m³/hm²@ 50Pa] 5 3 Average conductance [W/K] 496.91 853.23 Average U-value [W/m²K] 0.5 Alpha value* [%] 24.52 17.47

Building Global Parameters

Building Use % Area Building Type

100	B1 Offices and Workshop businesses
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	A1/A2 Retail/Financial and Professional services

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.86	10.24
Cooling	5.41	10.38
Auxiliary	4.2	2.7
Lighting	12.84	13.07
Hot water	0.68	1.12
Equipment*	42.19	42.19
TOTAL**	27.98	37.51

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	138.35	224.07
Primary energy* [kWh/m²]	85.9	112.27
Total emissions [kg/m²]	14.5	19

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

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

ŀ	HVAC Systems Performance									
System type							Cool gen SEER			
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	69.2	69.1	4.9	5.4	4.2	3.96	3.55	4.25	5
	Notional	89.6	134.5	10.2	10.4	2.7	2.43	3.6		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element		U _{i-Min}	Surface where the minimum value occurs*		
Wall	0.23	0.18	"First Floor 1 - Unit 6 Mezzanine_W_5"		
Floor	0.2	0.13	"000 Ground Floor - Unit 7_S_3"		
Roof	0.15	0.16	"First Floor 1 - Unit 6 Mezzanine_R_4"		
Windows, roof windows, and rooflights	1.5	1.4	"First Floor 1 - Unit 6 Mezzanine_G_7"		
Personnel doors	1.5	-	"No external personnel doors"		
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"		
High usage entrance doors	1.5	-	"No external high usage entrance doors"		
U _{I-Typ} = Typical individual element U-values [W/(m²K)]			U _{I-Min} = Minimum individual element U-values [W/(m²K)]		
* There might be more than one surface where the minimum U-value occurs.					

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

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Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Pub As designed

Date: Thu Mar 04 12:56:10 2021

Administrative information

Building Details

Address:

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name

Telephone number:

Address:

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	70.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	70.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	47.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

 $\label{thm:continuous} \mbox{Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.}$

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"001 Pub Unit 1 - Pub lift and stair to cellar_P_10
Floor	0.25	0.16	0.18	"001 Pub Unit 1 - Pub lift and stair to cellar_F_3'
Roof	0.25	-	-	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"001 Pub Unit 1 - Pub entrance_G_11"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [W			Llicate = C	alculated maximum individual element L-values [W//m²K)]

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Heating only ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	4.25	-	-	-	-				
Standard value	2.5*	N/A	N/A	N/A	N/A				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO									
* Standard shown is t	* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825								

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1482 for limiting standards.

2- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	4.25	4	-	-	-			
Standard value	2.5*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO								
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.								

¹⁻ DHW Pub Cafe gym with storage

		Water heating efficiency	Storage loss factor [kWh/litre per day]
This buil	ding	Hot water provided by HVAC system	0.001
Standard	l value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name ID of system type		SFP [W/(I/s)]						HR efficiency			
		В	С	D	E	F	G	Н	I	пке	miciency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
001 Pub Unit 1 - Pub entrance	-	-	-	1.4	-	-	-	-	-	0.85	0.5
001 Pub Unit 1 - Pub	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
001 Pub Unit 1 - Pub lift and stair to cellar	NO
001 Pub Unit 1 - Pub entrance	NO
001 Pub Unit 1 - Pub	NO

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

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

General lighting and display lighting	Lumino	us effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
001 Pub Unit 1 - Pub lift and stair to cellar	-	100	-	54
001 Pub Unit 1 - Pub entrance	-	100	75	101
001 Pub Unit 1 - Pub	-	100	75	754

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
001 Pub Unit 1 - Pub entrance	NO (-82.3%)	NO
001 Pub Unit 1 - Pub	NO (-21.6%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	360.5	360.5
External area [m²]	776.9	776.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	320.78	372.75
Average U-value [W/m²K]	0.41	0.48
Alpha value* [%]	11.85	13.09

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
100	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.57	8.43
Cooling	22.35	30.69
Auxiliary	11.3	7.2
Lighting	25.71	47.23
Hot water	28.94	44.89
Equipment*	110.43	110.43
TOTAL**	90.88	138.44

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

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	335.91	511.35
Primary energy* [kWh/m²]	279	414.37
Total emissions [kg/m²]	47.2	70.1

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

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H	HVAC Systems Performance										
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS]		Heat pump	(electric):	air source,	[HFT] Elect	tricity, [CFT] Natural Gas				
	Actual	137.4	134.6	10.1	0	10.4	3.79	0	4.25	0	
	Notional	216.9	376.9	24.8	0	6.1	2.43	0			
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	24	319.5	1.7	25	11.4	3.96	3.55	4.25	5	
	Notional	56.8	444.8	6.5	34.3	7.3	2.43	3.6			

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption

Cool SSEER = Cooling system seasonal energy efficiency ratio Heat gen SSEFF = Heating generator seasonal efficiency

- reading generator seasonal energy efficiency ratio
Cool gen SSEER
ST = System type
HS = Heat source = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element U _{i-Typ}		U _{i-Min}	Surface where the minimum value occurs*			
Wall 0.23		0.18	"001 Pub Unit 1 - Pub lift and stair to cellar_P_10"			
Floor 0.2		0.13	"001 Pub Unit 1 - Pub_S_3"			
Roof 0.15		-	"No heat loss roofs"			
Windows, roof windows, and rooflights 1.5		1.4	"001 Pub Unit 1 - Pub entrance_G_11"			
Personnel doors 1.5		-	"No external personnel doors"			
Vehicle access & similar large doors 1.5		-	"No external vehicle access doors"			
High usage entrance doors 1.5		-	"No external high usage entrance doors"			
U _{I-Typ} = Typical individual element U-values [W/(m ² K)]			U _{I-Min} = Minimum individual element U-values [W/(m²K)]			
* There might be more than one surface where the minimum U-value occurs.						

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

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Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Retail As designed

Date: Thu Mar 04 14:18:02 2021

Administrative information

Building Details

Address: .

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	37.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	37.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	25.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"000 Ground Floor - Unit 7_W_8"
Floor		0.13	0.13	"000 Ground Floor - Unit 7_S_3"
Roof	0.25	0.16	0.16	"000 Ground Floor - Unit 7_R_30"
Windows***, roof windows, and rooflights		1.4	1.4	"000 Ground Floor - Unit 7_G_9"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [V U _{a-Calc} = Calculated area-weighted average U-values			Ui-Calc = C	alculated maximum individual element U-values [W/(m²K)]

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values				
Whole building electric power factor achieved by power factor correction	<0.9			

1- ASHP

	Heating efficiency		Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	4.25	4	-	-	-			
Standard value	2.5*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO								
* Standard shown is f	* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825							

for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide					
Α	Local supply or extract ventilation units serving a single area					
В	Zonal supply system where the fan is remote from the zone					
С	Zonal extract system where the fan is remote from the zone					
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery					
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery					
F	Other local ventilation units					
G	Fan-assisted terminal VAV unit					
Н	Fan coil units					
I	Zonal extract system where the fan is remote from the zone with grease filter					

Zone name ID of system type		SFP [W/(I/s)]								UD officiency	
		В	С	D	E	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
000 Ground Floor - Unit 7	-	-	-	1.4	-	-	-	-	-	0.85	0.5
000 Ground Floor - Unit 8	-	-	-	1.4	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
000 Ground Floor - Unit 7	NO
000 Ground Floor - Unit 8	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
000 Ground Floor - Unit 7	-	100	75	1492
000 Ground Floor - Unit 8	-	100	75	1055

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

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

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
000 Ground Floor - Unit 7	NO (-67.6%)	NO
000 Ground Floor - Unit 8	NO (-84.2%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	255.4	255.4
External area [m²]	711.1	711.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	222.35	355.71
Average U-value [W/m²K]	0.31	0.5
Alpha value* [%]	27.1	19.51

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

Building Use

onal	% Are
4	100
1	
71	

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways B1 Offices and Workshop businesses B2 to B7 General Industrial and Special Industrial Groups

A1/A2 Retail/Financial and Professional services

B8 Storage or Distribution

a Building Type

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.39	8.49
Cooling	9.67	18.92
Auxiliary	5.88	3.78
Lighting	26.76	42.45
Hot water	1.7	1.96
Equipment*	20.26	20.26
TOTAL**	48.39	75.6

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	186.17	319.48
Primary energy* [kWh/m²]	148.56	222.59
Total emissions [kg/m²]	25.1	37.9

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

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H	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	62.6	123.6	4.4	9.7	5.9	3.96	3.55	4.25	5
	Notional	74.3	245.2	8.5	18.9	3.8	2.43	3.6		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption

 - reading system seasonal energy efficiency ratio
 - Heating generator seasonal efficiency
 - Cooling generator seasonal energy efficiency Cool SSEER Heat gen SSEFF

Cool gen SSEER

ST = System type = Heat source HS HFT = Heating fuel type CFT = Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"000 Ground Floor - Unit 7_W_8"
Floor	0.2	0.13	"000 Ground Floor - Unit 7_S_3"
Roof	0.15	0.16	"000 Ground Floor - Unit 7_R_30"
Windows, roof windows, and rooflights	1.5	1.4	"000 Ground Floor - Unit 7_G_9"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{I-Typ} = Typical individual element U-values [W/(m²K)]		U _{I-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the	minimum L	J-value oc	curs.

Air Permeability	Typical value	This building	
m³/(h.m²) at 50 Pa	5	5	

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Compliance with England Building Regulations Part L 2013

Project name

School As designed

Date: Thu Mar 04 16:05:35 2021

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	12
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	8.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	Ua-Limit	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"00_Ground Floor 1 - Stairs1_W_6"
Floor	0.25	0.11	0.16	"02_Second Floor 2 - Circulation_F_3"
Roof	0.25	0.16	0.16	"02_Second Floor 3 - Circulation_R_5"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"00_Ground Floor 1 - Stairs1_G_7"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a-Limit} = Limiting area-weighted average U-values [W U _{a-Calc} = Calculated area-weighted average U-values			Ui-Calc = C	alculated maximum individual element U-values [W/(m²K)]

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency					
This system	4.25	-	-	-	-					
Standard value	2.5*	N/A	N/A	N/A	N/A					
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO										
* Standard shown is t	* Standard shown is for all types >12 kW output, except absorption and das engine heat numbs. For types <=12 kW output, refer to FN 14825.									

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1483 for limiting standards.

2- air heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HF	Refficiency	
This system	4.25	-	-	1.4	0.8	35	
Standard value	2.5*	5* N/A N/A 1.5^ 0.5					
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	n	YES	

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

3- School Cooling Server

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	4.25	4	-	-	-			
Standard value	2.5*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES								
* Standard shown is for all types >12 kW output, except absorption and gas engine heat numbs. For types <=12 kW output, refer to FN 14825								

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 1482s for limiting standards.

4- School HVAC heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency					
This system	4.25	-	-	1.4	0.85					
Standard value	2.5*	N/A	N/A	1.5^	0.5					
Automatic moni	Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

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

1- Project DHW

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

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

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

[^] Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

[^] Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]								UD officions	
ID of system type	Α	В	С	D	Е	E F G H			ı	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
00_Ground Floor 1 - Store Nursery Cl	oaks	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Store Cleaner	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 5 - Store Cleaner	0.3	-	-	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Kitchen	-	0.2	-	-	-	-	-	-	1	-	N/A
01_First Floor 1 - Classroom Reception	n C2		-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Circulation1	-	-	-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Office Group Space	-	-	-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Toilet Staff	0.3		-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Classroom Y1 C2	-	-	-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Classroom Y1 C1	-	-	-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Classroom Reception	n C1	-	-	0.2	-	-	-	-	-	0.85	0.5
01_First Floor 1 - Office Meeting Roor	n-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Toilet Staff	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Office Group Spa	аєе2	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Office Group Spa	аєе1		-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Classroom Y3 C	1-		-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Office Staff Work	Sink	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 1 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 2 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 2 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 2 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 2 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 2 - Classroom Y3 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5

Zone name		SFP [W/(I/s)]									· ·
ID of system type	Α	В	С	D	Е	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
02_Second Floor 2 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 2 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Toilet Staff	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 3 - Office Group Spa	аєе1	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 3 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Classroom Y3 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Office Staff Work	Sink	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 3 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 5 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 5 - Office Group Spa	аєе2	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 5 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 5 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
02_Second Floor 5 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.85	0.5
00_Ground Floor 1 - Toilet Staff	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Hygiene Room	-	-	0.3	0.2	-	-	-	-	-	0.85	0.5
00_Ground Floor 1 - Store Reprograp	hics	-	0.2	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Toilets Nursery	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Ground Floor 1 - Store Nursery Cloak	100	-	-	16
00_Ground Floor 1 - Store kitchen Staff Dry	100	-	-	16
00_Ground Floor 1 - Store PE	100	-	-	20
00_Ground Floor 1 - Store General	100	-	-	13
00_Ground Floor 1 - Store Chair	100	-	-	17
01_First Floor 1 - Plant	100	-	-	205
01_First Floor 1 - Store Cleaner	100	-	-	8
01_First Floor 1 - Store Y1 C1	100	-	-	8
01_First Floor 1 - Store RC1	100	-	-	8
01_First Floor 1 - Store RC2	100	-	-	8
02_Second Floor 1 - Store Cleaner	100	-	-	8
02_Second Floor 1 - Store Y2 C1	100	-	-	5
02_Second Floor 1 - Store Y4 C2	100	-	-	9
02_Second Floor 1 - Store Y3 C1	100	-	-	8
02_Second Floor 1 - Store Y3 C2	100	-	-	8
02_Second Floor 1 - Store Y2 C2	100	-	-	9
02_Second Floor 2 - Store Y2 C1	100	-	-	5
02_Second Floor 2 - Store Y2 C2	100	-	-	9

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General lighting and display lighting	g and display lighting Luminous efficacy [I			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W
Standard value	60	60	22	
02_Second Floor 3 - Store Y4 C2	100	-	-	9
02_Second Floor 3 - Store Y3 C1	100	-	-	8
02_Second Floor 3 - Store Y3 C2	100	-	-	8
02_Second Floor 5 - Store Cleaner	100	-	-	8
02_Second Floor 5 - Store Y2 C1	100	-	-	5
02_Second Floor 5 - Store Y2 C2	100	-	-	9
00_Ground Floor 1 - Stairs1	-	100	-	58
00_Ground Floor 1 - Kitchen	-	100	-	513
01_First Floor 1 - Classroom Reception C2	100	-	-	282
01 First Floor 1 - Circulation1	-	100	-	141
01 First Floor 1 - Stairs2	-	100	-	58
01 First Floor 1 - Toilet Boys	-	100	-	73
01_First Floor 1 - Office Group Space	100	-	-	80
01 First Floor 1 - Stairs1	-	100	_	58
01 First Floor 1 - Toilet Girls	_	100	_	73
01 First Floor 1 - Toilet Staff	_	100	_	31
01 First Floor 1 - Classroom Y1 C2	100	-	_	292
01 First Floor 1 - Classroom Y1 C1	100	-	_	293
01 First Floor 1 - Classroom Reception C1	100	-	_	280
01 First Floor 1 - Office Meeting Room	100	-	_	106
02 Second Floor 1 - Circulation	-		-	
_		100		163 32
02_Second Floor 1 - Toilet Staff	-	100	-	
02_Second Floor 1 - Toilet Boys	-	100	-	73
02_Second Floor 1 - Stairs2	-	100	-	58
02_Second Floor 1 - Office Group Space2	100	-	-	79
02_Second Floor 1 - Classroom Y2 C1	100	-	-	292
02_Second Floor 1 - Office Group Space1	100	-	-	79
02_Second Floor 1 - Stairs1	-	100	-	58
02_Second Floor 1 - Toilet Girls	-	100	-	73
02_Second Floor 1 - Classroom Y4 C1	100	-	-	292
02_Second Floor 1 - Cloak Y4 C1	100	-	-	5
02_Second Floor 1 - Classroom Y4 C2	100	-	-	292
02_Second Floor 1 - Classroom Y3 C1	100	-	-	284
02_Second Floor 1 - Office Staff Work Sink	100	-	-	106
02_Second Floor 1 - Classroom Y3 C2	100	-	-	283
02_Second Floor 1 - Cloak Y2 C2	100	-	-	7
02_Second Floor 1 - Classroom Y2 C2	100	-	-	283
02_Second Floor 1 - Cloak Y4 C2	100	-	-	5
02_Second Floor 2 - Circulation	-	100	-	163
02_Second Floor 2 - Toilet Boys	-	100	-	73
02 Second Floor 2 - Stairs2	-	100	-	58
02 Second Floor 2 - Classroom Y2 C1	100	-	-	292
02 Second Floor 2 - Stairs1	-	100	_	58

General lighting and display lighting	Lumino	ous effic		
Zone name	Luminaire	Lamp		General lighting [W]
Standard value	60	60	22	
02_Second Floor 2 - Classroom Y4 C1	100	-	-	292
02_Second Floor 2 - Cloak Y4 C1	100	-	-	5
02_Second Floor 2 - Classroom Y4 C2	100	-	-	292
02_Second Floor 2 - Classroom Y3 C1	100	-	-	284
02_Second Floor 2 - Classroom Y3 C2	100	-	-	283
02_Second Floor 2 - Cloak Y2 C2	100	-	-	7
02_Second Floor 2 - Classroom Y2 C2	100	-	-	283
02_Second Floor 2 - Cloak Y4 C2	100	-	-	5
02_Second Floor 3 - Circulation	-	100	-	163
02 Second Floor 3 - Toilet Staff	-	100	-	32
02 Second Floor 3 - Office Group Space1	100	-	-	79
02 Second Floor 3 - Stairs1	-	100	-	58
02 Second Floor 3 - Toilet Girls	-	100	-	73
02 Second Floor 3 - Classroom Y4 C1	100	-	-	292
02 Second Floor 3 - Cloak Y4 C1	100	-	-	5
02 Second Floor 3 - Classroom Y4 C2	100	_	-	292
02 Second Floor 3 - Classroom Y3 C1	100	-	-	284
02 Second Floor 3 - Office Staff Work Sink	100	_	-	106
02_Second Floor 3 - Classroom Y3 C2	100	_	-	283
02 Second Floor 3 - Cloak Y4 C2	100	_	-	5
02 Second Floor 4 - Circulation	-	100	-	163
02_Second Floor 4 - Stairs1	_	100	-	58
02_Second Floor 5 - Toilet Boys	_	100	-	73
02 Second Floor 5 - Stairs2	_	100	_	58
02_Second Floor 5 - Office Group Space2	100	-	-	79
02_Second Floor 5 - Classroom Y2 C1	100	_	-	292
02 Second Floor 5 - Cloak Y2 C2	100	-	-	7
02 Second Floor 5 - Classroom Y2 C2	100	_	-	283
02 Second Floor 5 - Circulation	-	100	_	73
02_Second Floor 5 - Classroom Y3 C2	100	-	-	257
00 Ground Floor 1 - Studio	-	100	-	319
01 First Floor 1 - Server Room	100	-	-	33
00 Ground Floor 1 - Toilet Staff	-	100	-	35
00 Ground Floor 1 - Toilets	_	100	_	61
00 Ground Floor 1 - WC	_	100	-	33
00_Ground Floor 1 - Wgiene Room	100	-	-	13
00_Ground Floor 1 - Store Reprographics	100	-	-	15
01 First Floor 1 - Cloak Y1 C2	100	-	-	5
01 First Floor 1 - Cloak Y1 C1	100	-	-	5
00 Ground Floor 1 - Nursery	100	-	-	292
00 Ground Floor 1 - Nuisery 00 Ground Floor 1 - Office Staff Work	100	-	-	145
00 Ground Floor 1 - Office Heads	100	-	-	152
00_Ground Floor 1 - Stairs2	-	100	-	58
00_010uliu F1001 1 - 3tai(52	-	100	ı -	30

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General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Ground Floor 1 - Toilets Nursery	-	100	-	61
00_Ground Floor 1 - Circulation1	-	100	-	156
00_Ground Floor 1 - Nursery Small Group	100	-	-	78
00_Ground Floor 1 - Hall Internal	100	-	-	382
00_Ground Floor 1 - Hall Dimming	100	-	-	418
00_Ground Floor 1 - Office Interview	100	-	-	87
00_Ground Floor 1 - Entrance	-	100	75	70
00_Ground Floor 1 - Office General	100	-	-	175
00_Ground Floor 1 - Sick Bay	100	-	-	53

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_First Floor 1 - Classroom Reception C2	NO (-85.3%)	NO
01_First Floor 1 - Office Group Space	N/A	N/A
01_First Floor 1 - Classroom Y1 C2	NO (-62.7%)	NO
01_First Floor 1 - Classroom Y1 C1	NO (-77.6%)	NO
01_First Floor 1 - Classroom Reception C1	NO (-71.3%)	NO
01_First Floor 1 - Office Meeting Room	N/A	N/A
02_Second Floor 1 - Office Group Space2	N/A	N/A
02_Second Floor 1 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 1 - Office Group Space1	N/A	N/A
02_Second Floor 1 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 1 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 1 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 1 - Office Staff Work Sink	N/A	N/A
02_Second Floor 1 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 1 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 2 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 2 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 2 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 2 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 2 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 2 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 3 - Office Group Space1	N/A	N/A
02_Second Floor 3 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 3 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 3 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 3 - Office Staff Work Sink	N/A	N/A
02_Second Floor 3 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 5 - Office Group Space2	N/A	N/A
02_Second Floor 5 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 5 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 5 - Classroom Y3 C2	NO (-84.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Ground Floor 1 - Studio	N/A	N/A
01_First Floor 1 - Server Room	N/A	N/A
00_Ground Floor 1 - Nursery	NO (-51.5%)	NO
00_Ground Floor 1 - Office Staff Work	NO (-82.1%)	NO
00_Ground Floor 1 - Office Heads	NO (-86.6%)	NO
00_Ground Floor 1 - Nursery Small Group	N/A	N/A
00_Ground Floor 1 - Hall Internal	N/A	N/A
00_Ground Floor 1 - Hall Dimming	NO (-65.7%)	NO
00_Ground Floor 1 - Office Interview	N/A	N/A
00_Ground Floor 1 - Entrance	YES (+59.3%)	NO
00_Ground Floor 1 - Office General	NO (-87.3%)	NO
00_Ground Floor 1 - Sick Bay	N/A	N/A

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

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Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3943.9	3943.9
External area [m²]	6709.1	6709.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	1714.31	3147.85
Average U-value [W/m²K]	0.26	0.47
Alpha value* [%]	15.48	11.78

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

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

100 D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals

Others: Emergency services
Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.13	2.91
Cooling	0.35	0.35
Auxiliary	5.22	5.43
Lighting	7.68	12.27
Hot water	1.76	2.77
Equipment*	18.54	18.54
TOTAL**	16.13	23.73

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	74.08	137.26
Primary energy* [kWh/m²]	49.52	71.03
Total emissions [kg/m²]	8.4	12

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

H	IVAC Sys	stems Per	rformanc	е						
Sys	tem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heatin	g or Coolin	g							
	Actual	123.2	0.7	0	0	0.3	0	0	0	0
	Notional	141.3	1.7	0	0	0.5	0	0		
[ST] Central he	eating using	water: rad	iators, [HS]	Heat pum	(electric):	air source,	[HFT] Elect	tricity, [CF1] Natural (
	Actual	14.6	51.5	1.1	0	3.6	3.79	0	4.25	0
	Notional	22.3	111.3	2.5	0	4.9	2.43	0		
[ST] Central he	eating using	air distrib	ution, [HS]	Heat pump	(electric): a	ir source, [HFT] Electr	icity, [CFT]	Natural G
	Actual	1.5	11.9	0.1	0	11.3	3.96	0	4.25	0
	Notional	15.5	14.1	1.8	0	6.6	2.43	0		
[ST] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric): a	ir source, [HFT] Electr	icity, [CFT]	Electricity	
	Actual	0	1510.2	0	112.3	0	0	3.74	0	5
	Notional	0	1466.2	0	113.1	0	0	3.6		
[ST] No Heatin	g or Coolin	g							
	Actual	89.4	11.2	0	0	8	0	0	0	0
	Notional	112.3	37.4	0	0	11.7	0	0		
[ST] Central he	eating using	air distrib	ution, [HS]	Heat pump	(electric): a	ir source, [HFT] Electr	icity, [CFT]	Natural G
	Actual	36.2	29.6	2.5	0	18.5	3.96	0	4.25	0
	Notional	68.6	68.1	7.8	0	11.8	2.43	0		

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Auxiliary energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

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^{**} Total is net of any electrical energy displaced by CHP generators, if applicable.

Key Features

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

Building fabric

Element	U i-Тур	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"00_Ground Floor 1 - Stairs1_W_6"
Floor	0.2	0.09	"00_Ground Floor 1 - Toilets Nursery_S_3"
Roof	0.15	0.16	"02_Second Floor 3 - Circulation_R_5"
Windows, roof windows, and rooflights	1.5	1.4	"00_Ground Floor 1 - Stairs1_G_7"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{I-Typ} = Typical individual element U-values [W/(m²K)	j		U _{I-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the n	inimum U	-value oc	curs.

Air Permeability	Typical value	This building				
m³/(h.m²) at 50 Pa	5	5				



Compliance with England Building Regulations Part L 2013

Project name

Future School

As designed

Date: Thu Mar 04 15:53:03 2021

Administrative information

Building Details

Address: .

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.7

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

Certifier details

Name:

Telephone number:

Address: . .

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	12
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	7.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.12	0.12	"00_Ground Floor 1 - Stairs1_W_6"
Floor	0.25	0.09	0.1	"00_Ground Floor 1 - Kitchen_F_4"
Roof	0.25	0.1	0.1	"02_Second Floor 3 - Circulation_R_5"
Windows***, roof windows, and rooflights	2.2	1.1	1.1	"00_Ground Floor 1 - Stairs1_G_7"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Ua-Limit = Limiting area-weighted average U-values [W Ua-Calc = Calculated area-weighted average U-values			Ui-Calc = C	calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	2

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Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency							
This system	4.25	-	-	-	-							
Standard value	2.5*	N/A	N/A	N/A	N/A							
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO												
+0			50, 111, 16, 11, 10, 11, 11, 11, 11, 11, 11, 11, 11									

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

2- air heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	4.25	-	-	1.2	0.9				
Standard value	2.5*	N/A	N/A	1.5^	0.5				
Automatic monitoring & targeting with alarme for out of range values for this HVAC exetem VES									

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

3- School Cooling Server

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	4.25	4	-	-	-			
Standard value	2.5*	N/A	N/A	N/A	N/A			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES								

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

4- School HVAC heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency				
This system	4.25	-	-	1.2	0.9				
Standard value	2.5*	N/A	N/A	1.5^	0.5				
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES									

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

1- Project DHW

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide				
Α	Local supply or extract ventilation units serving a single area				
В	Zonal supply system where the fan is remote from the zone				
С	Zonal extract system where the fan is remote from the zone				
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery				
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery				
F	Other local ventilation units				
G	Fan-assisted terminal VAV unit				
Н	Fan coil units				
1	Zonal extract system where the fan is remote from the zone with grease filter				

Zone name	SFP [W/(I/s)]									T	
ID of system type	Α	В	С	D	Е	F	G	Н	I	HRE	efficiency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
00_Ground Floor 1 - Store Nursery Cl	oaks	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Store Cleaner	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 5 - Store Cleaner	0.3	-	-	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Kitchen	-	0.2	-	-	-	-	-	-	1	-	N/A
01_First Floor 1 - Classroom Reception	n C2	-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Circulation1	-	-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Office Group Space	-	-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Toilet Staff	0.3	-	-	-	-	-	-	-	-	-	N/A
01_First Floor 1 - Classroom Y1 C2	-	-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Classroom Y1 C1	-	-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Classroom Reception C1		-	-	0.2	-	-	-	-	-	0.9	0.5
01_First Floor 1 - Office Meeting Room	n-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Toilet Staff	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Office Group Spa	аєе2	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Office Group Spa	аєе1	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 1 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Classroom Y3 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Office Staff Work	s Sink	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 1 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 2 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 2 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 2 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 2 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 2 - Classroom Y3 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5

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

[^] Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

[^] Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

Zone name	SFP [W/(I/s)]				HR efficiency						
ID of system type	Α	В	С	D	E	F	G	Н	ı	HRE	ency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
02_Second Floor 2 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 2 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Toilet Staff	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 3 - Office Group Spa	аєе1	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Toilet Girls	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 3 - Classroom Y4 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Classroom Y4 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Classroom Y3 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Office Staff Work	Sink	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 3 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 5 - Toilet Boys	0.3	-	-	-	-	-	-	-	-	-	N/A
02_Second Floor 5 - Office Group Spa	аєе2	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 5 - Classroom Y2 C	1-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 5 - Classroom Y2 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
02_Second Floor 5 - Classroom Y3 C	2-	-	-	0.2	-	-	-	-	-	0.9	0.5
00_Ground Floor 1 - Toilet Staff	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Hygiene Room	-	-	0.3	0.2	-	-	-	-	-	0.9	0.5
00_Ground Floor 1 - Store Reprograp	h i cs	-	0.2	-	-	-	-	-	-	-	N/A
00_Ground Floor 1 - Toilets Nursery	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Lumino	us effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Ground Floor 1 - Store Nursery Cloak	120	-	-	14
00_Ground Floor 1 - Store kitchen Staff Dry	120	-	-	14
00_Ground Floor 1 - Store PE	120	-	-	17
00_Ground Floor 1 - Store General	120	-	-	11
00_Ground Floor 1 - Store Chair	120	-	-	14
01_First Floor 1 - Plant	120	-	-	171
01_First Floor 1 - Store Cleaner	120	-	-	6
01_First Floor 1 - Store Y1 C1	120	-	-	7
01_First Floor 1 - Store RC1	120	-	-	7
01_First Floor 1 - Store RC2	120	-	-	7
02_Second Floor 1 - Store Cleaner	120	-	-	6
02_Second Floor 1 - Store Y2 C1	120	-	-	4
02_Second Floor 1 - Store Y4 C2	120	-	-	8
02_Second Floor 1 - Store Y3 C1	120	-	-	6
02_Second Floor 1 - Store Y3 C2	120	-	-	6
02_Second Floor 1 - Store Y2 C2	120	-	-	8
02_Second Floor 2 - Store Y2 C1	120	-	-	4
02_Second Floor 2 - Store Y2 C2	120	-	-	8

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	2 31 1
02_Second Floor 3 - Store Y4 C2	120	-	-	8
02 Second Floor 3 - Store Y3 C1	120	-	-	6
02_Second Floor 3 - Store Y3 C2	120	-	-	6
02_Second Floor 5 - Store Cleaner	120	-	-	6
02_Second Floor 5 - Store Y2 C1	120	-	-	4
02_Second Floor 5 - Store Y2 C2	120	-	-	8
00_Ground Floor 1 - Stairs1	-	120	-	48
00_Ground Floor 1 - Kitchen	-	120	-	427
01_First Floor 1 - Classroom Reception C2	120	-	-	235
01_First Floor 1 - Circulation1	-	120	-	117
01_First Floor 1 - Stairs2	-	120	-	48
01_First Floor 1 - Toilet Boys	-	120	-	61
01_First Floor 1 - Office Group Space	120	-	-	67
01_First Floor 1 - Stairs1	-	120	-	48
01_First Floor 1 - Toilet Girls	-	120	-	61
01_First Floor 1 - Toilet Staff	-	120	-	26
01_First Floor 1 - Classroom Y1 C2	120	-	-	244
01_First Floor 1 - Classroom Y1 C1	120	-	-	244
01_First Floor 1 - Classroom Reception C1	120	-	-	233
01_First Floor 1 - Office Meeting Room	120	-	-	89
02_Second Floor 1 - Circulation	-	120	-	136
02_Second Floor 1 - Toilet Staff	-	120	-	27
02_Second Floor 1 - Toilet Boys	-	120	-	61
02_Second Floor 1 - Stairs2	-	120	-	48
02_Second Floor 1 - Office Group Space2	120	-	-	66
02_Second Floor 1 - Classroom Y2 C1	120	-	-	244
02_Second Floor 1 - Office Group Space1	120	-	-	66
02_Second Floor 1 - Stairs1	-	120	-	49
02_Second Floor 1 - Toilet Girls	-	120	-	61
02_Second Floor 1 - Classroom Y4 C1	120	-	-	244
02_Second Floor 1 - Cloak Y4 C1	120	-	-	4
02_Second Floor 1 - Classroom Y4 C2	120	-	-	244
02_Second Floor 1 - Classroom Y3 C1	120	-	-	236
02_Second Floor 1 - Office Staff Work Sink	120	-	-	89
02_Second Floor 1 - Classroom Y3 C2	120	-	-	236
02_Second Floor 1 - Cloak Y2 C2	120	-	-	6
02_Second Floor 1 - Classroom Y2 C2	120	-	-	236
02_Second Floor 1 - Cloak Y4 C2	120	-	-	4
02_Second Floor 2 - Circulation	-	120	-	136
02_Second Floor 2 - Toilet Boys	-	120	-	61
02_Second Floor 2 - Stairs2	-	120	-	48
02_Second Floor 2 - Classroom Y2 C1	120	-	-	244
02_Second Floor 2 - Stairs1	-	120	-	49

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General lighting and display lighting	ral lighting and display lighting Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
02_Second Floor 2 - Classroom Y4 C1	120	-	-	244
02_Second Floor 2 - Cloak Y4 C1	120	-	-	4
02_Second Floor 2 - Classroom Y4 C2	120	-	-	244
02_Second Floor 2 - Classroom Y3 C1	120	-	-	236
02_Second Floor 2 - Classroom Y3 C2	120	-	-	236
02_Second Floor 2 - Cloak Y2 C2	120	-	-	6
02_Second Floor 2 - Classroom Y2 C2	120	-	-	236
02_Second Floor 2 - Cloak Y4 C2	120	-	-	4
02_Second Floor 3 - Circulation	-	120	-	136
02_Second Floor 3 - Toilet Staff	-	120	-	27
02 Second Floor 3 - Office Group Space1	120	-	-	66
02_Second Floor 3 - Stairs1	-	120	-	49
02 Second Floor 3 - Toilet Girls	-	120	-	61
02 Second Floor 3 - Classroom Y4 C1	120	-	-	244
02 Second Floor 3 - Cloak Y4 C1	120	-	-	4
02 Second Floor 3 - Classroom Y4 C2	120	-	-	244
02 Second Floor 3 - Classroom Y3 C1	120	-	-	236
02 Second Floor 3 - Office Staff Work Sink	120	-	-	89
02 Second Floor 3 - Classroom Y3 C2	120	_	_	236
02 Second Floor 3 - Cloak Y4 C2	120	-	_	4
02 Second Floor 4 - Circulation	-	120	_	136
02 Second Floor 4 - Stairs1	-	120	-	49
02 Second Floor 5 - Toilet Boys	-	120	_	61
02 Second Floor 5 - Stairs2	-	120	_	48
02 Second Floor 5 - Office Group Space2	120	-	_	66
02 Second Floor 5 - Classroom Y2 C1	120	-	-	244
02 Second Floor 5 - Cloak Y2 C2	120	-	-	6
02 Second Floor 5 - Classroom Y2 C2	120	_	_	236
02 Second Floor 5 - Circulation	_	120	_	61
02 Second Floor 5 - Classroom Y3 C2	120	-	_	215
00 Ground Floor 1 - Studio	-	120	_	266
01_First Floor 1 - Server Room	120	-	_	27
00_Ground Floor 1 - Toilet Staff	-	120	_	29
00 Ground Floor 1 - Toilets	_	120	_	51
00 Ground Floor 1 - WC	-	120	_	27
00 Ground Floor 1 - Hygiene Room	120	-	-	11
00_Ground Floor 1 - Store Reprographics	120	_	_	13
01 First Floor 1 - Cloak Y1 C2	120	_	_	4
01_First Floor 1 - Cloak Y1 C1	120	-	-	4
00 Ground Floor 1 - Nursery	120	-	-	243
00_Ground Floor 1 - Office Staff Work	120	_	_	121
00 Ground Floor 1 - Office Heads	120	_	_	127
00 Ground Floor 1 - Stairs2	-	120	_	48
00_Ground F1001 1 - Stall 82	-	120	-	40

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Ground Floor 1 - Toilets Nursery	-	120	-	51
00_Ground Floor 1 - Circulation1	-	120	-	130
00_Ground Floor 1 - Nursery Small Group	120	-	-	65
00_Ground Floor 1 - Hall Internal	120	-	-	318
00_Ground Floor 1 - Hall Dimming	120	-	-	348
00_Ground Floor 1 - Office Interview	120	-	-	72
00_Ground Floor 1 - Entrance	-	120	90	59
00_Ground Floor 1 - Office General	120	-	-	146
00_Ground Floor 1 - Sick Bay	120	-	-	45

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_First Floor 1 - Classroom Reception C2	NO (-85.3%)	NO
01_First Floor 1 - Office Group Space	N/A	N/A
01_First Floor 1 - Classroom Y1 C2	NO (-62.7%)	NO
01_First Floor 1 - Classroom Y1 C1	NO (-77.6%)	NO
01_First Floor 1 - Classroom Reception C1	NO (-71.3%)	NO
01_First Floor 1 - Office Meeting Room	N/A	N/A
02_Second Floor 1 - Office Group Space2	N/A	N/A
02_Second Floor 1 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 1 - Office Group Space1	N/A	N/A
02_Second Floor 1 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 1 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 1 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 1 - Office Staff Work Sink	N/A	N/A
02_Second Floor 1 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 1 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 2 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 2 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 2 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 2 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 2 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 2 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 3 - Office Group Space1	N/A	N/A
02_Second Floor 3 - Classroom Y4 C1	NO (-62.7%)	NO
02_Second Floor 3 - Classroom Y4 C2	NO (-77.6%)	NO
02_Second Floor 3 - Classroom Y3 C1	NO (-72%)	NO
02_Second Floor 3 - Office Staff Work Sink	N/A	N/A
02_Second Floor 3 - Classroom Y3 C2	NO (-71.9%)	NO
02_Second Floor 5 - Office Group Space2	N/A	N/A
02_Second Floor 5 - Classroom Y2 C1	NO (-71.1%)	NO
02_Second Floor 5 - Classroom Y2 C2	NO (-83.1%)	NO
02_Second Floor 5 - Classroom Y3 C2	NO (-84.2%)	NO

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Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Ground Floor 1 - Studio	N/A	N/A
01_First Floor 1 - Server Room	N/A	N/A
00_Ground Floor 1 - Nursery	NO (-51.5%)	NO
00_Ground Floor 1 - Office Staff Work	NO (-82.1%)	NO
00_Ground Floor 1 - Office Heads	NO (-86.6%)	NO
00_Ground Floor 1 - Nursery Small Group	N/A	N/A
00_Ground Floor 1 - Hall Internal	N/A	N/A
00_Ground Floor 1 - Hall Dimming	NO (-65.7%)	NO
00_Ground Floor 1 - Office Interview	N/A	N/A
00_Ground Floor 1 - Entrance	YES (+59.3%)	NO
00_Ground Floor 1 - Office General	NO (-87.3%)	NO
00_Ground Floor 1 - Sick Bay	N/A	N/A

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

Actual Notional 3943.9 3943.9 Area [m²] External area [m2] 6709.1 6709.1 LON LON Weather Infiltration [m³/hm²@ 50Pa] 2 3 Average conductance [W/K] 1236.13 3147.85 Average U-value [W/m²K] 0.47 Alpha value* [%] 21.47 11.78

Building Use

	_
% Area	Building Type

A1/A2 Retail/Financial and Professional services

A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

100 D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.62	2.91
Cooling	0.2	0.35
Auxiliary	4.36	5.43
Lighting	6.68	12.27
Hot water	1.76	2.77
Equipment*	18.54	18.54
TOTAL**	13.61	23.73

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	71.83	137.26
Primary energy* [kWh/m²]	41.77	71.03
Total emissions [kg/m²]	7.1	12

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

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

ŀ	IVAC Sys	stems Per	rformanc	е						
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[] No Heatin	g or Coolin	g							
	Actual	90	8.0	0	0	0.3	0	0	0	0
	Notional	141.3	1.7	0	0	0.5	0	0		
[ST	T] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Natural									
	Actual	8.4	58	0.6	0	3.6	3.79	0	4.25	0
	Notional	22.3	111.3	2.5	0	4.9	2.43	0		
[ST] Central heating using air distribution, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Natural G										
	Actual	0	20.3	0	0	6.9	3.85	0	4.25	0
	Notional	15.5	14.1	1.8	0	6.6	2.43	0		
[ST	Split or m	Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity								
	Actual	0	1535.2	0	63.4	0	0	6.73	0	9
	Notional	0	1466.2	0	113.1	0	0	3.6		
[ST] No Heating or Cooling										
	Actual	62.7	11.3	0	0	8	0	0	0	0
	Notional	112.3	37.4	0	0	11.7	0	0		
[ST	[ST] Central heating using air distribution, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Natural Ga									
	Actual	16.3	48.5	1.2	0	11.4	3.85	0	4.25	0
	Notional	68.6	68.1	7.8	0	11.8	2.43	0		

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption Cool con [kWh/m2] = Cooling energy consumption

Aux con [kWh/m2] = Auxiliary energy consumption = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency = Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

= System type = Heat source HS HFT = Heating fuel type = Cooling fuel type

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*		
Wall	0.23	0.12	"00_Ground Floor 1 - Stairs1_W_6"		
Floor	0.2	0.08	"00_Ground Floor 1 - Toilets Nursery_S_3"		
Roof	0.15	0.1	"02_Second Floor 3 - Circulation_R_5"		
Windows, roof windows, and rooflights	1.5	1.1	"00_Ground Floor 1 - Stairs1_G_7"		
Personnel doors	1.5	-	"No external personnel doors"		
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"		
High usage entrance doors	1.5	-	"No external high usage entrance doors"		
U _{I-Typ} = Typical individual element U-values [W/(m²K)]			U _{I-Min} = Minimum individual element U-values [W/(m²K)]		
* There might be more than one surface where the minimum U-value occurs.					

Air Permeability	Typical value	This building		
m³/(h.m²) at 50 Pa	5	2		

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